


Afshar S (2011) High-Resolution Windows into Abrupt and Millennial-Scale Changes in Climate and Ocean since the Mid-Pliocene Transition, Santa Barbara Basin, California. M.Sc. Thesis, California State University, Long Beach, 134 p. https://docs.google.com/a/umich.edu/file/d/0B_44KoD6U_ezc0ZhrE1UtM56bXM/edit?usp=drive_web; Two high-resolution, multi-proxy records for ~5-kyr windows at ~290 ka and ~735 ka from marine piston cores, Santa Barbara Basin, California, abrupt millennial- to sub-millennial-scale oscillations in total organic carbon, carbonate and biogenic silica. *Note: the claimed presence of varves in deeper core sections was partially revised by Hendy et al.’s (2012) new interpretation of laminations.*


Anderson RY (1982) A long geoclimatic record from the Permian. *Journal of Geophysical Research* 87 (C9), 7285-7294. [dx.doi.org/10.1029/JC087iC09p07285](http://dx.doi.org/10.1029/JC087iC09p07285) Continuous 260,000-year marine varve-based time series from Permian Castile and Bell Canyon Formations of the Delaware Basin, southeastern New Mexico, and southwestern Texas, USA, calcite-laminated anhydrite and anhydrite-laminated halite, seasonal and annual deposition of evaporates, varve thickness, calcium sulfate, calcium carbonate, organic matter, oscillations of ∼100,000, 200,000, 2700, 200 years, sulfate, carbonate, halite.


Anderson RY (1986) The varve microcosm: propagator of cyclic bedding. *Paleoceanography* 1 (4), 373-382. [dx.doi.org/10.1029/PA001i004p00373](http://dx.doi.org/10.1029/PA001i004p00373) Example of cyclic bedding in the form of marine varves from the Permian Castile formation, skipping of climatic cycles by bedding response may lead to erroneous estimates of frequency.


Anderson RY, Dean WE (1988) Lacustrine varve formation through time. *Palaeogeography, Palaeoclimatology, Palaeoecology* 62 (1-4), 215-235. [dx.doi.org/10.1016/0031-0182(88)90055-7](http://dx.doi.org/10.1016/0031-0182(88)90055-7) Different types of varved sediments observed through time, iron-rich laminations were common in the middle Precambrian, glaciolacustrine varves, carbonate-rich varves in the Precambrian and Phanerzoic, diatom laminae.


Andrén T, Dean WE Jr, Kirkland DW, Snider HI (1972) Permian Castile varved evaporite sequence, West Texas and New Mexico. Geological Society of America Bulletin 83 (1), 59-86. http://dx.doi.org/10.1130/0016-7606(1972)83[59:PCVESW]2.0.CO;2; marine varves are correlated for distances up to 113 km, 260,000-varve sequence, Bell Canyon Formation = about 50,850 varve couplets, etc., Castle, Salado.


Anderson RY, Kirkland DW (1960) Origin, varves, and cycles of Jurassic Todilto formation, New Mexico. Bulletin of American Association of Petroleum Geologists 44 (1), 37-52. http://aapgbull.geoscienceworld.org/content/44/1/37.abstract; marine varved sequence of limestone and gypsum, northwestern New Mexico, periodicities 10-13-year sunspot cycle, 60-, 85-, 170-, and 180-year cycles, varved cycle is nearly complete in the Todilto sequence and is present in the Green River basin of Colorado and Wyoming, the Delaware basin of Texas and New Mexico, the Paradox basin of Utah and the Four Corners region, and in most other evaporite deposits.


Andrén T (1996) The Younger Dryas-Preboreal transition as recorded in varved glacial clay sequences in the NW Baltic Sea. GFF 118 (supplement 004), 79. http://dx.doi.org/10.1080/11035896069546378


(SICI)1099-1417(199907)14:4<361::AID-JOS446>3.0.CO;2-R; mean varve thickness curve for part of the Swedish varve chronology from the northwestern Baltic proper, correlation with δ18O from GRIP ice-core using the Younger Dryas—Preboreal climate shift, pollen analyses, suggesting a large error in the Swedish varve chronology in the part younger than ca. 10300 clay-varve yr BP.


Andrén T, Sohlenius G (1995) Late Quaternary development of the north-western Baltic Proper — Results from the clay-varve investigation. *Quaternary International* 27, 5-10. http://dx.doi.org/10.1016/1040-6182(94)00055-A: late glacial, calcarceous micro-fossils, mineral magnetic properties, measurements of clay-varves, correlation between brackish water ostracods and foraminifera and a distinct change in mineral magnetic parameters, Yoldia Sea stage is 60 to 120 clay-varve years, Baltic Sea, Sweden.


Barrell J (1917) Rhythms and the measurements of geologic time. Bulletin of the Geological Society of America 28 (1), 745-904. http://dx.doi.org/10.1130/GSAB-28-745; early thoughts about laminations: “Nature vibrates with rhythms, climatic and diastrophic, those finding stratigraphic expression ranging in period from the rapid oscillation of surface waters, recorded in ripple-mark, to those long-deferred stirrings of the deep imprisoned titans which have divided earth history into periods and eras…” etc.


two varve records for quality control of varve-counting, cross-dating, detection of false and missing varves, Guaymas Basin slope, Gulf of California, Mexico, marine sediment.


Baumgartner TR, Soutar A, Ferreira-Bartrina V (1992) Reconstruction of the history of the Pacific sardine and northern anchovy populations over the past two millennia from sediments of the Santa Barbara basin, California. *California Cooperative Oceanic Fisheries (CalCOFI) Investigations Report* 33, 24-40. [http://www.calcofi.org/publications/calcofireports/v33/Vol_33_Baumgartner_etal.pdf](http://www.calcofi.org/publications/calcofireports/v33/Vol_33_Baumgartner_etal.pdf); North America, marine sediment, Pacific Ocean, California Current, fish scales, sardine, anchovy, reconstruction of fish stocks. *Note that the varve chronology of the last 2,000 years was revised by Hendy et al. (2012)* leading to potentially different interpretations.


Behl RJ, Kennett JP (1996) Brief interstadial events in the Santa Barbara basin, NE Pacific, during the past 60 kyrs. *Nature* 379, 243-246. [http://dx.doi.org/10.1038/379243a0](http://dx.doi.org/10.1038/379243a0); Santa Barbara Basin, California, North America, marine sediment, Pacific Ocean, recognition of Dansgaard–Oeschger events in the form of laminated (i.e. partially varved) sediment intervals versus massive intervals. *Note: this paper was published before the recognition that not all laminated sediment in Santa Barbara Basin is necessarily varved; the recognition has no impact on the paper’s conclusions."


Belbin SP (1994) A new standard method of impregnation using crysitic resin. *Journal of Sedimentary Research* 64 (3a), 673. [http://jsedres.geoscienceworld.org/content/64/3a/673.full.pdf+html](http://jsedres.geoscienceworld.org/content/64/3a/673.full.pdf+html); resin impregnation after exchange of water with acetone.
http://dx.doi.org/10.1016/j.epsl.2014.05.049; cosmogenic isotope $^{10}$Be, lacustrine varved sediment, precursor of the Dead Sea, detrital sediments and primary (evaporitic) aragonites, rapid change in the $^{10}$Be production rate during the Laschamp geomagnetic excursion; however, see López-Merino et al. (2016) who advise caution.


http://dx.doi.org/10.1016/j.palaeo.2007.12.004; Late Pleistocene trace fossils from glaciolacustrine varves of Connecticut River Valley, glacial Lake Hitchcock, reinhabitation of freshwater fish (cottids) from a Wisconsinan glacial refugium.

http://dx.doi.org/10.1023/A:1011179318352; test of mobility of lead-210, cesium-137, Connecticut, USA, three lakes, peaks in concentrations of trace metals, sediment focusing, geochronology.

http://dx.doi.org/10.1130/G19578.1; quantitative one-dimensional model for the formation and preservation of sedimentary fabric based on interacting sedimentation and bioturbation, event layer, preservation of varves.

http://dx.doi.org/10.1016/S0921-8181(02)00122-4; Late Holocene, ~5000 year varve record, oxygen-minimum zone (OMZ) off Pakistan, varve thickness, periodicity, autocorrelation, Fourier analysis, lunar perigee cycle, tidal cycles, marine sediment.

http://dx.doi.org/10.1007/s10933-010-9437-1; annually resolved record of $^{10}$Be in varved lake sediments, Lake Lehmilampi, Finland, focus on the last 100 years, sunspots, solar activity.


http://dx.doi.org/10.4319/lo.2003.48.2.0813; California, Pacific Ocean, life positions of microbes within marine anoxic sediment, submillimeter distributions of eukaryotic nanobionta and meiofauna, microelectrode profiles, mosaic of chemically heterogeneous microhabitats exist in vertical and horizontal dimensions.


http://dx.doi.org/10.1029/2008GL033950; lake sediment, Lower Mystic Lake, Boston, Massachusetts, North America, flood layer, history and frequency of hurricanes.


Biondi F, Lange CB, Hughes MK, Berger WH (1997) Inter-decadal signals during the last millennium (AD 1117-1992) in the varve record of Santa Barbara basin, California. Geophysical Research Letters 24 (2), 193-196. http://dx.doi.org/10.1029/96GL03813; varve thickness, interdecadal oscillation, singular spectrum analysis, inter-decadal oscillations. Note that the varve chronology of the last 2,000 years was revised by Hendy et al. (2012) leading to potentially different interpretations. Biondi et al. (1997) reported a significant change around 1600 AD, which roughly coincides with the transition from older laminated to younger varved sediment.


Bird BW, Abbott MB, Vuille M, Rodbell DT, Stansell ND, Rosenmeier MF (2011) A 2,300-year-long annually resolved record of the South American summer monsoon from the Peruvian Andes. Proceedings of the National Academy of Sciences, PNAS 108 (21), 8583-8588. http://dx.doi.org/10.1073/pnas.1003719108; Laguna Pumacocha, high-altitude lacustrine varves, South America, Medieval Climate Anomaly, Little Ice Age, oxygen isotopes, authigenic calcite; this article contains supporting information online at http://www.pnas.org/content/suppl/2011/05/03/1003719108.DCSupplemental.


Björck J, Possnert G, Schoning K (2001) Early Holocene deglaciation chronology in Västergötland and Närke, southern Sweden — biostratigraphy, clay varve, 14C and calendar year chronology. Quaternary Science Reviews 20 (12), 1309-1326. http://dx.doi.org/10.1016/S0277-3791(00)00168-2; marine calcareous fossils, varve counting, radiocarbon dating, pollen stratigraphy, varves ∼11,500 to 11,200 calendar years BP, deglaciation, corresponding varve ages in the Swedish Time Scale are ∼700–800 years younger, Lake Vättern, 10–50 year marine ingestion into Baltic basin prior to Yoldia Sea brackish phase, ∼140 years before deglaciation of Närke Strait.

ratios in authigenic calcites during their precipitation and dissolution, Sacrower See (northeastern Germany). Autochthonous organic matter and biochemically precipitated calcite, lake sediment, water column stratification, diatoms.

meteorological parameters, biochemical calcite precipitation, organic matter production, total particle flux, dominated by hypertrophic hardwater lake (Sacrower See, Northeastern Germany).

stratification as forcing factors of seasonal carbonate and organic matter flux dynamics in a Soppensee, Switzerland, radiocarbon, Laacher See tephra, lake sediment.

Science Reviews exemplified by the revised chronology for the Central European varved lake Soppensee.

temperature, sediment trap, lake sediment, tree-rings, sediment transport mechanisms, Maunder Minimum, Little Ice Age, 10.1177/0959683607073278 high-resolution summer temperature reconstruction for the eastern Swiss Alps back to AD 1580 inferred from varved sediments of Lake Silvaplana (southeastern Swiss Alps).

cesium-137, glacial varves, turbidite, European Alps.

Helvetiae (Sustenpass, Switzerland) compared with historic events and instrumental meteorological data.

the Nile deep-sea fan, partially laminated and even seasonally varved due to deposition from hyperpycnal flows.

10.1016/j.epsl.2013.01.009 sedimentary deposits of the Nile deep-sea fan.

4000 yr., Saanich Inlet, marine sediment.

reanalysis of varve chronology improves uncertainty estimates on ages of prehistoric debris-flow deposits (DFDs) in the last 4000 yr., Saanich Inlet, marine sediment.

Blais-Stevens A, Clague JJ, Bobrowsky PT, Patterson RT (1997) Late Holocene sedimentation in Saanich Inlet, British Columbia, and its paleoseismic implications. Canadian Journal of Earth Sciences 34 (10), 1345-1357. http://dx.doi.org/10.1139/e17-197: 8 piston cores of marine sediment spanning the last 1500 years, cesium-137, 210Pb, 14C ages, varve counts to date and correlate massive layers, not all massive layers correlate from core to core and are seismically generated deposits.


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ggeochemical responses of Lake
µm resolution, XRF whole-core scanner (XRF-S) with 5-mm resolution, continuous element profiles.
dx.doi.org/10.1029/2006GC001480
profiles of wet marine sediments.
nged image acquisition, automated classification, neural networks, particle recognition, automated microscopy, microfossils, morphometry, calcareous nannofossils, planktic foraminifera, SEM, light microscopy.
http://dx.doi.org/10.1002/jqs.1469; freshwater molluscs, zoochory, African Humid Period, fresh and saline lakes of Ounianga Kebir and Serir with varved sediment, gastropods, bivalve.
Boës X, Fagel N (2008) Relationships between southern Chilean varved lake sediments, precipitation and ENSO for the last 600 years. Journal of Paleolimnology 39 (2), 237-252, http://dx.doi.org/10.1007/s10933-007-9119-9; El Niño Southern Oscillation (ENSO), South America, Chile, varve-thickness record, Lago Puyehue (40° S), the last 600 years, annual sediment accumulation rate, varve-counting, thin sections, varve thickness correlates with austral autumn/winter precipitation, Medieval Warm Period, spectral analysis.


Brännvall ML, Bindler R, Renberg I, Emteryd O, Bartnicki J, Billström K (1999) *The Medieval metal industry was the cradle of modern large-scale atmospheric lead pollution in northern Europe.*
Environmental Science & Technology 33, 4391-4395. [http://dx.doi.org/10.1021/es990279n]: heavy metals, pollution, atmospheric deposition, lead concentrations, stable lead isotope ratios $^{206}$Pb/$^{207}$Pb, lake sediment, four lakes in northern Sweden, Lakes Kassjön, Lake Norrtjärn, Lake Gränärstjärn, atmospheric lead pollution for the last 3000 years, airborne pollution from Greek and Roman cultures 2000 years ago, Medieval pollution.


Brauer A, Wulf S, Mangili C, Moscariello M (2007) Tephrochronological dating of varved interglacial lake deposits from Piànico-Sèllere (Southern Alps, Italy) to around 400 ka. Journal of Quaternary Science 22 (1), 85-96. http://dx.doi.org/10.1002/jqs.1014; paleolake Piànico, Italy, new dating by tephrochronology. This study was subsequently criticized by Pinti et al. (2007), and the critique was rebutted by Brauer et al. (2007; see above).


Bukry D, King SA, Horn MK, Manheim FT (1970) Geological significance of coccoliths in fine-grained carbonate bands of postglacial Black Sea sediments. Nature 226, 156-158. http://dx.doi.org/10.1038/226156a0; light-coloured bands and darker bands imaged via scanning electron and light microscopy, Holocene coccoliths are the overwhelmingly dominant constituents in the light bands, whereas Cretaceous and Eocene coccoliths are important components of the carbonate in the darker matrix, in part marine sediment.


coastal runoff, backscatter electron imagery to measure components of varves, periodicities of 3.1 and 8.4 yr in terrigenous series, periodicities of 3.5 and 7.6 yr in diatomaceous series, El Niño, cross-spectral analysis of the terrigenous and diatomaceous records. El Niño has been a persistent feature of late Quaternary climate variability; the study incorrectly assumes the presence of varves; see Schimmelmann et al. (2013) http://dx.doi.org/10.1080/11035887.2013.773066.

Burke IT, Grigorov I, Kemp AES (2002) Microfabric study of diatomaceous and lithogenic deposition in laminated sediments from the Gotland Deep, Baltic Sea. Marine Geology 183 (1-4), 89-105. http://dx.doi.org/10.1016/S0025-3227(01)00250-X; anoxic diatomaceous sediments at intervals throughout the last 8000 yr, scanning electron microscope study, couples, triplets and quadruplets of diatomaceous and lithogenic laminae are observed with an average thickness of approximately 700 μm, diagenetic Ca-rhodochrosite laminae, diatom assemblages suggest that bundles of laminae represent varves, varve record often interrupted by diffusely laminated and homogenous sediments.


Caisse BE, Brigham-Grette J, Lawrence KT, Herbert TD, Cook MS (2010) Last Glacial Maximum to Holocene sea surface conditions at Umnak Plateau, Bering Sea, as inferred from diatom, alkenone, and stable isotope records. Paleoceanography 25 (1), PA1206. http://dx.doi.org/10.1029/2008PA001671; deglaciation was characterized by laminated, partially varved intervals with productive and diverse diatom assemblages.


Carstensen J, Andersen JH, Gustafsson BG, Conley DJ (2014) Deoxygenation of the Baltic Sea during the last century. Proceedings of the National Academy of Sciences of the United States of America (PNAS) 111 (15), 5628-5633. http://dx.doi.org/10.1073/pnas.1323156111; Baltic Sea is the largest anthropogenically induced hypoxic area in the world, 10-fold increase of hypoxia in the Baltic Sea, references to varves and laminations.


Hypoxia is increasing in the Coastal Zone of the Baltic Sea.


Cockburn JMH, Lamoureux SF (2008) Inflow and lake controls on short-term mass accumulation and sedimentary particle size in a High Arctic lake: implications for interpreting varved lacustrine sedimentary records. *Journal of Paleolimnology* 40 (3), 923-942. http://dx.doi.org/10.1007/s10933-008-9207-5; Canadian High Arctic, rate of sediment accumulation changed over short distances down-lake, grain size measures may not be representative proxies of inflow competence, grain size indices based on a measure of the coarser fraction may be more appropriate link between contemporary runoff processes and sedimentary characteristics.


Lake sediment, Holocene, annual mass accumulation, temperature reconstruction, Little Ice Age.


Lamination (varve) occurrence contemporaneous with laminated sediments from the California margin and Gulf of California, due to low-oxygen conditions at intermediate depths in the North Pacific Ocean.


Laminated sediments, North Atlantic Ocean, Backscatter Scanning Electron Microscopy (BSEM), couplets of dark clay-rich sediments thought to be deposited from spring to autumn, pale silt-rich layers believed to represent sedimentation through winter, X-ray densitometry, difficult count the laminations, floating chronologies.


AMS radiocarbon dating of 6-m sediment core, Late Pleistocene and the first ca. 7500 yr of the Holocene, suggestion of varves, pollen, laminations due to winter floods, varve chronology for the Holocene.


1321–1963 AD laminations in lake sediment from Loch Ness, Scotland, United Kingdom, laminating thickness correlates with the number of ice weeks off Ireland, the index of the North Atlantic Oscillation (NAO), and with Zurich sunspot number, power spectra, low frequencies compatible with the NAO, the “11-year” sunspot cycle, the Hale (or “double sunspot”) cycle, and the Gleissberg (88 year) solar cycle, solar variability.


1548-year varstic varved record, northern Spain, biogenic varves composed of calcite, organic matter and detrital laminae and turbidite layers, human impact, Medieval Climate Anomaly, Mediterranean, Pyrenees, human impact.


60 year-reconstruction of depositional history, sedimentology, geochemistry, diatom, instrumental climate data (1952–2007), limnological monitoring, discontinuous varve counts, cesium-137, radiocarbon, varved facies intercalated with fine turbidite deposits, Northern Iberia, land use.


Extreme rainfall events interpreted from detrital layers and turbidites interbedded within a varved sediment record since the 14th century in Montcortès Lake, NE Spain, high-resolution geochemical and sedimentological analyses.


The last 6,000 cal. years, karstic lake sediment, turbidite, calcite laminae, Iberian-Roman Period, Little Ice Age, Medieval Climate Anomaly, Mediterranean, Pyrenees, human impact.


pastglobalchanges.org/download/docs/meeting-products/abstracts/2011_VWG_2nd_wkshp.pdf: 5,221 year varve record, Lower Murray Lake, Ellesmere Island, Canadian Arctic, varve thickness, event deposits.
Lago-Mare episode. *Sedimentary Geology* **178** (1-2), 31-53. [http://dx.doi.org/10.1016/j.sedgeo.2005.03.010](http://dx.doi.org/10.1016/j.sedgeo.2005.03.010); Late Messinian Lago-Mare deposits, high-frequency cyclicity, Mediterranean Basin, Adriatic side of the central Apennines, Italy, Fonte dei Pulcini section (SE Majella Mts.), 53 meters of millimeter- and centimeter-scale white-and-dark couplets forming varves, geochemistry, mineralogy (XRD analyses), micropaleontology, SEM and microprobe, spectral analyses, cyclicities, sunspot solar activity, Messinian salinity crisis.


Crowell JC, Duchon CE, Rhi J (1986) Climate record in varved sediments of the Eocene Green River Formation. *Journal of Geophysical Research* **91**(D8), 8637-8647. [http://dx.doi.org/10.1029/JD091iD08p08637](http://dx.doi.org/10.1029/JD091iD08p08637); time series of 1469, 1869, and 4158 varve thickness measurements from the Eocene Green River Formation, Colorado, statistical techniques to characterize climate variations, Fourier spectra, maximum entropy spectra, nonperiodic and weakly predictive climate during the time periods corresponding to deposition of the varves.


Crusius J, Anderson RF (1992) Inconsistencies in accumulation rates of Black Sea sediments inferred from records of laminae and 210Pb. *Paleoceanography* 7 (2), 215-227. http://dx.doi.org/10.1029/92PA00279; AMS radiocarbon dating does not compare well with marine varve counts [Degens et al., 1980; Hay, 1988], sediment accumulation rate, lead-210, during discrepancy exists because (a) it difficult to count very fine laminae and (b) because a complete couplet is not deposited every year; estimate of the age of a distinct black marker horizon across the entire abyssal plain to be 150 ± 8 years (deposited in 1838 ± 8 A.D.).

Crusius J, Anderson RF (1995) Evaluating the mobility of 137Cs, 239+240Pu and 210Pb from their distributions in laminated lake sediments. *Journal of Paleolimnology* 13 (2), 119-141. http://dx.doi.org/10.1007/BF00678103; post-depositional mobility of 137Cs cesium, 239+240Pu plutonium, 210Pb lead-210, use of varved lake sediments for superior chronologic control, no evidence of mobility of 210Pb, significant mobility of 137Cs, 239+240Pu is a more reliable sediment chronometer than 137Cs because it is significantly less mobile, radionuclides.


Cuvyn, Francis P, Lamoureux S (2011) Mid to Late Holocene hydroclimatic and geochemical records from the varved sediments of East Lake, Cape Bounty, Canadian High Arctic. *Quaternary Science Reviews* 30 (19-20), 2651-2665. http://dx.doi.org/10.1016/j.quascirev.2011.05.019; Melville Island, 4200 year-long clastic varve record, micro X-ray fluorescence (µ-XRF), progression from marine in the mid-Holocene, to estuarial from 2195 BC to 243 AD, to fully lacustrine source after 244 AD, correlation with local meteorological data, varve thickness correlates with snow depth and Sept–May temperatures, paleoecologic reconstruction, Little Ice Age.


Dallimore A, Jmieff DG (2010) Canadian west coast fjords and inlets of the NE Pacific Ocean as depositional archives. In: (Howe JA, Austin WEN, Forwick M, Paetzel M, Eds.) Fjord Systems and Archives. Geological Society of London, Special Publications 344, 143-162. http://dx.doi.org/10.1144/SP344.12; summary of Canadian west coast fjord environments, (1) mainland fjords drain high mountains and ice fields with sediment input from snowmelt and glacier runoff in spring and summer, (2) inlets on Vancouver Island are in a milder marine climate, sediment input mostly during rains of autumn and winter, shallow sills at the mouth of some Vancouver Island inlets trigger anoxic bottom waters, marine mixed vanes.


SRXRF scanning, geochemical indicators, geochemical and biological proxies in varved lake sediment, tree-ring width chronology, Lake Teletskoe (Altai), Lake Kucherla (Altai), Lake Baikal, Lake Arahle (Chita), scanning X-ray fluorescent analysis with synchrotron radiation, trace elements from K to U, radiocarbon, lead-210, cesium-137, instrumental data, transfer functions, reconstruction of annual temperature and precipitation.


Proxy-based, quantitative reconstruction of cold-season (mean October to May) air temperatures covering nearly the entire last millennium (AD 1060–2003, some hiatuses) based on subfossil chrysophyte stomatocyst remains in the varved sediments of high-Alpine Lake Silvaplana, eastern Swiss Alps. (46°27′N, 9°48′W, 1791 m a.s.l.), 5-yr resolution, Little Ice Age, since AD 1980 summer and cold season temperatures show a simultaneous, strong increase, which is unprecedented in the context of the last millennium.


Dean JM, Kemp AES, Pearce RB (2001) Palaeo-flux records from electron microscope studies of Holocene laminated sediments, Saanich Inlet, British Columbia. *Marine Geology* 174 (1-4), 139-158. [http://dx.doi.org/10.1016/S0025-3227(00)00147-X](http://dx.doi.org/10.1016/S0025-3227(00)00147-X); ODP Leg 169S, scanning electron microscope, varves form couplets, varves may contain up to 19 sub-laminae recording sub-seasonal to seasonal-scale processes, laminae fabrics, unique massive interval for inter-site correlation, marine sediment.


Dean WE (2006) The geochemical record of the last 17,000 years in the Guaymas Basin, Gulf of California. *Chemical Geology* 232 (3-4), 87-98. [http://dx.doi.org/10.1016/j.chemgeo.2006.02.017](http://dx.doi.org/10.1016/j.chemgeo.2006.02.017); calcium carbonate, organic carbon, cadmium, molybdenum, Pacific Ocean, marine varves, North America, Mexico, sediments deposited over the last 17,000 years in the western Guaymas Basin can be divided into five intervals, oxygen minimum zone.

Dean WE, Anderson RY (1973) Trace and minor element variations in the Permian Castile Formation, Delaware basin, Texas and New Mexico, revealed by varve calibration. 4th Symposium on Salt, Cleveland, Northern Ohio Geological Society 275-285. Additional information needed: Electronic link? Keywords?

Dean WE, Anderson RY (1974) Application of some correlation coefficient techniques to time-series analysis. *Mathematical Geology* 6 (4), 363-372. [http://dx.doi.org/10.1007/BF02082357](http://dx.doi.org/10.1007/BF02082357); sliding correlation technique allows detailed stratigraphic correlation over entire basins, value for correlation of stratigraphic sequences such as varves and turbidites, autocorrelation, cross-correlation, time series.


Dean W, Anderson R, Bradbury JP, Anderson D (2002) A 1500-year record of climatic and environmental change in Elk Lake, Minnesota I: Varve thickness and gray-scale density. *Journal of Paleolimnology* 27 (3), 287-299. [http://dx.doi.org/10.1023/A:1016069220744](http://dx.doi.org/10.1023/A:1016069220744); continuously varved and complete Holocene section, varve components are predominantly autochthonous (CaCO$_3$, organic material, biogenic silica, iron and manganese minerals), varves contain minor wind-borne (eolian) detrital-clastic (aluminosilicate) component, singular spectrum analysis (SSA) and wavelet analysis of varve thickness, periodicities of ~10, 22, 40, and 90 years, solar activity.

Dean WE, Gardner JV, Anderson RY (1994) Geochemical evidence for enhanced preservation of organic matter in the oxygen minimum zone of the continental margin of northern California during the Late Pleistocene. *Paleoceanography* 9 (1), 47-61. [http://dx.doi.org/10.1029/93PA02823](http://dx.doi.org/10.1029/93PA02823); Pacific Ocean off California and Oregon, oxygen minimum zone (OMZ) between 600 and 1200 m, laminated and varved sediments are preserved in upper Pleistocene sections, Point Conception, upper Pleistocene varved marine sediments contain more abundant lipid-rich “sapropelic” (type II) organic matter than the overlying bioturbated, oxidized Holocene sediments, preservation.

Dean WE, Megard RO (1993) Environment of deposition of CaCO$_3$ in Elk Lake, Minnesota. In: (Bradbury JP, Dean WE, eds.) *Elk Lake, Minnesota: Evidence for Rapid Climate Change in the North-Central United States*. The Geological Society of America, Special Paper 276, 97-114. [http://dx.doi.org/10.1130/SPE276-p97](http://dx.doi.org/10.1130/SPE276-p97); lacustrine varves, seasonal deposition of high-Mg calcite and dolomite in addition to low-Mg calcite, manganese carbonate (rhodochrosite).

Dean WE, Pride C, Thunell R (2004) Geochemical cycles in sediments deposited on the slopes of the Guaymas and Carmen Basins of the Gulf of California over the last 180 years. *Quaternary Science Reviews* 23 (16-17), 1817-1833. [http://dx.doi.org/10.1016/j.quascirev.2004.03.010](http://dx.doi.org/10.1016/j.quascirev.2004.03.010); box cores, marine varves, Pacific Ocean, Mexico, North America, molybdenum, sulfate reduction, bottom waters of the Gulf have become more oxygenated over the last 100 years, box core, cyclicity with periodicities of 10–20 years, 20-year cycles in the more mafic components (e.g., titanium, particularly in sediments deposited during the 19th century), titanium cycles in agreement with warm phases of the Pacific Decadal Oscillation (PDO), El Niño, higher winter precipitation, riverine influx of volcanic rock debris from Sierra Madre.


de Diego T, Douglas RG (1999) Oxygen-related sediment microfabrics in modern "black shales", Gulf of California, Mexico. *Journal of Foraminiferal Research* 29 (4) 453-464. [http://iff.geoscienceworld.org/content/29/4/453.full.pdf+html](http://iff.geoscienceworld.org/content/29/4/453.full.pdf+html); dark colored, thinly bedded, marine organic-rich muds accumulating under low oxygen conditions in slope basins in the Gulf of California. Microfabrics are modern "black shales" with features similar to "black shales" found in the Cretaceous, x-radiography, repeated shifts from laminated to semi-laminated or bioturbated sedimentation in the past several hundred years, Alfonso Basin, varve counts, lead-210, slope sediments off Santa Rosalia, microfabrics, shifts in seafloor oxygen concentration.


De Geer EH (1943) Exakt geokronologisk förbindelse Sverige — Finland. *Geologiska Föreningen i Stockholm Förhandlingar* 65 (3), 225-240. [http://dx.doi.org/10.1080/11035894309451809](http://dx.doi.org/10.1080/11035894309451809); geochronological linkage between varve sequences in Sweden and Finland.

De Geer G (1938) Conclusions from C 14 and De Geer’s chronology Daul-Gotiglacial, with datings. Geologiska Föreningen i Stockholm Förhandlingar 73 (4), 557-570. http://dx.doi.org/10.1080/11035895109442854; asserting simultaneous last E—W and N—S Pleistocene deglaciations back to 20,000 B.P.


De Geer G (1916) Om internationell användning av den svenska kvartärkronologien. Geologiska Föreningen i Stockholm Förhandlingar (GFF) 38, 17-21. This citation seems to err with regard to volume number or journal title.

De Geer G (1921) Correlation of late glacial annual clay-varves in North America with the Swedish time scale. Geologiska Föreningen i Stockholm Förhandlingar (GFF) 43 (1-2), 70-73. http://dx.doi.org/10.1080/11035892109443889;

De Geer G (1926) On the solar curve as dating the Ice Age, the New York moraine and Niagara Falls through the Swedish time scale. Geografiska Annaler (Stockholm) 8, 253-283. http://dx.doi.org/10.1080/1103589197519727; historical attempt to correlate Swedish varve patterns with North American patterns.

De Geer G (1927) Late glacial clay varves in Argentina measured by Dr Carl Caldenius, dated and connected with the solar curve through the Swedish timescale. Geografiska Annaler (Stockholm) 9, 1-8. http://dx.doi.org/10.1080/2307519677;


De Geer G (1940) Geochronologia Suecia Principles. Kungliga Svenska Vetenskapsakademiens Handlingar, 3rd, 18 (6), 1-360. “From the obvious similarity with the regular, annual rings of the trees I got at once the impression that both ought to be annual deposits” (1940, p. 13). Additional information needed: Electronic link? Keywords?


Degens ET, Stoffers P (1976) Stratified waters as a key to the past. Nature 263, 22-27. Note: copy and paste the following URL directly into your browser; clicking may not work: http://dx.doi.org/10.1038/26322a0; sapropel formation began 2,300 years after forming on the bottom of the Black Sea, marine sediment; a comparison of modern sediments with sediments formed since the Cambrian reveals that the ancient sea has been stratified a number of times.


DeMaster DJ (1978) 210Pb, 32Si, and 14C chronologies in a varved Gulf of California sediment core. EOS (American Geophysical Union Transactions) 59 (12), 1118 (abstract O 205). http://dx.doi.org/10.1029/EO059i12p01236; excess 210Pb, marine varve chronology, sediment accumulation rate of 0.19 cm/yr in a one meter long box core, varve thickness unchanged over the entire length of the core, indicating a constant rate of sediment accumulation, 32Si specific activities measured on biogenic silica from sequential layers, half life of 32Si calculated to 276+32 years; 14C measurements on the organic fraction.
DeMaster DJ (1980) The half life of $^{32}$Si determined from a varved Gulf of California sediment core. *Earth and Planetary Science Letters* **48** (1), 209-217. [http://dx.doi.org/10.1016/0012-821X(80)90182-X](http://dx.doi.org/10.1016/0012-821X(80)90182-X); the half life of silicon-32 is $272 \pm 32$ years based on a marine varved sedimentary record in the Gulf of California, excess $^{210}$Pb, varve chronology, sediment accumulation rate of 0.19 cm/yr in a one meter long box core, varve thickness unchanged over the entire length of the core, indicating a constant rate of sediment accumulation, $^{32}$Si specific activities measured on biogenic silica from sequential layers, half life of $^{32}$Si calculated to 276±32 years.


Desloges JR, Gilbert R (1994) Sediment source and hydroclimatic inferences from glacial lake sediments: the postglacial sedimentary record of Lillooet Lake, British Columbia. *Journal of Hydrology* **159** (1-4), 375-393. [http://dx.doi.org/10.1016/0022-1694(94)90268-2](http://dx.doi.org/10.1016/0022-1694(94)90268-2); Canada, glaciolacustrine varves accumulate at a rate of up to 28 mm year$^{-1}$ in the north and decline to less than 0.9 mm year$^{-1}$ in the south.

De Vries TJ, Schrader H (1981) Variation of upwelling/oceanic conditions during the latest Pleistocene through Holocene off the central Peruvian coast; a diatom record. *Marine Micropaleontology* **6** (2), 157-167. [http://dx.doi.org/10.1016/0377-8398(81)90037-7](http://dx.doi.org/10.1016/0377-8398(81)90037-7); diatoms in partly laminated or varved Holocene and late Pleistocene marine sediments on the upper continental slope of central Peru.


Diedrich KE, Loso MG (2012) Transient impacts of Little Ice Age glacier expansion on sedimentation processes at glacier-dammed Iceberg Lake, southcentral Alaska. *Journal of Paleolimnology* **48** (1), 115-132. [http://dx.doi.org/10.1007/s10933-011-9641-5](http://dx.doi.org/10.1007/s10933-011-9641-5); proglacial lake with 1,500+ year glaciolacustrine varve record, compounded by a history of episodic lake-level changes associated with fluctuations in ice-dam thickness and position, radiocarbon, correlations among cores, description of ~1,000 years of stratigraphy, Little Ice Age (LIA) glacial advance.


Donegan D, Schrader H (1982) Biogenic and abiogenic components of laminated hemipelagic sediments in the central Gulf of California. *Marine Geology* 48 (3-4), 215-237. [http://dx.doi.org/10.1016/0025-3227(82)90098-6](http://dx.doi.org/10.1016/0025-3227(82)90098-6); marine sediment, Pacific, difference between light and dark laminae, mode of deposition, oxygen minimum zone intersects the sediment—water interface, Guaymas Basin, opal micro-floral assemblage, textural character, trace metal and bulk chemical (Cu, Mn, Fe, Ni, Zn, Ca, K, Al, SiO2 and C-org) content, mineralogy, diatom, light laminae apparently represent sedimentation during the dry winter season of northwesterly winds, whereas the dark laminae represent the wet summer season of southeasterly winds.


Duman M (1994) Late Quaternary chronology of the southern Black Sea basin. Geo-Marine Letters 14 (4), 272-278. http://dx.doi.org/10.1007/BF01274063; varve counting in southeastern Black Sea cores shows the chronology of the O2/H2S interface, Holocene sapropel along the eastern margin ranges from 4000 to 1000 yr BP in deep water and 2500—1000 yr BP in shallower water, marine sapropel formation started at 3650 yr BP at a water depth of 2200 m.


Dzens-Litovsky AI (1936) Geological age of the bottom salt deposits of mineral lakes and lagoons. Priroda 12 (in Russian). (Дзенс-Литовский АИ (1936) Геологический возраст донных солевых отложений минеральных озер. Природа 12.) Holocene, salt lakes of Crimea, Ukraine, lithology, varve counts, dry and wet periods, origin of thick salt bed in lake sequences. Additional information needed: Electronic link? Keywords?


Enkin RJ, Dallimore A, Baker J, Southon JR, Ivanochko T (2014) A new high-resolution radiocarbon Bayesian age model of the Holocene and Late Pleistocene from core MD02-2494 and others, Effingham Inlet, British Columbia, Canada; with an application to the paleoseismic event chronology of the Cascadia Subduction Zone. Canadian Journal of Earth Sciences 50 (7), 746-760. http://dx.doi.org/10.1139/cjes-2012-0150; 42 m varved marine sediments record from the present to about 14 ka 14C BP (17 ka cal BP); anchored by recent freeze core, Mazama Ash, varve counting. 21 Effingham seismite ages are 169 ± 206 years older than the Cascadia Subduction Zone. Effingham Inlet, British Columbia, Canada; with an application to the paleoseismic event chronology of the Cascadia Subduction Zone. Canadian Journal of Earth Sciences 50 (7), 746-760. http://dx.doi.org/10.1139/cjes-2012-0150; 42 m varved marine sediments record from the present to about 14 ka 14C BP (17 ka cal BP); anchored by recent freeze core, Mazama Ash, varve counting. 21 Effingham seismite ages are 169 ± 206 years older than turbidite ages estimated largely by radiocarbon analysis of foraminifera.


Field DB, Baumgartner TR (2000) A 900 year stable isotope record of interdecadal and centennial change from the California Current. *Paleoceanography* 15 (6), 695-708. [http://dx.doi.org/10.1029/1999PA000480](http://dx.doi.org/10.1029/1999PA000480); Santa Barbara basin, California, marine sediment, interdecadal and centennial record (5 yr intervals) of foraminiferal oxygen isotope record, *Neogloboquadrina dutertrei*. Note: the findings of this study were partially revised by Hendy et al.’s (2012) new chronology for deeper sediment.

Field DB, Baumgartner TR, Charles CD, Ferreira-Bartrina V, Ohman MD (2006) Planktonic foraminifera of the California Current reflect 20th-Century warming. *Science* 311 (5757), 63-66. [http://dx.doi.org/10.1126/science.1116220](http://dx.doi.org/10.1126/science.1116220); Santa Barbara Basin, marine sediment, Soutar box core, Pacific, variations in planktonic foraminifera from varved sediments spanning the past 1400 years, warming trend superimposed on decadal-scale fluctuations, 20th-century warming has already affected lower trophic levels of the California Current. Supporting material: [www.sciencemag.org/cgi/content/full/311/5757/63/DC1](http://www.sciencemag.org/cgi/content/full/311/5757/63/DC1); Note: the findings of this study were partially revised by Hendy et al.’s (2012) new chronology for deeper sediment.


Förster MW, Sirocko F (2016) *The ELSA tephra stack: Volcanic activity in the Eifel during the last 500,000 years*. *Global and Planetary Change* 142, 100-107. [http://dx.doi.org/10.1016/j.gloplacha.2015.07.012](http://dx.doi.org/10.1016/j.gloplacha.2015.07.012); review of tephra in German varved maars, Eifel, tephra types, correlation for 220 ka, intense volcanism correlated with climate change.


Francus P (1998) An image-analysis technique to measure grain-size variation in thin sections of soft elastic sediments. Sedimentary Geology 121 (3-4), 289-298. http://dx.doi.org/10.1016/S0037-0738(98)00078-5; simple and fast image-analysis technique, grain-size variation in thin sections of soft clastic sediments, optical and backscattered electron microscope photographs are digitised from thin sections, cut by freeze-drying to avoid disturbing the sediments, granulometry.


Fraser HJ (1929) An experimental study of varve deposition. Transactions of the Royal Society of Canada 23, Sect. 4, 49-60. Additional information needed: Keywords? Link?


Gajewski K, Hamilton PB, McNeely R (1997) A high resolution proxy-climate record from an arctic lake with annually-laminated sediments on Devon Island, Nunavut, Canada. Journal of Paleolimnology 17 (2), 215-225. [http://dx.doi.org/10.1023/A:1007984617675] varves in the deepest part of the basin, lead-210, 14 cm encompass 150 years, dark layers represent biogenic components deposited in summer, light inorganic layers represent clastic deposition from allochthonous sources, diatom, varve thickness, Canadian Arctic Archipelago.


Galloway JM, Babalola LO, Patterson RT, Roe HM (2010) A high-resolution marine palynological record from the central mainland coast of British Columbia, Canada: Evidence for a mid-late Holocene dry climate interval. Marine Micropaleontology 75 (1-4), 62-78. [http://dx.doi.org/10.1016/j.marmicro.2010.03.001] marine varves in Frederick Sound in the Seymour–Belzile Inlet Complex, varves consist of light-colored diatom-rich summer and dark-colored mineral-rich winter laminae, most common from ~2840 cal. yr BP to ~1820 cal. yr BP.


Gálman V, Rydberg J, Bigler C (2009) Decadal diagenetic effects on δ13C and δ15N studied in varved lake sediment. Limnology and Oceanography 54 (3), 917-924. [http://dx.doi.org/10.4319/lo.2009.54.3.0917] lake sediment, long-term 27 yr effects of sediment aging on stable carbon and nitrogen isotope values, collection of eight freeze cores from 1979 to 2007, Lake Nylandssjön, Sweden, δ13C increased by 0.4–1.5% during the first 5 yr, δ15N gradually decreased by 0.3–0.7% over the entire 27-yr period.


Gardner JV, Hemphill-Haley E (1986) Evidence for a stronger oxygen-minimum zone off central California during late Pleistocene to early Holocene. Geology 14 (8), 691-694. [http://dx.doi.org/10.1130/0091-7613(1986)14<691:EFASOZ>2.0.CO;2] 18 marine deep-sea cores collected along the central California continental slope have ‘varve-like’ sediment at depth, last global deglaciation to early Holocene, oxygen-minimum zone along the northeastern Pacific Ocean was stronger than at present, intensified upwelling.


Gerasimenko N (2009) Cyclicity in pollen-fall derived from the steppe and mountain forest of the Crimea, Ukraine. In: The 7th International Meeting of Pollen Monitoring Programme, extended abstracts, Thessaloniki, 16-18. Saki Lake, monthly observation on pollen-fall, comparison with meteorological data from the Saki station and with past pollen records in varved beds. Additional information needed: Electronic link?


Gerasimenko N, Subetto D, Bakhmutov V, Dubis L, Gladyrevska M (2011) New data on the Middle and Late Holocene environmental changes from the Saki Lake, Crimea (Ukraine). In: (Gilbert A, Yanko-Hombach V, eds.) The Sixth Plenary Meeting and Field Trip of IGCP-521 Project “Black Sea - Mediterranean Corridor During the Last 30 ky: Sea Level Change and Human Adaptation”, Gelendzik-Kerch, extended abstracts, 92-93. Radiocarbon dating, magnetostratigraphy, pollen, quartz micromorphology, climatic cyclicity. Additional information needed: Electronic link?


Goslar T (1998) 6.3. The record of laminae thickness of the Lake Gościąż sediments, and its correlation with absolutely dated tree-ring width sequences. In: (Ralska-Jasiewiczowa M, Goslar T, Madeyska T, Starkel L, eds.) Lake Gościąż, Central Poland, a Monographic Study. Part I, 104-109. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. Keywords:

Goslar T (1998) 6.4. Absolute age of floating varve chronology of Lake Gościąż. In: (Ralska-Jasiewiczowa M, Goslar T, Madeyska T, Starkel L, eds.) Lake Gościąż, Central Poland, a Monographic Study. Part I, 110-111. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. Keywords:

Goslar T (1998) 7.2. Late-Glacial sediments of Lake Gościąż – chronological background. In: (Ralska-Jasiewiczowa M, Goslar T, Madeyska T, Starkel L, eds.) Lake Gościąż, Central Poland, a Monographic Study. Part I, 119-123. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. Keywords:


Goslar T (1998) 9.2.1. Archive data and economic-social background to the anthropogenic changes in the Lake Gościąż region from 1700AD till today. In: (Ralska-Jasiewiczowa M, Goslar T, Madeyska T, Starkel L, eds.) Lake Gościąż, Central Poland, a Monographic Study. Part I, 297-300. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. Keywords:

Goslar T (1998) 9.2.2. Chronological base - reconstruction of yearly cycles in the Lake Gościąż youngest sediments. In: (Ralska-Jasiewiczowa M, Goslar T, Madeyska T, Starkel L, eds.) Lake Gościąż, Central Poland, a Monographic Study. Part I, 301-309. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. Keywords:

Goslar T (1998) 9.2.3. Anthropogenic changes in the chemical composition of the Lake Gościąż sediments. In: (Ralska-Jasiewiczowa M, Goslar T, Madeyska T, Starkel L, eds.) Lake Gościąż, Central Poland, a Monographic Study. Part I, 310-317. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. Keywords:


Gravenor CP, Symons DTA, Coyle DA (1984) Errors in the anisotropy of magnetic susceptibility and magnetic remanence of unconsolidated sediments produced by sampling methods. Geophysical Research Letters 11 (9), 836-839. [http://dx.doi.org/10.1029/GL011i009p00836]; glacial varves were subsampled into plastic cubical containers, anisotropy of magnetic susceptibility, serious magnetic artifacts may result from the way how the cube was pressed into the soft sediment.


Grönlund E (1991) Sediment characteristics in relation to cultivation history in two varved lake sediments from East Finland. Hydrobiologia 214 (1), 137-142. [http://dx.doi.org/10.1007/BF00050942]; Lake Heinälampi, Lake Suurjärvi sediment quality variables and pollen analysis data, changes in agricultural land-use patterns studied with canonical correspondence analysis (CCA).


Gruszka B, van Loon AJ (2007) Pleistocene glaciolacustrine breccias of seismic origin in an active graben (central Poland). *Sedimentary Geology* 193 (1-4), 93-104. http://dx.doi.org/10.1016/j.sedgeo.2006.01.009; varved glaciolacustrine Early Saalian sediment in Belchatów mine (central Poland), description of deformations, half-varve deformation affects clayey lamina of a varve, multi-varve deformation affects several varves, clast-supported breccia beds with varve fragments in a quasi-horizontal position within a clayey matrix, deformed beds resulting from subsequent plastic deformation and folding, deformed beds are interpreted as seismites derived from earthquakes related to deep graben structure.


Guyard H, Chapron E, St-Onge G, Labrie J (2013) Late-Holocene NAO and ocean forcing on high-altitude proglacial sedimentation (Lake Bramant, Western French Alps). The Holocene 23 (8), 1163-1172. http://dx.doi.org/10.1177/0959683613483616; proglacial Lake Bramant, France, Holocene, varves reflect glacier mass balance in the watershed, clastic sedimentation over the last 4150 years, pluridecadal variability at frequencies compatible with NAO.


Hang T, Kohv M (2013). Glacial varves at Pärnu, south-western Estonia: a local varve chronology and proglacial sedimentary environment. GFF, special issue "Varve Genesis, Chronology and


Hanson MA, Lian OB, Clague JL (2012) The sequence and timing of large late Pleistocene floods from glacial Lake Missoula. Quaternary Science Reviews 31, 67-81. http://dx.doi.org/10.1016/j.quascirev.2011.11.009; Washington, varved sequence from Lake Missoula compared to sediments at Ninemile Creek 26 km to the northwest, draining of glacial Lake Missoula repeatedly exposed the lake floor and caused erosion and deformation of varved glaciolacustrine sediment, desiccation cracks, varve counting constrains the age of the floods to 15.1 ± 0.6 ka at the base of Ninemile exposure, and 14.8 ± 0.7 and 12.6 ± 0.6 ka at rail line exposure.


Hay BJ (1988) Sediment accumulation in the central western Black Sea over the past 5100 years. *Paleoceanography* 3 (4), 491-508. [http://dx.doi.org/10.1029/PA003i004p00491](http://dx.doi.org/10.1029/PA003i004p00491); marine varve composition, sedimentologic differences relate to climate and sea level, particle flux, mass accumulation rate, appearance of *Emiliana huxleyi*.


Heideman M, Menounos B, Clague JJ (2015) An 825-year long varve record from Lillooet Lake, British Columbia, and its potential as a flood proxy. *Quaternary Science Reviews* 126, 158-174. [http://dx.doi.org/10.1016/j.quascirev.2015.08.017](http://dx.doi.org/10.1016/j.quascirev.2015.08.017); Canada, anomalously thick clastic lacustrine varves, comparison of river discharge dating back to 1914 to varve thickness, some thick varves attributed to landslides in the watershed.


Hendy IL, Dunn L, Schimmelmann A, Pak DK (2013) Resolving varve and radiocarbon chronology differences during the last 2000 years in the Santa Barbara Basin sedimentary record, California. *Quaternary International* 310, 155-168. [http://dx.doi.org/10.1016/j.quaint.2012.09.006](http://dx.doi.org/10.1016/j.quaint.2012.09.006); California Current, marine sediment prior to 18th century was not continuously varved, but instead was occasionally merely laminated, leading to incorrect varve count-ages, radiocarbon dating of terrestrial macrofossils, drought periods may have starved the basin of sediment and provided insufficient lithic material to deposit winter laminae.

Hernández JMA (2016) A $^{210}$Pb-based chronological model for recent sediments with random entries of mass and activities. Model development. *Journal of Environmental Radioactivity* 151 (1), 64-74. [http://dx.doi.org/10.1016/j.jenvrad.2015.09.018](http://dx.doi.org/10.1016/j.jenvrad.2015.09.018); $^{210}$Pb-based dating tool is possible with restrictive assumptions on flux and SAR; TERESA $^{210}$Pb dating tool based on stochastic law; unsupported $^{210}$Pb vs. mass depth profiles.


Heydari E, Wade WJ, Anderson LC (1997) Depositional environments, organic carbon accumulation, and solar-forcing cyclicity in Smackover Formation lime mudstones, northern Gulf Coast. *American Association of Petroleum Geologists Bulletin* 81 (5), 760-774. [http://aapgbull.geoscienceworld.org/content/81/5/760](http://aapgbull.geoscienceworld.org/content/81/5/760); Upper Jurassic, Gulf of Mexico, North America, basal laminated lithofacies consists of organic- and siliciclastic-rich lamina-sets that alternate with organic-poor carbonate lamina-sets that are composed of lamina couplets interpreted to be
varves, anoxia, cycles in basal laminated lithofacies contain an average of 12 or 24 varves, sunspots, Hale solar cycle, solar forcing, flood-drought climatic variations.


Hoffmann P, Pätzold J (2002) The stabilisation of wet sediment cores by means of a polyethylene glycol/fluorocarbon treatment for display and permanent storage. Geo-Marine Letters 21 (4), 245-252. http://dx.doi.org/10.1007/s00367-001-0085-3; reversible method to transform waterlogged sediment cores into dry and stable specimens, archiving, stabilization, wet sediment core segments are bath-impregnated with polyethylene glycol (PEG), freeze-drying, PEG forms bonding porous structure, impregnation times vary from 2 weeks for coarse sand to 6–10 weeks for more compacted sediments, color changes, the processed samples are lighter in appearance and the contrasts are enhanced, PEG can be re-dissolved and washed out of the sediments.

Hogbom AG (1889) Om relationen mellan kalcium-och magnesiumkarbonat i qvartara aflagringar. Geologiska Föreningens i Stockholm Förhandlingar 11, 263-273. Additional information needed: Keywords?


Holmquist B, Wohlfarth B (1998) An evaluation of the Late Weichselian Swedish varve chronology based on cross-correlation analysis. GFF 120 (1), 35-46. http://dx.doi.org/10.1080/11035899801201035; some visual ‘correlations’ of varve-thickness diagrams are statistically weak or invalid and need to be corroborated.


Hubeny KA, Overpeck JT, Lehman SJ, Kashgarian M, Southon J, Peterson LC, Alley R, Sigman DM (1998) *Deglacial changes in ocean circulation from an extended radiocarbon calibration.* Nature 391, 65-68. Note: copy and paste the following URL directly into your browser; clicking the link may not work: http://dx.doi.org/10.1038/34150; effort to extend 14C timescale, Cariaco Basin marine varved sediments, Caribbean Sea.


Hubeny KA, Overpeck JT, Peterson LC, Trumbore S (1996) *Rapid climate changes in the tropical Atlantic region during the last deglaciation.* Nature 380, 51-54. http://dx.doi.org/10.1038/380051a0; Cariaco Basin, Venezuela, marine varves, Younger Dryas synchronous oscillations with with climate changes at high latitudes.

Hughen KA, Southon JR, Lehman SJ, Overpeck JT (2000) Synchronous radiocarbon and climate shifts during the last deglaciation. Science 290 (5498), 1951-1954. http://dx.doi.org/10.1126/science.290.5498.1951; Cariaco Basin, Venezuela, South America, tropical Atlantic Ocean, expanded 14C varve chronology is tied to 14C-dated Hulu Cave speleothem records, from 45 to 15 ka Δ14C remains anomalously high, indicating that the distribution of radiocarbon among ocean reservoirs was different.


Hughen KA, Southon JR, Lehman SJ, Overpeck JT (2000) Synchronous radiocarbon and climate shifts during the last deglaciation. Science 290 (5498), 1951-1954. http://dx.doi.org/10.1126/science.290.5498.1951; Cariaco Basin, Venezuela, South America, tropical Atlantic Ocean, expanded 14C varve chronology is tied to 14C-dated Hulu Cave speleothem records, from 45 to 15 ka Δ14C remains anomalously high, indicating that the distribution of radiocarbon among ocean reservoirs was different.


naturally produced by a landslide, 500 to 1800 BP, flood layers and turbidites, no recognizable correlation with other paleoclimate records, Italy.


Johnson MD, Kylander ME, Casserstedt L, Wiborgh H, Björck S (2013) Varved glaciomarine clay in central Sweden before and after the Baltic Ice Lake drainage: a further clue to the drainage events at Mt Billingen. *GFF, special issue "Varve Genesis, Chronology and Paleoclimate"* 135 (3-4), 293-307. http://dx.doi.org/10.1080/11035897.2013.819032; Glaciomarine clay west of Mt Billingen, central Sweden, contains distinct varve units, separated by a sand layer deposited in the North Sea during the catastrophic drainage of the Baltic Ice Lake (BIL), stratigraphy suggests that the BIL drainage lasted < 1 year.


Jones R, Chambers FM, Benson-Evans K (1991) Heavy metals (Cu and Zn) in recent sediments of Llangorse Lake, Wales: non-ferrous smelting, Napoleon and the price of wheat — a palaeoecological study. *Hydrobiologia* **214** (1), 149-154. [Link](http://dx.doi.org/10.1007/BF00050944); Cu and Zn contamination began during the 18th century via aerial transport from smelters 80 km upwind during the Industrial Revolution.


Juillet-Leclerc A, Schrader H (1987) Variations of upwelling intensity recorded in varved sediment from the Gulf of California during the past 3,000 years. *Nature* **329**, 146-149. [Link](http://dx.doi.org/10.1038/329146a0); oxygen isotopes, diatom silica, sea surface temperature, changes in trade-wind intensity, Pacific Ocean, Mexico, Guaymas Basin, North America, marine sediment.


Kalugin I, Darin A, Rogozin D, Tretyakov G (2013) Seasonal and centennial cycles of carbonate mineralisation during the past 2500 years from varved sediment in Lake Shira, South Siberia. *Quaternary International* **290-291**, 245-252. [Link](http://dx.doi.org/10.1016/j.quaint.2012.09.016); carbonate biochemical mineralization in Shira Lake shows seasonal and centennial pulses, scanning X-ray fluorescence for sub-millimeter microstratigraphic study, geochemical oscillations of microelement content (Rb, Ti, Ca, Sr, Br, XRD), hydrometeorological time series over the last 2500 years.


Kemp AES, Baldauf JG (1993) Vast Neogene laminated diatom mat deposits from the eastern equatorial Pacific Ocean. Nature 362, 141-144. http://dx.doi.org/10.1038/362141a0; upwelling region, increased equatorial primary production between 15 and 4.4 million years ago, diatom *Thalassiothrix* mats, marine sediment.


Kennedy AES, Pike J, Pearce RB, Lange CB (2000) The “Fall dump” - a new perspective on the role of a “shade flora” in the annual cycle of diatom production and export flux. Deep-Sea Research II 47 (9-11), 2129-2154. http://dx.doi.org/10.1016/S0967-0645(00)00019-9; concept developed from the analysis of laminated marine sediments, diatom flux, scanning electron microscope techniques, sediment trap, diatoms able to generate substantial production at depth, may represent a “shade flora” adapted to grow in low-light conditions and/or to regulate their buoyancy to move between a deep nutrient source and the euphotic zone, “fall dump” is the sedimentation of a long-lived episode of production (lasting the duration of the seasonal thermocline) and triggered by the fall/winter mixing that breaks down stratification, may produce much of export production.


Kennedy JA, Brassell SC (1992) Molecular records of twentieth century El Niño events in laminated sediments from the Santa Barbara basin. Nature 357, 62-64. http://dx.doi.org/10.1038/357062a0; marine sediment, Pacific, California, El Niño, alkenone, Emiliania huxleyi, coccolithophorid. Note that subsequent radiocarbon compound-specific studies proved that a significant fraction of biomarkers derives from older, re-suspended sediments. Mixing of old with new biomarkers influences the biochemical signal in accumulating varves (e.g., Mollenhauer and Eglinton, 2007).

Kennett JP, Ingram BL (1995) A 20,000-year record of ocean circulation and climate change from the Santa Barbara basin. *Nature* **377**, 510-514. doi:10.1038/377510a0; Pacific Ocean, oscillations of the benthic environment between low-oxygen conditions (laminated sediments) during periods of warm climate, and higher-oxygen conditions (non-laminated, bioturbated sediments) during cool intervals.


Note that subsequent radiocarbon compound-specific studies proved that a significant fraction of biomarkers derives from older, re-suspended sediments. Mixing of old with new biomarkers influences the biochemical signal in accumulating varves (Mollenhauer and Eglinton, 2007).
Kleinmann A (with palynological contribution from H. Freund) (2004) Palaeoenvironments of deposition of Neogene laminated diatom mat deposits from the eastern equatorial Pacific from studies of benthic foraminifera (sites 844, 849, 851). Marine Micropaleontology 35 (3-4), 161-177. http://dx.doi.org/10.1016/S0377-8398(98)00020-6; Thalassiothrix longissima forming marine laminated diatom mat deposits, 15 to 4.8 m.y. ago, benthic foraminifera used to reconstruct benthic environment, preservation of lamination in the diatom mat deposits is due to the physical exclusion of macro endobenthos rather than oxygen depletion of the bottom waters.


Kirkland DW (2003) An explanation for the varves of the Castile evaporites (Upper Permian), Texas and New Mexico, USA. Sedimentology 50 (5), 899-920. http://dx.doi.org/10.1046/j.1365-3091.2003.00588.x; laterally persistent marine varves in Castile evaporites occur as singlets (calcite laminae), couplets (calcite laminae interstratified with anhydrite laminae), thick couplets (calcite laminae interstratified with thin anhydrite beds) and triplets (calcite and anhydrite laminae interstratified with thin halite beds) in a deep (initially =550 m), persistently stratified, saline lake separated from the ocean by a reef, different varve types recur with a period of 1800–3000 years reflecting climatic changes on a millennial time scale.


Klaminder J, Appleby P, Crook P, Renberg I (2012) Post-deposition diffusion of 137Cs in lake sediment: Implications for radiocarbon dating. Sedimentology 59 (7), 2259-2267. http://dx.doi.org/10.1111/j.1365-3091.2012.01343.x; radiocesium in lake sediments infers ages of sediment deposited from nuclear bomb testing or the 1986 Chernobyl accident, varved lake sediments have a clear and well-resolved peak in the 1986 varve, Chernobyl 137Cs incorporated into the 1986 varve diffused downwards, the weapons fallout marker is likely to be of little use for determining 137Cs dates in areas strongly affected by levels of Chernobyl fallout.


Seesedimenten des Holozän: Vergleich N- und S-Deutschland. Unpublished final report (Archivbericht), Niedersächsisches Landesamt für Bodenkunde, Hannover, Germany, 26 pp. (in German).  Additional information needed: Keywords?


Kleinmann A, Merkt J, Müller H, Küster H (2000) Klimavariabilität im Spät- und Postglazial nach lakustringen Warven. Abschlußbericht (Bundesministerium für Bildung und Forschung), Archivbericht Tagebuch-No. 249/02, Niedersächsisches Landesamt für Bodenkunde, Hannover, Germany, 63 pp. (in German).  Additional information needed: Keywords?

Klisch M (2009) Kompleksowe badania izotopowe laminowanych osadów jeziora Gościąż (A comprehensive isotopic investigation of laminated sediments of Lake Gościąż). Ph.D. dissertation, Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakówie, Kraków, Poland, 111 pp. (in Polish). https://docs.google.com/file/d/0B3RylZ-mb9R-ODAwMDhjZTYtYWM1OS00YWEyLTg5YjctODNjZDQyZTJjQDdh/edit; high-resolution multiproxy climate reconstructions from varved lake in Poland, oxygen isotopes in calcite and aquatic cellulose, reconstruction of absolute temperature of lake water, comparison of two geothermometers, carbon and nitrogen cycles for five representative periods from Younger Dryas to late Holocene, Younger Dryas/Preboreal transition, verification of archival isotopic data for calcite encompassing 12000 years. See also Rozanski et al. 2010.  Additional information needed: Keywords?

Kocurek G, Carr M, Ewing R, Havholm KG, Nagar YC, Singhvi AK (2007) White Sands Dune Field, New Mexico: Age, dune dynamics and recent accumulations. Sedimentary Geology 197 (3-4), 313-331. http://dx.doi.org/10.1016/j.sedgeo.2006.10.006; Tularosa Basin, New Mexico, USA, gypsum accumulation as dune field from deflation of Pleistocene Lake Otero, dune sets show annual cycles, interdune laminations show light/dark couplets interpreted as annual varves, dry/wet portions of the year, wet aeolian system, interdune varves.  Additional information needed: Keywords?


Koh M, Hang T, Talviste P, Kalm V (2010) Analysis of a retrogressive landslide in glaciolacustrine varved clay. Engineering Geology 116 (1-2), 109-116, http://dx.doi.org/10.1016/j.enggeo.2010.07.012; Estonia, glaciolacustrine varved clays, slope failure, Audru landslide, varve correlation was used to localize the failure zone and estimate the extent of the displaced material within the landslide body, Eastern Baltic.  Additional information needed: Keywords?


Korn H (1938) Schichtung und absolute Zeit. *Neues Jahrbuch der Mineralogie Geologie Paläontologie** **74A**, 50-186 (in German). Additional information needed: Electronic link? Keywords?


Kotilainen AT, Vallius H, Ryabchuk D (2007) Seafloor anoxia and modern laminated sediments in coastal basins of the eastern Gulf of Finland, Baltic Sea. *Geological Survey of Finland Special Paper** **45**, 49–62. Baltic Sea, many basins have been continuously or seasonally anoxic for at least 10 years, overall shallowing of anoxia since 1950’s, marine varves also in the shallower basins.


dewatering with acetone, embedding with Spurr epoxy resin. Unfrozen sediments, final thin sections preserve very fine structural detail without interruption due to ice-crystal casts, revealing by sediment cores and 3.5 kHz seismic mapping.

Hundred meters.

Age 10.5194/cp-10-2215-2014; marine varves during the last glacial termination, alternation between predominantly terrigenous and diatom-dominated opal sedimentation, spring/summer productivity events related to the retreating sea ice margin.

Information needed: Electronic link? Keywords?


Laminated sediments in the Bering Sea reveal atmospheric teleconnections to Greenland climate on millennial to decadal timescales during the last deglaciation. Climate of the Past 10, 2215-2236. http://dx.doi.org/10.5194/cp-10-2215-2014; marine varves during the last glacial termination, alternation between predominantly terrigenous and diatom-dominated opal sedimentation, spring/summer productivity events related to the retreating sea ice margin.


Kulbe T, Niederreiter R (2003) Freeze coring of soft surface sediments at a water depth of several hundred meters. Journal of Paleolimnology 29 (2), 257-263. http://dx.doi.org/10.1023/A:1023200632092; freeze corer for water depth of up to 1000 meters, successful test at 200 m depth, high pressure resistant housing with vacuum insulated jacket for ethanol which can be chilled by separate cooling agents, electrical pump, freezing wedge 100 cm long.

Kurnakov NS, Kuznetsov VG, Dzens-Litovsky AI, Ravich MI (1935) Соляные озера Крыма. Москва-Ленинград). Keywords: Holocene, Ukraine, annually laminated saline lake deposits, lithology.


Lajunesse P, Allard M (2003) Late Quaternary deglaciation, glaciomarine sedimentation and glacioisostatic recovery in the Rivière Nastapoka area, eastern Hudson Bay, northern Québec. Géographie physique et Quaternaire 57 (1), 65-83. http://dx.doi.org/10.7202/010331ar; postulated ice-distal glaciomarine varves, Canada, ~7.7 to 7.3 cal ka BP in unit ‘De2b’, some intervals contain alternating light clastic laminae and black, sulfide-stained laminae with a postulated annual sedimentation rate of 5 to 10 cm.


Lane CS, Brauer A, Blockley SPE, Dulski P (2013) Volcanic ash reveals time-transgressive abrupt climate change during the Younger Dryas. Geology 41 (12), 1251-1254. http://dx.doi.org/10.1130/G34867.1; atmospheric proxy signals of the resumption of thermohaline circulation midway through the Younger Dryas occurred 100 yr before deposition of ash from the Icelandic Vedde eruption in a German varve lake record, and 20 yr after the same isochron in western Norway, synchronization of two high-resolution continental records uses Vedde Ash layer (12,140 ± 40 varve yr B.P.).

Lane CS, Brauer A, Martín-Puertas C, Blockley SPE, Smith VC, Tomlinson EL (2015) The Late Quaternary tephrostratigraphy of annually laminated sediments from Meerfelder Maar, Germany. Quaternary Science Reviews 122, 192-206. http://dx.doi.org/10.1016/j.quascirev.2015.05.025; Eifel, lacustrine varves throughout the Last Glacial to Interglacial transition (LGIT) and most of the Holocene, Ulmener Maar Tephra, Laacher See Tephra, 15 cryptotephra layers, Vedde Ash, Neapolitan Yellow Tuff.


Laroque-Tobler I, Filipiak J, Tylmann W, Bonk A, Grosjean M (2015) Comparison between chironomid-inferred mean-August temperature from varved Lake Zabińska (Poland) and instrumental data since 1896 AD. *Quaternary Science Reviews* 111, 35-50. [http://dx.doi.org/10.1016/j.quascirev.2015.01.001](http://dx.doi.org/10.1016/j.quascirev.2015.01.001); lacustrine varves, chironomids, reconstructed mean-August air temperature since 1896 AD at annual (1949–2011 AD) and at 3–4 year resolutions (1896–1948 AD), transfer functions for temperatures in northeastern Canada and Poland.

late Holocene, non-biting midges, meteorological data, chironomids, Engadine, European Alps, Europe, lake sediment, reconstruction of mean July air temperature, validation with early instrumental data, dendrochronology, biogenic silica.


Larsen CPS, Pienitz R, Smol JP, Moser KA, Blais JM, Macdonald GM, Hall RI (1998) Relations between lakemorphometry and the presence of laminated lake sediments: a re-examination of Larsen and Macdonald (1993). *Quaternary Science Reviews* 17 (8), 711-717. http://dx.doi.org/10.1016/S0277-3791(97)00043-7; empirical test of a published equation which relates lake surface area and maximum lake depth to the presence or absence of laminated lake sediments, 297 lake dataset from New York State and six regions in Canada, deeper lakes are more likely to contain laminated lake sediments than shallower lakes, many factors other than lake morphometry affect the formation and preservation of laminated sediments.

Larsen CPS, Macdonald GM (1993) Lake morphometry, sediment mixing and the selection of sites for fine resolution palaeoecological studies. *Quaternary Science Reviews* 12 (9), 781-792. http://dx.doi.org/10.1016/0277-3791(93)90017-G; model and equations of lake depth and area determine whether the sediments of a lake will likely be massive or annually laminated.


varve chronology, pollen, biochemical calcite precipitation, oxygen isotope ratios of endogenic calcite and ostracod valves, regional eastern European atmospheric circulation pattern, westerlies, decay of the ice sheet.


Leroy SAG (2010) Pollen analysis of core DS7-1SC (Dead Sea) showing intertwined effects of climatic change and human activities in the Late Holocene. *Journal of Archaeological Science* **37** (2), 306-316. http://dx.doi.org/10.1016/j.jas.2009.09.042; Dead Sea, pollen, human impact, Holocene, Israel, vegetation 2500-year record, high-resolution palynological study of individual laminae (aragonite and gypsum in the summer versus detritics in winter) confirms the seasonal character of the laminae, but throws a note of caution as for their regular annual character; see López-Merino et al. (2016) who advise caution about the presence of varves in the Dead Sea.


Byzantine period, Holocene, Israel, seismically triggered turbidites, Ze’elim gully; see López-Merino et al. (2016) who advise caution about the presence of varves in the Dead Sea.


Leroy SAG, Zolitschka B, Negendank JW, Seret G (2000) Palynological analyses in the laminated sediment of Lake Holzmaar (Eifel, Germany): duration of Lateglacial and Preboreal biozones. Boreas 29 (1), 52-71. http://dx.doi.org/10.1111/j.1502-3885.2000.tb01200.x; lake sediment, Holocene, Older Dryas, Younger Dryas, pollen, continuous varve chronology for the last 3500 varve years, floating varve chronology back to more than 22500 vy BP, palynology, environmental changes, biozonation for Lake Holzmaar below the Laacher See Tephra, 15 pollen subzones grouped in four biozones defined by cluster analysis. Balling, Allered 883-yy-long, Preboreal 702-yr-long, the chronology of Holzmaar may require revision below the middle of the Younger Dryas, comparison with the varve record of Meervelder Maar suggests adding 320 varve years below 12025 varve years.


Lewy Z (2009) Early Precambrian banded iron formations: Biochemical precipitates from highly evaporated hydrothermal solutions of polar region lakes. Carbonates and Evaporites 24 (1), 1-15. http://dx.doi.org/10.1007/BF03228053; BIFs accumulated during the Lower Precambrian in shallow depositional settings in warm hydrothermal solutions undergoing intensive evaporation and mineral concentration in cold Polar Regions, after half a year of insolation, cyanobacteria oxygenic photosynthesis deposited iron oxides with silica (geyserite) followed by a lamina of silica only, forming recurrent annual varves.


represent varves, reconstructions of past conditions in the lake, 19 lithologic layers with five zones, water pH, total phosphorus (TP), total organic carbon (TOC).

Liden R (1913) Geokronologiska studier ofver det finiglaciala skedet I Ångermanland. Sveriges Geologiska Undersökning Ca-9, 1-39. Additional information needed. Key words? Link?

Liden R (1938) Den senkvartara strandforskjutningens forlopp och kronologi i Ångermanland. Geologiska Föreningen i Stockholm Förhandlingar 60, 397-404. Additional information needed. Key words? Link?


Lindeberg G, Ringberg B (1999) Image analysis of rhythmites in proximal varves in Blekinge, southeastern Sweden. GFF 121 (3), 182-186. http://dx.doi.org/10.1080/11035899901213182; Image analysis, proximal varves in the bottom bed of the Bredåkra glaciolacustrine delta, greyscale and color profiling on digital images, summer layers consist of ca. 50 diurnal couplets during intense melting period of c. 50 days during the Late Weichselian deglaciation of the Bölling Chronozone (G1-1e).


Formation cannot be considered as varves, prompting a re-evaluation of older Quaternary laminated sequences.

Consisting of alternating detrital and authigenic aragonite laminae; pollen and other evidence shows that the Holocene Ze'elim addition of acetone for reduction of the viscosity, overview on methods for removal of water.

Transmission and reflected light microscopy.

Method, history of original varve research methods as an introduction to papers presented at a meeting.

Climatically relevant periodicities in the thickness of biogenic carbonate varves in Soppensee, Switzerland (9740-6870 calendar yr BP).

Sedimentary evidence for a major glacial oscillation and proglacial lake formation in the Solway Lowlands (Cumbria, UK) during Late Devensian deglaciation. 

Climatically relevant periodicities in the thickness of biogenic carbonate varves in Soppensee, Switzerland (9740-6870 calendar yr BP). 

Using palynology to re-assess the Dead Sea laminated sediments – Indeed varves? 

http://dx.doi.org/10.1016/j.quascirev.2014.03.017; International Continental Scientific Drilling Program (ICDP), 219 m long continental pollen record, Ahlat Ridge.

http://dx.doi.org/10.1007/s10933-011-9543-8; reservoirs have hydrodynamic characteristics intermediate between those of rivers and lakes, diatom assemblage, varve counting, strong thermal stratification for 10 months of the year preserves varves.

Changes in the diatom community, including the appearance of Actinoecytus normani f. subsalsa, during the biomanipulation of Lake Vesijärvi, Finland. European Journal of Phycology 32 (4), 353-361. 

http://dx.doi.org/10.1007/10.1080/09670269710001737289; eutrophication due to sewage until after 1976, diatom in varved sediment, Laitialanselkä least polluted basin of the lake, Lahti city.

http://dx.doi.org/10.1007/s10933-013-9733-7; Fourier transform infrared spectroscopy (FTIR) and scanning X-ray fluorescence (XRF), relative abundances of carbonates, organic matter, biogenic silica, Lake Malawi, Lake Qinghai, calcium:titantium (Ca/Ti), incoherent:coherent X-ray scatter intensities (Inc/Coh), silicon:titantium (Si/Ti), the relationship between XRF-ratios or FTIR-absorbances and abundances of corresponding sedimentary components can vary with sediment source and lithology.


http://dx.doi.org/10.1007/BF00028039; eutrophication by sewage from the City of Lahti for 60 years until 1976, varved bottom sediment from the Enonselkä basin, less eutrophic Laitialanselkä basin.

http://dx.doi.org/10.1111/j.1502-3885.2010.00149.x; glacial deposits, northwest England, United Kingdom, laminated glaciolacustrine sediments, at one location the laminated sediments are interpreted as varves, proglacial lake, Solway Basin, lake existed for at least 261 years.

http://dx.doi.org/10.1007/s10933-011-9513-z, 77-119. 

Using palynology to re-assess the Dead Sea laminated sediments – Indeed varves? Quaternary Science Reviews 140, 49-66. 

http://dx.doi.org/10.1016/j.quascirev.2016.03.024; lacustrine Dead Sea high-stand mm-scale laminated sections consisting of alternating detrital and authigenic aragonite laminae; pollen and other evidence shows that the Holocene Ze’elim Formation cannot be considered as varves, prompting a re-evaluation of older Quaternary laminated sequences.


Lotter AF, Birks HJB (1997) The separation of the influence of nutrients and climate on the varve time-series of Lake Brienzersee, Switzerland. *Aquatic Sciences* 59 (4), 362-375. [http://dx.doi.org/10.1007/BF02522364](http://dx.doi.org/10.1007/BF02522364); lake sediment, variance partitioning, redundancy analysis, multiple linear regression, eutrophication, freeze-core, Lake Brienzersee, Switzerland, European Alps, varve thickness, annual precipitation versus summer precipitation.

Lotter AF, Birks HJB, Hofmann W, Marchetto A (1997) Modern diatom, cladocera, chironomid, and chrysophyte cyst assemblages as quantitative indicators for the reconstruction of past environmental conditions in the Alps. 1. Climate. *Journal of Paleolimnology* 18, 395-420. [http://dx.doi.org/10.1023/A:1007982008956](http://dx.doi.org/10.1023/A:1007982008956); transect of 68 small lakes along an altitudinal gradient from 300 to 2350 m, Switzerland, 43 environmental variables, physical limnology, geography, catchment characteristics, climate, water chemistry, canonical correspondence analyses (CCA), Monte Carlo permutation tests, transfer functions for individual proxies, cross-validation, summer temperature, training set.

Lotter AF, Birks HJB, Zolitschka B (1995) Late-glacial pollen and diatom changes in response to two different environmental perturbations: volcanic eruption and Younger Dryas cooling. *Journal of Paleolimnology* 14, 23-47. [http://dx.doi.org/10.1007/BF00682592](http://dx.doi.org/10.1007/BF00682592); pollen, diatoms, lake sediment, Laacher See Tephra, variance partitioning, redundancy analysis, sequence sitting, Lake Holzmaar, Eifel, Germany, biostratigraphy suggests a volcanic-induced response on productivity of the lake.


Lotter AF, Sturm M, Teranes JL, Wehrli B (1997) Varve formation since 1885 and high-resolution varve analyses in hypertrophic Baldeggersee (Switzerland). *Aquatic Sciences* 59 (4), 304-325. [http://dx.doi.org/10.1007/BF02522361](http://dx.doi.org/10.1007/BF02522361); lake sediment, Lake Baldeggersee, Switzerland, European Alps, eutrophication, grain-size, geochemistry, time-series, freeze-core, turbidites, cesium-137, phosphorus correlates with grain size of calcite crystals.


Ludlam SD, Feeney S, Douglas MSV (1996) Changes in the importance of lotic and littoral diatoms in a high arctic lake over the last 191 years. Journal of Paleolimnology 16 (2), 187–204. http://dx.doi.org/10.1007/BF00178935; diatom habitat preferences and community associations, varve-counted dates of major turbidites relate to exceptionally thick varves and the concentration of valves, concentration of valves appears to be a proxy for sediment deposition from turbidity currents.


Marshall CJ (2012) Sedimentation in an Active Fold and Thrust Belt, From 1 Ma to Present, Santa Barbara Channel, California. M.Sc. Thesis, California State University, Long Beach, 79 p. https://docs.google.com/a/unich.edu/file/d/0B_44KqD6U_zwTHZSZmpDb1Jvck0/edit?usp=drive_web; Santa Barbara Basin, California, Pacific Ocean, marine sedimentation since 1 Ma, depocenter evolution reflects growth history of faults and folds, related subsidence, changes in sedimentation rates reflect diversion of Santa Clara River sediment from Santa Barbara to Santa Monica basin, Hueneme Fan, Anacapa Ridge anticline. Note: the claimed presence of varves in deeper core sections was partially revised by Hendy et al.’s (2012) new interpretation of laminations.


Martin H (1964) Beobachtungen zum Problem der jung-Präkambrischen glazialen Ablagerungen in Südwestafrika. *Geologische Rundschau* **54** (1), 115–127. [http://dx.doi.org/10.1007/BF01821173](http://dx.doi.org/10.1007/BF01821173); Late Precambrian Numees Formation, Namibia, southwest Africa, laminated siltstones resembling glacial varved rocks, dropstones, presumed glacial varves, Buschmannsklippe Formation.


Martin-Puertas C, Brauer A, Dulsiki P, Brademann B (2012) Testing climate-proxy stationarity throughout the Holocene: an example from the varved sediments of Lake Meerfelder Maar (Germany). *Quaternary Science Reviews* **58**, 56-65. [http://dx.doi.org/10.1016/j.quascirev.2012.10.023](http://dx.doi.org/10.1016/j.quascirev.2012.10.023); Last Glacial/Interglacial transition back to ~1500 years BP, varve counting, microfacies and micro-XRF analyses, carve structure and thickness and geochemical composition, winter minerogenic influx into the lake reflected by Ti intensities, Si/Ti ratio indicates diatom concentration, higher values of the Ti/Si ratio together with thicker varves interpreted as wind-stress phases.


Menounos B, Clague JJ (2008) Reconstructing hydro-climatic events and glacier fluctuations over the past millennium from annually laminated sediments of Cheakamus Lake, southern Coast Mountains, British Columbia, Canada. *Quaternary Science Reviews* **27** (7-8), 701-713. [http://dx.doi.org/10.1016/j.quascirev.2008.01.007](http://dx.doi.org/10.1016/j.quascirev.2008.01.007); North America, late Holocene environmental conditions, rhythmically varved clayey silt, seven types of varves, couplet thickness, different types of floods, glacier runoff, Little Ice Age, glacier activity, thickest varves coincide with times of rapid glacier retreat and periods when air temperatures were warmer than average.


Mensing S A (1998) 560 years of vegetation change in the region of Santa Barbara, California. *Madroño* **45**(1), 1-11. [http://www.calbotsoc.org/madroño.html](http://www.calbotsoc.org/madroño.html); pollen, vegetation changes, European settlement. Note: the findings of this study were partially revised by Hendy et al.’s (2012) new chronology.

Mensing S A, Michaelsen J, Byrne R (1999) A 560-year record of Santa Ana fires reconstructed from charcoal deposited in the Santa Barbara Basin, California. *Quaternary Research* **51** (3), 295-305. [http://dx.doi.org/10.1006/qres.1999.2035](http://dx.doi.org/10.1006/qres.1999.2035); Santa Ana winds, fire history, marine sediment AD 1425 to 1985, Chumash period, Spanish/Early American period, pollen, precipitation reconstructed from tree rings, large fires at the end of wet periods and beginning of droughts. Note: the findings of this study were partially revised by Hendy et al.’s (2012) new chronology.


Meriläinen JJ, Kustula V, Witick A, Hallia-Hovi E, Saarinen T (2010) Pollution history from 256 BC to AD 2005 inferred from the accumulation of elements in a varve record of Lake Korttajärvi in Finland. *Journal of Paleolimnology* **44**(2), 531-545. [http://dx.doi.org/10.1007/s10933-010-9435-3](http://dx.doi.org/10.1007/s10933-010-9435-3); varved lake sediment, varve counting (256 BC to AD 2005), metallurgical activities of the Roman Empire, accumulation rates of individual elements (Cd, Sn, Pb, Si, Ni, B, Cu, Zn, Sr, Na, K, Sb, Ca, Cr, U, Mg), earliest lead pollution AD 1055–1141, trace elements.


Merk J (1975) Interpretation der älteren Sedimente von Schleisensee, Degesee und Muttelsee hinsichtlich ihrer Bildungsbedingungen und ihre Eignung für die Korrelationsforschung. Final report part B - Archivbericht, Niedersächsisches Landesamt für Bodenkunde, Hannover, Germany, 25 pp. (IN German). Additional information needed: Keywords?


Merk J, Müller H (1995) Laminated sediments from Neolithic to the Hallstatt period in South Germany. *European Study Group on Physical, Chemical and Mathematical Techniques Applied to Archaeology (PACT)* **41** (II.1), 101-116. [http://hdl.handle.net/10251/identities/lccn-n82-79995](http://hdl.handle.net/10251/identities/lccn-n82-79995); Additional information needed: Electronic link? Keywords?

Abstract Volume, *Würzburger Geographische Manuskripte* 41, 137-138. Additional information needed: Electronic link? Keywords?

Merkt J, Müller H (1999) Varve chronology and palynology of the Lateglacial in Northwest Germany from lacustrine sediments of Hämelensee in Lower Saxon. *Quaternary International* 61 (1), 41-59. [dx.doi.org/10.1016/S1040-6182(99)00016-6](http://dx.doi.org/10.1016/S1040-6182(99)00016-6); Lake Hämelensee is a dolina from a collapse over Permian salt at the end of the Pleniglacial, 18 m of lacustrine sediment, multidisciplinary studies of the microfacies from thin sections, geochemistry, pollen, rotifer, Lateglacial biozones, rapid climatic changes, Allerod sediment 625 yr seasonally varved, Laacher-See tephras (12,900 cal BP) had a 10 yr impact on the climate, 50 yr transition from Allerod to Younger Dryas, abrupt change at the end of the Lateglacial (11,560 cal BP) occurred within less than 10 yr.


Mieszcankin T, Noryśkiewicz B (2000) Processes that can disturb the chronostratigraphy of laminated sediments and pollen deposition. *Journal of Paleolimnology* 23 (2), 129-140. [http://dx.doi.org/10.1023/A:1008073732192](http://dx.doi.org/10.1023/A:1008073732192); lake morphometry, total sedimentation, pollen sedimentation, resuspension, laminated sediments, chronostratigraphy, sediment trap, Lake Gościąż, Poland, resuspension of pollen grains diminishes the chronostratigraphic value of pollen analyses.


Michaelsen J (1985) An automated method for measuring thicknesses of layered sediments. *Mathematical Geology* 17 (7), 729-742. [http://dx.doi.org/10.1007/BF01031613](http://dx.doi.org/10.1007/BF01031613); varve thicknesses, automated method, digitizing an X-radiographic image, two-dimensional optical density field, filtration to enhance varve signal, definition of line segments as varve boundaries, example of thin laminae from the Gulf of California (Deep Sea Drilling Project Hole 480), Fourier analysis.


Millet L, Arnaud F, Heiri O, Magny M, Verneaux V, Desmet M (2009) Late-Holocene summer temperature reconstruction from chironomid assemblages of Lake Anterne, northern French Alps. The Holocene 19 (2), 317-328. http://dx.doi.org/10.1177/0959683608100576; chironomid-based reconstruction of late-Holocene temperature in 8 m presumably varved sediment core covering the last 1800 years, chironomid fauna, Dark Age Cold Period (DACP), the Medieval Warm Period (MWP), Little Ice Age (LIA).


Mollenhauer G, Eglington TI (2007) Diagenetic and sedimentological controls on the composition of organic matter preserved in California Borderland Basin sediments. Limnology and Oceanography 52 (2), 558-576. http://dx.doi.org/10.4319/lo.2007.52.2.0558; compound-specific radiocarbon (14C) contents, stable carbon isotopes, lipid biomarkers, alkenones, fatty acids, Santa Barbara Basin, Pacific Ocean, marine sediment, radiocarbon, planktic foraminifera, alkenones are systematically depleted in radiocarbon with respect to foraminifera, preferential preservation of terrestrially derived fatty acids, short-chain fatty acids tend to be more 14C-enriched relative to alkenones in core-top sediments, longer-chain homologues are generally the most radiocarbon depleted lipids, lower 14C content of more refractory compounds reflects a larger proportion of laterally supplied preaged material, selective degradation.

Möller H (1962), 10900/49701; marine varves, Levantine Basin, annual blooms of mat-forming diatoms, wavelet analysis.


Moore JJ, Hughen KA, Miller GH, Overpeck JT (2001) Little Ice Age recorded in summer temperature reconstruction from varved sediments of Donard Lake, Baffin Island, Canada. Journal of Paleolimnology 25 (4), 503-517. http://dx.doi.org/10.1023/A:1011181301514; clastic varved sediments, Cape Dyer, 1250 yr record of decadal-to-centennial scale climate variability, summer melting of the Caribou Glacier, radiocarbon date on moss fragments in agreement with varve-count age, varve thickness correlates with average summer temperature from nearby Cape Dyer, varve thickness was used to reconstruct average summer temperatures for the past 1250 years, abrupt shifts and large amplitude decadal-to-centennial scale variability, Little Ice Age.


Morford JL, Russell AD, Emerson S (2001) Trace metal evidence for changes in the redox environment associated with the transition from terrigenous clay to diatomaceous sediment, Saanich Inlet, BC. Marine Geology 174 (1-4), 355-369. http://dx.doi.org/10.1016/S0025-3227(00)00169-2; redox-sensitive trace metals (Mn, V, Mo, U, Cd and Re) in sediments from ODP Leg 169S Hole 1033B, British Columbia, marine varves. See also: http://dx.doi.org/10.1016/S0025-3227(00)00169-2; marine varves, Levantine Basin, annual blooms of mat-forming diatoms, wavelet analysis.

Mörner NA (1975) Palaeomagnetism and the relation between the Bredåkra delta and the Fjärås Stadial and the Gothenburg Magnetic Excursion. Geologiska Föreningen i Stockholm Förhandlingar 97 (3), 298-301. http://dx.doi.org/10.1080/11035897509454317; Gothenburg Magnetic Excursion in Fjärås Stadial 12,350–12,400 BP, 3 varved clay sequences. Note: This work has been criticized by Ringberg (1976), prompting a reply by Mörner (1976).

Mörner NA (1975) The genesis of the Bredåkra delta and its relation to the Fjärås Stadial. Geologiska Föreningen i Stockholm Förhandlingar 97 (3), 294-297. http://dx.doi.org/10.1080/11035897509454316; revision of Ringberg’s idea that the Bredåkra delta (in south-eastern Sweden) was deposited right in front of the receding ice for topographical reasons. Note: This work has been criticized by Ringberg (1976), prompting a reply by Mörner (1976).


Mörner NA (1977) Varve chronology on Södertörn: Recording and dating of the “drainage” of the Baltic Ice Lake and correlation with the Finnish varve chronology. Geologiska Föreningen i Stockholm Förhandlingar 99 (4), 423-425. http://dx.doi.org/10.1080/11035897709455050; Short-distance varve correlations across the Södertörn area have extended the continuous Swedish Time Scale back to about varve -1500 (about 10,400 B.P.). Varve -1073 (= 9,965 varves B.P.) is represented by a distinct drainage varve and a change from diatom to siltymc varves, recording the “drainage” of the Baltic Ice Lake at Billingen and the invasion of the sea into the Baltic.


Mörner NA (1979) *The Fennoscandian uplift and Late Cenozoic geodynamics: geological evidence*. *GeoJournal* 3 (3), 287-318. [https://dx.doi.org/10.1007/BF00177634](https://dx.doi.org/10.1007/BF00177634); varve-dated sea level curve of Lidén (1938), evidence from Finland, Sweden, Fennoscandian Shield, postglacial uplift.


Mörner NA (1995) *The Baltic Ice Lake-Yoldia Sea transition*. *Quaternary International* 27, 95-98. [https://dx.doi.org/10.1016/0920-9003(95)00065-D](https://dx.doi.org/10.1016/0920-9003(95)00065-D); Baltic Ice Lake, Yoldia Sea, Ancylus Lake, Littorina Sea are the 4 classical stages in the postglacial evolution of the Baltic basin; 300 years of Yoldia Lake stage suggested between Baltic Ice Lake and Yoldia Sea right after the drainage of the Baltic Ice Lake and before the ingestion of salt water.

Mörner NA (1996) Liquefaction and varve deformation as evidence of paleoseismic events and tsunamis. *The autumn 10,430 BP case in Sweden*. *Quaternary Science Reviews* 15 (8-9), 939-948. [https://dx.doi.org/10.1016/S0277-3791(96)00057-1](https://dx.doi.org/10.1016/S0277-3791(96)00057-1); liquefaction and deformation of varves provide information on paleoseismic events, varve chronology, liquefaction structures and seismic varve deformation dated to autumn 10,430 varve years BP.


Mörner NA (2013) *Drainage varves, seismites and tsunamites in the Swedish Varve Chronology*. *GFF*, special issue “Varve Genesis, Chronology and Paleoclimate” 135 (3-4), 308-315. [https://dx.doi.org/10.1080/11035897.2013.645457](https://dx.doi.org/10.1080/11035897.2013.645457); testing of possible synchronicity of deformations and turbidites over wide areas using varves, high-magnitude earthquakes, varve events previously interpreted as “drainage varves” are seismically induced marker-beds and should be renamed seismites; layers formed by tsunamis should be termed tsunamites.


Moscariello A, Ravazzi C, Brauer A, Mangili C, Chiesa S, Rossi S, de Beaulieu JL, Reille M (2000) *A long lacustrine record from the Plànicco-Sèllere Basin (Middle-Late Pleistocene, Northern Italy)*. *Quaternary International* 73/74, 47-68. [http://dx.doi.org/10.1016/S1040-6182(00)00064-1](http://dx.doi.org/10.1016/S1040-6182(00)00064-1); Middle--Upper Pleistocene, lake sediment, varved carbonates, pollen, microstratigraphy.


paleoecological transfer functions, changes in sea surface temperature and salinity, 10 500-yr Pacific record shows that the largest blooms occurred during the early Holocene, modern disequilibrium of the natural ecosystem structure.


Murton DK, Murton JB (2012) Middle and Late Pleistocene glacial lakes of lowland Britain and the southern North Sea Basin. Quaternary International 260, 115-142. http://dx.doi.org/10.1016/j.quaint.2011.07.034; review of sedimentary and geomorphic evidence for main glacial lakes inferred during the Middle and Late Pleistocene, Lake Bosworth, low-level Lake Humber, varve chronologies have been correlated with the Greenland ice-core record.


bi-annual lamination and calcite precipitation cycles, Mn maxima coincide with annual maximum deep-water oxygen spring concentrations, Fe signal due to calcite dilution, semi-quantitative reconstruction of bottom water oxygenation.


Nipkow F (1920) Vorläufige Mitteilungen über Untersuchungen des Schlammabsatzes im Zürichsee. *Schweizerische Zeitschrift für Hydrologie* **1**(1-2), 100-122 (in German). [dx.doi.org/10.1007/BF02485147](http://dx.doi.org/10.1007/BF02485147); “Preliminary communication about studies of sedimentary mud in Lake Zurich”. First report about laminated sediment in Lake Zurich.

Nipkow HF (1927) *Über das Verhalten der Skelette planktischer Kieselalgen im geschichteten Tiefenschlamm des Zürich- und Baldeggersees*. PhD Dissertation, ETH Zürich. [dx.doi.org/10.3929/ethz-a-00011597](http://dx.doi.org/10.3929/ethz-a-00011597); Additional information needed: Keywords?


Norton SA, Kahl JS (1991) Progress in understanding the chemical stratigraphy of metals in lake sediments in relation to acidic precipitation. *Hydrobiologia* **214**(1), 77-84. [dx.doi.org/10.1007/BF00055035](http://dx.doi.org/10.1007/BF00055035); lead-210 dating of relatively unpolluted lake sediment, development of chronology of atmospheric deposition of trace elements related to air pollution, net fluxes of trace metals from natural and anthropogenic sources, metal mobility during acidification, value of varved sediment.


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Nykänen M, Vakkilainen K, Liukkonen M, Kairesalo T (2009) Cladoceran remains in lake sediments: a comparison between planktonic counts and sediment records. *Journal of Paleolimnology* **42** (4), 551-570. http://dx.doi.org/10.1007/s10933-008-9304-5; year-to-year and seasonal comparisons of contemporary zooplankton data and cladoceran remains in varves of Lake Vesijärvi, southern Finland, deposition of remains differed significantly among taxa, some species are under-represented in sediment due to poor preservation, results of cladoceran analyses should be expressed in several ways (relative abundances, per unit dry weight, per unit organic matter, net accumulation values), taphonomy.


O’Sullivan PE, Moyeed R, Cooper MC, Nicholson MJ (2002) Comparison between instrumental, observational and high resolution proxy sedimentary records of Late Holocene climatic change—a discussion of possibilities. Quaternary International 88 (1), 27-44. http://dx.doi.org/10.1016/S1040-6182(01)00071-4; discussion of variability, long-term changes are known only from proxies, whereas shorter periodicities are identified in instrumental and observational data, less well known centennial periodicities in varved lake sediments.


Paquette N, Gajewski K (2013) Climatic change causes abrupt changes in forest composition, inferred from a high-resolution pollen record, southwestern Quebec, Canada. *Quaternary Science Reviews* 75, 169-180. http://dx.doi.org/10.1016/j.quascirev.2013.06.007; lacustrine pollen profile in varved sediments sampled at continuous 10-year intervals and spanning the past 1000 years, responses to climate change and anthropogenic activity.


Peacock JD (2003) Late Devensian marine deposits (Errol Clay Formation) at the Gallowflat Claypit, eastern Scotland: new evidence for the timing of ice recession in the Tay Estuary. *Scottish Journal of Geology* **39** (1), 1-10. [http://dx.doi.org/10.1144/sjg39010001](http://dx.doi.org/10.1144/sjg39010001); Late Devensian arctic marine deposits at the Gallowflat Claypit between Perth and Dundee are correlated with the type succession at nearby Inchoonans, but include an expanded basal glaciomarine unit with rhythms interpreted as symmict varves. Laminated silt–clay couplets are thought to be tidal.


Pérez-Cruz L, Urrutia-Fucugauchi J (2010) Holocene laminated sediments from the southern Gulf of California: geochemical, mineral magnetic and microfossil study. Journal of Quaternary Science 25 (6), 989-1000. [http://dx.doi.org/10.1002/jqs.1386] Holocene laminated sequence from the Alfonso Basin, northern Bay of La Paz, Gulf of California, authors suggest that darklight laminae result from oceanographic and climatic cyclic processes forming a non-annual depositional system, in contrast to the varved sediments characteristic of the central Gulf of California basins.


Pike J, Crosta X, Maddison EJ, Stickley CE, Denis D, Barbara L, Renssen HJ (2009) Observations on the relationship between Antarctic coastal diatoms Thalassiosira antarctica Comber and Porosira glacialis (Grunow) Jorgensen and sea ice concentrations during the Late Quaternary. Marine Micropaleontology 73 (1–2), 14–25. http://dx.doi.org/10.1016/j.marmicro.2009.06.005; late Quaternary seasonally laminated marine diatom ooze from coastal Antarctic sites, sub-laminae dominated by specific diatoms are nearly always deposited as the last sediment increment of the year, Dumont d'Urville Trough, Adélie Land, mid-Holocene autumnal sub-laminae dominated by certain diatom species, Svenner Channel, Princess Elizabeth Land, diatom climate proxy, East Antarctica, sea ice.


Pike J, Stickley CE (2007) Diatom records: Marine laminated sediments. In: (Elias S, ed.) Encyclopedia of Quaternary Science, Elsevier, 557-566. http://dx.doi.org/10.1016/B0-44-452747-8/00238-6: history of marine laminated sediment research, nature of diatom records from Quaternary laminated marine sediments, marine diatom ooze, sedimentary preservation of the seasonal succession of surface water diatom blooms, semi-enclosed seas (e.g., Gulf of California, Mexico), silled basins (e.g., Santa Barbara Basin, California margin and Iceberg Alley, MacRobertson Shelf, Antarctica), open continental margin (e.g., Peru margin).
Pike J, Stickley CE (2013) Diatom records: Marine laminated sediments. In: (Elias SA, ed.) Encyclopedia of Quaternary Science (2nd Edition), Elsevier, pp. 554-561. [ISBN: 9780444536426] history of marine laminated sediment research, nature of diatom records from Quaternary laminated marine sediments, marine diatom ooze, sedimentary preservation of the seasonal succession of surface water diatom blooms (e.g., Gulf of California, Mexico), silled basins (e.g., Santa Barbara Basin, California margin and Iceberg Alley, MacRobertson Shelf, Antarctica), open continental margin (e.g., Peru margin).

Pilskalin CH, Pike J (2001) Formation of Holocene sedimentary laminae in the Black Sea and the role of the benthic flocculent layer. Palaeogeography, Palaeoclimatology, Palaeoecology 161 (1), 1-19. http://dx.doi.org/10.1016/S0031-0182(00)00522-3; geochemical data, backscattered electron imagery (BSEI), sedimentological relationships between the benthic flocculent layer and the formation of underlying laminated unit I sediments, permanent benthic fluff layer as a geochemical transition layer, all sedimentary particles are hydraulically sorted and subject to dissolution or organic remineralization prior to deposition in varve, particle residence time within the benthic fluff layer is key factor in determining sedimentary microfabric and geochemical composition of laminated unit I sediments, marine.


studies identifying “missing or “miscounted” varves, regional climate, impact of mid-Holocene cooling on lake eutrophicity, decoupling the climate and anthropogenic impact around the Iron Age.


Ramrath A, Nowaczyk NR, Negendank JFW (1999) Sedimentological evidence for environmental changes since 34,000 years BP from Lago di Mezzano, central Italy. *Journal of Paleolimnology* 21 (4), 423-435. http://dx.doi.org/10.1023/A:1008066424708; petrography, dry density, total organic carbon, 34,000 yr record, floating varve chronology, radiocarbon, Late Pleistocene, Late Glacial, Younger Dryas, Holocene, sedimentation pattern strongly influenced by human impact since 3700 varve years BP; Bronze Age settlement.


Raspopov OM, Dergachev VA, Ogurtsov MG, Kolström T, Jungner H, Dmitriev PB (2011) Variations in climate parameters at time intervals from hundreds to tens of millions of years in the past and its relation to solar activity. *Journal of Atmospheric and Solar-Terrestrial Physics* 73 (2-3), 388-399. http://dx.doi.org/10.1016/j.jastp.2010.02.012; varved sediment analyzed to reveal periodicities in climatic processes at tens to hundreds of millions of years, periodicities are compared with solar and climatic periodicities observed at present, solar activity.


Reimer PJ (2012) Refining the radiocarbon time scale. *Science* **338** (6105), 337-338. [dx.doi.org/10.1126/science.1228653](http://dx.doi.org/10.1126/science.1228653); Lake Suigetsu limnic sediment, Japan, ~50,000 year varve record, leaves and seeds provide detailed radiocarbon record for improving the radiocarbon dating accuracy, perspective on Ramsey et al. (2012).


Rein B, Jäger K, Kocot Y, Grimm K, Sirocko F (2007) Early Norrland development, varves in two sediment sequences from Schalkenmehrener Maar Lake and from dry maar paleolake West Hoher List, Germany, dry periods with aeolian dust deposition during the last interglacial, natural sedimentation processes versus human-controlled elastic input during the last 3000 years, Little Ice Age, Late Eemian Aridity Pulse.

Reinikainen P, Meriläinen JJ, Virtanen A, Veijola H, Äystö J (1997) Accuracy of $^{210}$Pb dating in two annually laminated lake sediments with high Cs background. *Applied Radiation and Isotopes* **48** (7), 1009-1019. [http://dx.doi.org/10.1016/S0969-8043(96)00337-6](http://dx.doi.org/10.1016/S0969-8043(96)00337-6); Holocene, last interglacial, varves from two sediment sequences from Schalkenmehrener Maar Lake and from dry maar paleolake West Hoher List, Germany, dry periods with aeolian dust deposition during the last interglacial, natural sedimentation processes versus human-controlled elastic input during the last 3000 years, Little Ice Age, Late Eemian Aridity Pulse.

Reinikainen P, Meriläinen JJ, Virtanen A, Veijola H, Äystö J (1997) Accuracy of $^{210}$Pb dating in two annually laminated lake sediments with high Cs background. *Applied Radiation and Isotopes* **48** (7), 1009-1019. [http://dx.doi.org/10.1016/S0969-8043(96)00337-6](http://dx.doi.org/10.1016/S0969-8043(96)00337-6); Holocene, last interglacial, varves from two sediment sequences from Schalkenmehrener Maar Lake and from dry maar paleolake West Hoher List, Germany, dry periods with aeolian dust deposition during the last interglacial, natural sedimentation processes versus human-controlled elastic input during the last 3000 years, Little Ice Age, Late Eemian Aridity Pulse.

Renberg I (1986) Photographing demonstration of the annual nature of a varve type common in N. Swedish lake sediments. *Hydrobiologia* **140**(1), 93-95. [dx.doi.org/10.1007/BF00006731](http://dx.doi.org/10.1007/BF00006731); Sweden, lake sediment, Lake Nylandssjön, no change in visual appearance of individual varves occurs after deposition of additional varves.


Renberg I, Hansson H (1993) A pump freeze corer for recent sediments. *Limnology and Oceanography* 38 (6), 1317-1321. http://www.aslo.org/do/journals/vol_38/issue_6/1317.pdf; pump unit, thin wedge-shaped freeze container, methanol or ethanol, dry ice in thermos, cold alcohol pumped down into freeze wedge, less disturbance of sediment stratigraphy and thicker crust of frozen sediment, cores up to 50 cm long, operates from ice-covered lakes but could be modified for coring from boat, pump concept could allow freeze coring in ~200 m deep lakes or on the continental shelf.


Renberg I, Hansson H (2010) Freeze corer No. 3 for lake sediments. *Journal of Paleolimnology* 44 (2), 731-736. http://dx.doi.org/10.1007/s10933-009-9378-8; coring from lake ice, thermost connected to thin freeze wedge filled with 4 liter of ethanol, 6-8 kg dry ice kept in thermos by trapdoor that is opened by messenger after blade has entered sediment.


beds of glaciofluvial deltas in the provinces of Skåne and Blekinge, 43 and 56 ‘day varves’ have been observed in the summer layers and the number of ‘day varves’ are supposed to represent the length of summers.


Ripepe M, Roberts LT, Fisher AG (1991) Enso and sunspot cycles in varved Eocene oil shales from image analysis. Journal of Sedimentary Research 61 (7), 1155-1163. http://dx.doi.org/10.1306/P4267857-2826-11D7-8648000102C1865D; varve thickness in three core segments from distal lacustrine oil shales (Tipton and Laney members) of the Green River Formation, image analysis program, two strong bimodal periodicities, 4.8-5.6 years interpreted as an El Niño type (ENSO) phenomenon, 10.4-14.7 years interpreted as sunspot cycle, suggestion that some but not all of the oil shale of the Green River Formation is varved.


Rowell HC, Bopp RF, Peng F, Velinsky DJ, Bloomfield JA (2015) Annually laminated sediments from Onondaga Lake, New York (USA) provide a basis for high-resolution studies of lake degradation and recovery. *Journal of Paleolimnology* **53**(1), 107–121. [http://dx.doi.org/10.1007/s10933-014-9811-5](http://dx.doi.org/10.1007/s10933-014-9811-5); lacustrine varves preserved due to high sedimentation rate, 137Cs, correlation with historical impacts, onset of laminations correlates to an 1822 change in lake level.

Rozanski K, Klisch MA, Wachniew P, Gorczyca Z, Goslar T, Edwards TWD, Shemesh A (2010) Oxygen-isotope geothermometers in lacustrine sediments: New insights through combined δ18O analyses of aquatic cellulose, authigenic calcite and biogenic silica in Lake Goś, central Poland. *Geochimica et Cosmochimica Acta* **74**, 2957–2969. [http://dx.doi.org/10.1016/j.gca.2010.02.026](http://dx.doi.org/10.1016/j.gca.2010.02.026); water-based oxygen-isotope geothermometers (calcite–cellulose, silica–cellulose) across five intervals, decadal resolution, Younger Dryas, subsequent periods of relative stability during the early, middle and late Holocene, the calcite–cellulose geothermometer may be influenced by kinetic effects during rapid carbonation precipitation, which offsets temperature-dependent fractionation and thus leads to high temperature estimates, the silica–cellulose geothermometer may be affected by the production of diatom silica early in the spring, prior to seasonal warming and isotopic enrichment of the epilimnion, thus generating low temperature estimates.

Rozanski K, Klisch MA, Wachniew P, Gorczyca Z, Goslar T, Edwards TWD, Shemesh A (2010) Oxygen-isotope geothermometers in lacustrine sediments: New insights through combined δ18O analyses of aquatic cellulose, authigenic calcite and biogenic silica in Lake Goś, central Poland. *Geochimica et Cosmochimica Acta* **74**, 2957–2969. [http://dx.doi.org/10.1016/j.gca.2010.02.026](http://dx.doi.org/10.1016/j.gca.2010.02.026); water-based oxygen-isotope geothermometers (calcite–cellulose, silica–cellulose) across five intervals, decadal resolution, Younger Dryas, subsequent periods of relative stability during the early, middle and late Holocene, the calcite–cellulose geothermometer may be influenced by kinetic effects during rapid carbonation precipitation, which offsets temperature-dependent fractionation and thus leads to high temperature estimates, the silica–cellulose geothermometer may be affected by the production of diatom silica early in the spring, prior to seasonal warming and isotopic enrichment of the epilimnion, thus generating low temperature estimates.


Rowell HC, Bopp RF, Peng F, Velinsky DJ, Bloomfield JA (2015) Annually laminated sediments from Onondaga Lake, New York (USA) provide a basis for high-resolution studies of lake degradation and recovery. *Journal of Paleolimnology* **53**(1), 107–121. [http://dx.doi.org/10.1007/s10933-014-9811-5](http://dx.doi.org/10.1007/s10933-014-9811-5); lacustrine varves preserved due to high sedimentation rate, 137Cs, correlation with historical impacts, 200-year record began due to lake level change.


Saarinen T (1998) High-resolution palaeosecular variation in northern Europe during the last 3200 years. *Physics of the Earth and Planetary Interiors* 106 (3-4), 299-309. http://dx.doi.org/10.1016/S0379-9453(97)00113-1; declination, inclination, relative paleointensity of Earth’s magnetic field during the last 3200 yr, sediments in Lake Pohjajärvi, Finland, uniform magnetic mineralogy, magnetite of pseudo-single-domain (PSD) grain size, relative paleointensity curve correlated with archaeological data from Central Europe, palaeosecular variation; paleomagnetism, Holocene, Northern Europe, lake sediment.

Saarinen T (1999) Palaeomagnetic dating of Late Holocene sediments in Fennoscandia. *Quaternary Science Reviews* 18 (7), 889-907. http://dx.doi.org/10.1016/S0277-3791(99)00003-7; palaeomagnetic secular variation curves, varve counts, dating of four Holocene lacustrine sediment sequences from central Finland and northwest Russia, geomagnetic declination and inclination fluctuations, relative paleomagnetic dating, dating error during the last 3200 yr is estimated to be less than ± 50 yr.


Oligotrophy and nitrogen fixation during eastern Mediterranean sapropel events. *Science* **286** (5449), 2485-2488. [dx.doi.org/10.1126/science.286.5449.2485](http://dx.doi.org/10.1126/science.286.5449.2485); nitrogen stable isotope ratios of fossil chlorophyll from late Pleistocene sapropels in the eastern Mediterranean Sea, marine laminated sediment (varved?), evidence for stratified surface water.

Cross-stratigraphies from a seismically active mud lens off Peru indicate horizontal extensions of laminae, missing sequences, and a need for multiple cores for high resolution records. *Marine Geology* **357**, 72-89. [dx.doi.org/10.1016/j.margeo.2014.07.008](http://dx.doi.org/10.1016/j.margeo.2014.07.008); marine finely laminated sediment, Pacific, multiple stratigraphic discontinuities in sediment off Pisco (Peru) covering the last 600 years, $^{210}$Pb, $^{241}$Am, $^{14}$C, some sedimentary sequences are continuous across scales of tens of kilometers, indicating that regional processes often determine laminae formation.

The response of the Peruvian Upwelling Ecosystem to centennial-scale global change during the last two millennia. *Climate of the Past* **10**, 715-731. [dx.doi.org/10.5194/cp-10-715-2014](http://dx.doi.org/10.5194/cp-10-715-2014); marine laminated (partially varved?) sediment, Pacific ocean, last 600 years, off Pisco, oxygen minimum zone intensity changes during the past 2000 yr.


Processes controlling the accumulation of diatoms in sediments: A model derived from British Columbian fjords. *Paleoceanography* **4**(3), 235-251. [dx.doi.org/10.1029/PA004i003p00235](http://dx.doi.org/10.1029/PA004i003p00235); sediment traps over 3-year period at 4 sites in fjords of British Columbia, rates of marine sediment accumulation, biological rates of production and flux, comparison with surface sediment from box cores, preservation of deep-sea assemblages depends on water depth, accumulation rate, degree of bioturbation, modification of assemblages can occur within the upper 500 m.

Diatoms in the Gulf of California: Seasonal flux patterns and the sediment record for the last 15,000 years. *Paleoceanography* **10**(1), 67-84. [dx.doi.org/10.1029/94PA02796](http://dx.doi.org/10.1029/94PA02796); sediment traps, central Gulf of California, piston core Atlantis II 125-8 56JPC from oxygen minimum zone in Guaymas Basin, correlation to nearby Deep Sea Drilling Project Hole 480, 15 ka record, laminated Holocene and late deglacial marine sediments.


The annual cycle of sedimentation in Saanich Inlet, British-Columbia - implications for the interpretation of diatom fossil assemblages. *Deep-Sea Research Part A. Oceanographic Research Papers* **35**(1), 71-90. [dx.doi.org/10.1016/0012-2698(93)90058-1](http://dx.doi.org/10.1016/0012-2698(93)90058-1); monthly sediment traps at three depths near the head and mouth of Saanich Inlet, seasonal cycle of production and vertical flux to the sediments, carbon flux is a poor indicator or productivity, marine sediment.


Paleoemagnetic records from two varved clay sequences in the Middle Swedish ice marginal zone. *Boreas* **17**(2), 215-227. [dx.doi.org/10.1111/j.1502-3885.1988.tb00551.x](http://dx.doi.org/10.1111/j.1502-3885.1988.tb00551.x); varved glacial clay sequences, Rystad, Tottnäs, Sweden, paleomagnetic analysis, floating varve chronology, link to Swedish time scale, sediment successions are partly synchronous, deglaciation at Tottnäs started ca. 130 years earlier than at Rystad.

A Late Weichselian geomagnetic record from Lake Tamula, SE Estonia. *GFF* **119**(4), 279-284. [http://www.tandfonline.com/doi/abs/10.1080/11035899709546488](http://www.tandfonline.com/doi/abs/10.1080/11035899709546488); paleomagnetic record compared to southern Sweden and Karelia in NW Russia, floating varve chronology in the varved clay unit, deglaciation.

The eutrophication history of Lake Särkinen, Finland and the effects of lake aeration. *Hydrobiologia* **214**(1), 191-199. [dx.doi.org/10.1007/BF00050956](http://dx.doi.org/10.1007/BF00050956); eutrophication since the 1960's, aeration started in 1980, diatom flora indicates rising eutrophy from the beginning of the 20th century and again in the 1950–60's period.

Sauramo M (1923) Studies on Quaternary varve sediments in southern Finland. *Bulletin de la Commission Géologique de Finlande* 60, 164 p. Keywords: Quaternary, varve sediments, clay varves, chronology, deglaciation.


Schaller T, Moor HC, Wehrli B (1997) Sedimentary profiles of Fe, Mn, V, Cr, As and Mo as indicators of benthic redox conditions in Baldeggersee. *Aquatic Sciences - Research Across Boundaries* 59 (4), 345-361. http://dx.doi.org/10.1007/BF02522363; concentration profiles of Mg, K, La, Fe, Mn, V, Cr, As, Mo in freeze core from varved Lake Baldeggersee, Switzerland, European Alps, redox indicators, trace metals.

Schaller T, Moor HC, Wehrli B (1997) Reconstructing the iron cycle from the horizontal distribution of metals in the sediment of Baldeggersee. *Aquatic Sciences - Research Across Boundaries* 59 (4), 326-344. http://dx.doi.org/10.1007/BF02522362; distributions of solid phase Fe, Mn, V, Cr, As, Mo in different sediment strata reflecting various deep-water oxygen conditions, Fe cycling is inhibited by oxygen penetration into the sediment, metal distribution, geochemical focusing.


Schettler G, Romer RL (1998) Anthropogenic influences on Pb/Al and lead isotope signature in annually layered Holocene Maar lake sediments. *Applied Geochemistry* 13 (6), 787-797. http://dx.doi.org/10.1016/S0883-2927(98)00010-9; Eifel volcanic field, Germany, Lake Meerfelder Maar, Lake Schalkenmehrener Maar, anomalously high lead with distinct isotope signature during first century AD, same isotopic composition as galena used for regional Roman lead refinement, airborne transport into Maar lakes, varve chronostratigraphy indicates 230 years of Roman lead input.


Schimmelmann, A, Hendy IL, Dunn L, Pak DK, Lange CB (2013) Revised ~2,000-year chronostratigraphy of partially varved marine sediment in Santa Barbara Basin, California. *GFF, special issue "Varve Genesis, Chronology and Paleoclimate"*, **135** (3-4), 258-264. [http://dx.doi.org/10.1080/11035897.2013.773066]; California Current, marine sediment prior to 18th century was not continuously varved, but instead was occasionally merely laminated, leading to incorrect varve count-ages, radiocarbon dating of terrestrial macrofossils, drought periods may have starved the basin of sediment and provided insufficient lithic material to deposit winter laminae, declining oxygenation of bottom waters in Santa Barbara Basin and Santa Monica Basin.


Schimmelmann A, Lange CB, Meggers BL (2003) Palaeoclimatic and archaeological evidence for a ~200-yr recurrence of floods and droughts linking California, Mesoamerica and South America over the past 2000 years. *The Holocene* **13** (5), 763-778. [http://dx.doi.org/10.1191/0959683603hl661tr]; Santa Barbara Basin, California, Pacific Ocean, marine sediment, X-rayography, flood layers, turbidites, flood frequency, Mesoamerica, archaeological records. Note: the findings of this study were partially revised by Hendy et al.’s (2012) new chronology.


Schulz H, von Rad U (2014) Vertical and lateral flux on the continental slope off Pakistan: correlation of sediment core and trap results. Biogeosciences 11, 3107-3120. http://dx.doi.org/10.5194/bg-11-3107-2014; marine varves, Holocene, late Pleistocene, hemipelagic muds, microscopic and SEM studies, laminated due to seasonal changes of surface productivity and lateral supply of fine-grained sediment, oxygen minimum zone (OMZ), Arabian Sea, west of Karachi (Hab area), trap, accumulation rates, flux rates, laterally advected fine-grained material.


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Shchukarev A, Gälman V, Rydberg J, Sjöberg S, Renberg I (2008) Speciation of iron and sulphur in seasonal layers of varved lake sediment: an XPS study. Surface and Interface Analysis 40, 354-357. http://dx.doi.org/10.1002/sia.2704; Lake Nylandsjön, Sweden, lake sediment, iron speciation, sulfur speciation, analyses of seasonal layers of varves formed in 1968 and 2005 using X-ray photoelectron spectroscopy, organic (C, N, O, S) and inorganic (Al, Si, Ca, Fe, S) elemental compositions similar for all samples, chemical states of iron and sulfur differed depending on season, black color of the summer layer was caused by the precipitation of inorganic FeS, light layers contained only organic thiol (-SH) and sulfate together with Fe(III) hydroxides.


Santa Barbara Basin, California Borderland, Pacific Ocean, marine sediment, X-radiography, core-to-core correlation, marine sediment, Macoma layer, Ocean Drilling program, sediment slabs, selected varved or laminated intervals. Note: the findings of this study were partially revised by Hendy et al.'s (2012) new chronology.


Shostakovich VB (1934) Lake silt bands and periodic oscillations in nature. Zapiski Gosudarstvennogo Hydrogeologicheskogo Instituta 13, 95-140 (in Russian). (Шостакович ВБ (1934) Иловые отложения озер и периодические колебания в явлениях природы. Известия Географического общества 73). Keywords: Holocene, Saki Lake, Crimea, Ukraine, varve counts, varve origin, dry and wet periods, climatic cyclicity.

Shostakovich B (1936) Geschichte Bodenablagerungen der Seen als Klima-Ann. Meteorologische Zeitschrift 63, 176-182. Additional information needed: Electronic link? Keywords?

Shostakovich VB (1941) Lake silt bands and geological problems. Izvestia Geograficheskogo obschchestva 73 (in Russian). (Шостакович ВБ (1941) Слоистые иловые отложения и некоторые вопросы геологии. Известия Географического общества 73). Keywords: Holocene, Saki Lake, Crimea, Ukraine, varve counts, varve origin, dry and wet periods, climatic cyclicity.


Simola H, Tolonen K (1981) "Diurnal laminations in the varved sediment of Lake Lovojärv, south Finland.


Smith VC, Staff RA, Blockley SPE, Bronk Ramsey C, Nakagawa T, Mark DF, Takemura K, Danhara T, Suigetsu 2006 Project Members (2013) Identification and correlation of visible tephras in the Lake Suigetsu SG06 sedimentary archive, Japan: chronostratigraphic markers for synchronising of east Asian/west Pacific palaeoclimatic records across the last 150 ka. *Quaternary Science Reviews* 67, 121-137. http://dx.doi.org/10.1016/j.quascirev.2013.01.026; Honshu Island, central Japan, high-resolution palaeoenvironmental varved record, including 30 visible tephra layers spanning the last ~150 ka, major element glass composition, precise and accurate ages for the tephas from eruptions within the last 50 ka.


Sohlenius G, Lindeberg G, Björck J, Westman P, Risberg J (2003) The isolation age and history of Lake Sågsjön, Stockholm, based on different dating techniques. GFF 125 (2), 69-76. http://dx.doi.org/10.1080/11035890301252069; the last 1000 years or 14C dated (AMS, terrestrial macrofossils) varve record, diatom stratigraphy to determine the age of the isolation from the Baltic Sea to AD 1500 to 1600.


to tree growth and regional indices of rainfall and temperature, varve thickness is independent of temperature but correlated to rainfall.


Soutar A, Kling SA, Crill PA, Duffrin E, Bruland KW (1977) Monitoring the marine environment through sedimentation. *Nature* 266, 136-139. [http://dx.doi.org/10.1038/266136a0](http://dx.doi.org/10.1038/266136a0); Santa Barbara Basin, marine sediment, sediment traps, California, Pacific Ocean.


Sprek D, Weber ME, Kuhn G, Wennrich V, Hartmann T, Seelos K (2014) Seasonal changes in glacial polynya activity inferred from Weddell Sea varves. *Climate of the Past* 10, 1239-1251. [http://dx.doi.org/10.5194/cp-10-1239-2014](http://dx.doi.org/10.5194/cp-10-1239-2014); core PS1795 consists primarily of fine-grained siliciclastic marine varves that were deposited on contourite ridges in the southeastern Weddell Sea during the Last Glacial Maximum (LGM), high-resolution XRF analysis and grain-size measurements on thin sections, two seasonal components of varves, bright relative coarser minerogenic laminae, contourite ridges in the southeastern Weddell Sea during the Last Glacial Maximum (LGM), high-resolution XRF analysis and grain-size measurements on thin sections, two seasonal components of varves, bright relative coarser minerogenic laminae, dark laminae contain finer particles such as mica and clay, model of enhanced thermohaline convection in front of a grounded ice sheet, darker finer-grained layers were then deposited during less winder season, mainly during summer, when coastal polynya activity was likely reduced.


Stanton T, Snowball I, Zillén L, Wastegård S (2010) Validating a Swedish varve chronology using radiocarbon, palaeomagnetic secular variation, and statistical correlation. *Quaternary Geochronology* **5** (6), 611-624, http://dx.doi.org/10.1016/j.quageo.2010.03.004; statistical correlation as a technique for detecting errors between chronologies, palaeomagnetic secular variation (PSV), varved Holocene lake sediment, Sweden, Lake Källsjön, Fennoscandian palaeomagnetic master stack (FENNOSTACK), likely errors in varve chronology, lead pollution-derived chronology for the last 2000 years, 270 years may be missing from younger part of varve chronology, possible overestimation by ca. 230 years in the number of varves counted in early Holocene, validation, lake sediment.


glaciomarine varves provide a more continuous record of changes in the ice-front character than can be obtained from intermittent moraine positions.

Stevens LR, Dean WE (2008) Geochemical evidence for hydrologic variability over the last 2460 years from Crevice Lake in Yellowstone National Park, USA. *Quaternary International* **188**, 139-148. [Link](http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1328&context=geosciencefacpub)


shards, dating results indicates that rhythm layers at Skilak Lake are not annual varves, earlier work on sunspot and climate changes thought to have been recorded in the ‘varved’ Skilak Lake needs to be reevaluated.

St. Jacques JM, Cumming BF, Sauchyn DJ, Smol JP (2015) The bias and signal attenuation present in conventional pollen-based climate reconstructions as assessed by early climate data from Minnesota, USA. *PLoS ONE* **10** (1), e0118306. http://dx.doi.org/10.1371/journal.pone.0118306; reconstructed record of past temperatures since AD 1116 from pollen counts from a lacustrine varve-dated record from Lake Mina, positive bias of 0.8–1.7°C based on non-native pollen.


Stockhausen H, Zolitschka B (1999) Environmental changes since 13,000 cal. BP reflected in magnetic and sedimentological properties of sediments from Lake Holzmaar (Germany). *Quaternary Science Reviews* **18** (7), 913–925. http://dx.doi.org/10.1016/S0277-3791(99)00005-0; lake sediment, Eiffel, magnetic properties dominated by paramagnetic minerals, remanence carrying ferromagnetic minerals dominated by low coercivity fraction, titanomagnetite, hematite, post-depositional dissolution of titanomagnetite, authigenic growth of greigite, positive correlation between initial magnetic susceptibility (κ) and sediment accumulation rate and between κ and non-arboreal pollen percentage, κ and organic carbon content show negative correlation.


Stockhecke M, Sturm M, Brunner I, Schmincke HU, Sumita M, Kipfer R, Cukur D, Kwiecien O, Anselmetti FS (2014) Sedimentary evolution and environmental history of Lake Van (Turkey) over the past 600


Stromberg B (1989) Fluorescent whitening agents were examined in varved sediment freeze core, input history of FWAs since mid 1960s.


Sturm M, Lotter AF (1995) Seesedimente als Umweltarchive. Was ist natürlich, was vom Menschen verursacht? EAWAG news 38 D, 6-9 (in German). Note: copy and paste the following link directly into your browser. Clicking on the link may not work: http://www.climategeology.ethz.ch/news/focusterra/EawagNews_1995.pdf: introducing the use of varves in palaeoenvironmental research, for public outreach, example of Lake Soppensee, Switzerland.


Subetto DA, Stolba V, Neustrueva IYu, Sapelko TV, Kuznetsov DD, Gerasimenko NP, Bakhmutov VG, Ludikova AV, Davydova NN (2007) Environmental and Black Sea level changes in the Holocene as recorded in lakes Saki and Dzarylgach, Crimean Peninsula. In: (Gilbert A, Yanko-Hombach V, eds.), The 3rd Plenary Meeting and Field Trip of IGCP-521 Project “Black Sea – Mediterranean Corridor During the Last 30 ky, Sea Level Change and Human Adaptations”, extended abstracts, Gelendzik-Kerch, 157-159. Keywords: Holocene, the Saki and Dzharylgach lakes, varves in Lake Saki, lithology, varve count, radiocarbon dating, pollen, transformation of sea gulsfs into lakes.


Sugawara K (1934) Liesegang’s stratification developed in the diatomaceous gyttja from Lake Haruna, and problems related to it. Bulletin of Chemical Society of Japan 9, 402-409. Additional information needed: Electronic link? Keywords?


Swann GEA, Pike J, Snelling AM, Leng MJ, Williams MC (2013) Seasonally resolved diatom δ^{18}O records from the West Antarctic Peninsula (WAP), single species samples from individual laminae, season-specific isotope records, significant intra-annual seasonal variability during the deglaciation.


Swierczynski T, Lauterbach S, Dulski P, Brauer A (2013). Late Neolithic Mondsee Culture in Austria: living on lakes and living with flood risk? Climate of the Past 9, 1601-1612. http://dx.doi.org/10.5194/cp-9-1601-2013; Neolithic and Bronze Age lake dwellings, varved lake sediment with flood layers and debris flow events between 7000 and 4000 varve years BP, European Alps, flood frequency decreased since 4450 yr BP without establishment of new lake dwellings


Swierczynski T, Lauterbach S, Dulski P, Delgado J, Merz B, Brauer A (2014) Mid- to late Holocene flood frequency changes in the northeastern Alps as recorded in varved sediments of Lake Mondsee (Upper Austria). Quaternary Science Reviews 80, 78–90. http://dx.doi.org/10.1016/j.quascirev.2013.08.018: varved sediments of Lake Mondsee provide a 7100 yr record of spring/summer floods, event layers are detected by combination of thin section and micro-element scanning, flood frequencies indicate a variability on millennial to decadal time scales, main shift towards more flood events occurred after 1500 varve years BP, more floods in the northern pre-Alps during periods of alpine glacier advance.

Sylwan CA (1990) Paleomagnetism of glacial varves from the last glaciation maximum in Patagonia at Lago Blanco. Physics of the Earth and Planetary Interiors 64 (2-4), 143-152. http://dx.doi.org/10.1016/0031-9201(90)90034-U: paleomagnetic measurements on 178 glaciolacustrine varves, Argentina, last glaciation maximum, magnetic mineral composition determined by Simplex method, haematite (0.16%), magnetite (0.1%), magnetic susceptibility, declination shift, inclination shift, virtual geomagnetic pole (VGP) position.


the fall-winter period produces dark laminae, spring upwelling and high surface productivity results in high biogenic silica fluxes in light laminae.


Tothurst TJ, Underwood AJ, Perkins RG, Chapman MG (2005) Content versus concentration: Effects of units on measuring the biogeochemical properties of soft sediments. Estuarine, Coastal and Shelf Science 63 (4), 665-673. http://dx.doi.org/10.1016/j.ecss.2005.01.010; use of different units of expression (i.e. content and concentration) can change patterns in the expression of unconsolidated sediments, presentation and interpretation of data expressed as concentration is preferable to content for biogeochemical measurements in sediments, because content data is confounded by various factors (including core density/mass), leading to mistaken inference.


sediment, varve counts AD 182 to AD 1513, some radiocarbon dates were older due to erosion of old organic terrestrial material via agriculture, varve chronology compared to tree rings, historical documents.


Tolonen M, Antoniades D, Lamoureux SF, Vincent WF (2008) A simple and effective method for preserving the sediment–water interface of sediment cores during transport. *Journal of Paleolimnology* 40 (1), 577-582. [http://dx.doi.org/10.1007/s10933-007-9175-1](http://dx.doi.org/10.1007/s10933-007-9175-1); transport of unfrozen sediment cores, polymer gel (sodium polyacrylate) applied above the sediment surface as stabilizer while preserving surface undulations, gel may react with organic material (e.g. algal mats), no detectable effects on total organic carbon or total nitrogen.

Tolonen M, Lamoureux SF (2005) Multiple hydroclimatic controls over recent sedimentation in proglacial Mirror Lake, southern Selwyn Mountains, Northwest Territories. *Canadian Journal of Earth Sciences* 42 (9), 1589-1599. [http://dx.doi.org/10.1139/e05-049](http://dx.doi.org/10.1139/e05-049); changing climatic influences on discharge and sedimentation during the late 20th century, formation of varves, glacial discharge.


Toucanne S, Soulet G, Freslon N, Jacinto RS, Zaragosi S, Eynaud F, Bourillet JF, Bayon G (2015) Millennial-scale fluctuations of the European Ice Sheet at the end of the last glacial, and their potential impact on global climate. *Quaternary Science Reviews* 123, 113-133. [http://dx.doi.org/10.1016/j.quascirev.2015.06.010](http://dx.doi.org/10.1016/j.quascirev.2015.06.010); Bay of Biscay, northeast Atlantic, revised genetic interpretation of marine varves from the Celtic Margin, re-interpretation of material that originated from British Ice-sheet instead of Fennoscandian Ice-Sheet.


Tracey B, Lee N, Card V (1996) Sediment indicators of meromixis: comparison of laminations, diatoms, and sediment chemistry in Brownie Lake, Minneapolis, USA. *Journal of Paleolimnology* 15 (2), 129-132. [http://dx.doi.org/10.1007/BF00196776](http://dx.doi.org/10.1007/BF00196776); comparison of 3 sediment indicators of meromixis in a eutrophic lake that became meromictic around 1925, onset of laminations and changes in the iron to manganese ratio likely occurred before development of permanently anoxic bottom water, changes in diatom assemblage occurred later.

Silvaplana, Alps, Switzerland, Europe, X-ray diffraction, meteorological data, reconstruction of precipitation and summer temperature, Little Ice Age, wet periods, glacier advances.


Trendall AF (1972) Revolution in earth history. Journal of the Geological Society of Australia 19 (3), 287-311. http://dx.doi.org/10.1080/00167617208728798: 900 m of banded iron formation in the 2,400-m thick Hamersley Group, 3 scales of stratification, termed macrobanding, mesobanding (the normal 'banding' of banded iron formation) and microbanding. Microbands are thin (0.2–2.0 mm) regular laminae, alternately rich and poor in iron, within chert mesobands. Microbands, mesobands and macrobands may all be correlated over the whole of the present outcrop. Microbands are believed to result from annual seasonal control of the primary precipitation in the basin, while alternations between microbanded chert mesobands and the adjacent non-microbanded chert-matrix are thought to reflect a 25-year environment cyclicity. There is also a higher-order cyclicity. The microbands are chemical evaporitic varves.


Udden JA (1924) *Laminated anhydrite in Texas*. *Bulletin of the Geological Society of America* **36**, 347-354. [http://bulletin.geoscienceworld.org/content/35/2/347](http://bulletin.geoscienceworld.org/content/35/2/347); additional information needed: Keywords?


Upham W (1884) *The Minnesota valley in the Ice Age*. *The American Journal of Science* **27**(158), 104-111. [http://books.google.com/books?id=vnLWAAAAYAAJ&pg=PA104&lpg=PA104&dq=The+Minnesota+valley+in+the+Ice+Age+&source=bl&ots=7SqmhwRSO&q&sig=ccWwpVvGEXHqwcF_uU2hdHL5usK8&hl=en&sa=X&ei=PfPMUYe5KeP9yhG8XqZo&ved=0CF4Q6AEwCQ#v=onepage&q=The%20Minnesota%20valley%20in%20the%20Ice%20Age&f=false](http://books.google.com/books?id=vnLWAAAAYAAJ&pg=PA104&lpg=PA104&dq=The+Minnesota+valley+in+the+Ice+Age+&source=bl&ots=7SqmhwRSO&q&sig=ccWwpVvGEXHqwcF_uU2hdHL5usK8&hl=en&sa=X&ei=PfPMUYe5KeP9yhG8XqZo&ved=0CF4Q6AEwCQ#v=onepage&q=The%20Minnesota%20valley%20in%20the%20Ice%20Age&f=false); northern Colorado, USA, North America, laminated sandstone "Red Beds" of the Lyons and Lykins formations, alternate white (quartz) and brown sublaminia, eolian origin, no fossils, suspected varves, periodicity of varve thickness.


colored laminae rich in marine organic matter deposited during high-productivity season of late summer monsoon (August–October), precipitation and river runoff appear to control varve thickness and turbidite frequency, spectral analysis.


Vuorinen J (1978) The influence of prior land use on the sediments of a small lake. *Polskie Archiwum Hydrobiologii (Polish Archive of Hydrobiology)* **25** (1/2), 453-451. Lake Hännisenlampi, Finland, kettle lake, abrupt change from brown to 1.2 m thick topmost black sediment was varve-counted to 1504 AD, also change in sedimentation rate due to onset of hemp processing, copper and zinc concentrations.

Walker D (2011) The frequency of laminations in the sediments of Lake Barrine, tropical north-east Australia, during the last five millennia. *Palaeogeography, Palaeoclimatology, Palaeoecology* **299** (1-2), 214-226. [http://dx.doi.org/10.1016/j.palaeo.2010.11.003](http://dx.doi.org/10.1016/j.palaeo.2010.11.003); tropics, Holocene, uppermost sediment is composed of alternating detritus-poor and detritus-rich laminae, 4.5 m long record contains about 3000 individual laminations, marker bands represent periods of unusual turbulence in the water body, radiocarbon dates from 5 ka cal BP to 1987 AD.


Wall D, Dale B (1973) Paleosalinity relationships of dinoflagellates in the late quaternary of the black sea - a summary. *Geoscience and Man* (7) (1), 95-102. [http://dx.doi.org/10.1080/00721395.1973.9989738](http://dx.doi.org/10.1080/00721395.1973.9989738); Dinoflagellites in Late Quaternary sediments from deepwater cores in the Black Sea fall into two ecological categories that are dependent upon paleosalinity, transition at 7,000 years BP between euryhaline and freshwater species when saline water from the Mediterranean began to flow into the Black Sea.


are exposed to greater water movement, carbon isotope ratios linked to dominance of planktonic diatoms low during the Medieval Warm Period, then gradually increased with the onset of the Little Ice Age.


Weinheimer AL, Cayan DR (1997) Radiolarian assemblages from Santa Barbara Basin sediments: Recent interdecadal variability. *Paleoceanography* 12 (5), 658-670. [http://dx.doi.org/10.1029/97PA00086](http://dx.doi.org/10.1029/97PA00086); marine sediment, annual time series 1909–1991, polycystine radiolarian assemblages, flux of a few representative species can be extrapolated to estimate fluxes of environmentally sensitive groups, subdecadal-scale changes in assemblages, diversity, increase in percent warm water fauna consistent with a spin-down of the California Current System.

Weinheimer AL, Kennett JP, Cayan DR (1999) Recent increase in surface-water stability during warming off California as recorded in marine sediments. *Geology* 27 (11), 1019-1022. [http://dx.doi.org/10.1130/0091-7613(1999)027<1019:RIISWS>2.3.CO;2](http://dx.doi.org/10.1130/0091-7613(1999)027<1019:RIISWS>2.3.CO;2); marine sediment, radiolarian assemblages, warming of surface waters in the California Current since the 1950s, reduced upwelling of nutrient-rich waters, increased thermal stratification across the thermocline, oxygen stable isotopes of planktonic foraminifera, instrumental records.


Whiticar MJ, Elvert ME (2001) Organic geochemistry of Saanich Inlet, BC, during the Holocene as revealed by Ocean Drilling Program Leg 169S. *Marine Geology* 174 (1-4), 249-271. [http://dx.doi.org/10.1016/S0025-3227(00)00154-7](http://dx.doi.org/10.1016/S0025-3227(00)00154-7); organic-rich marine laminated sediment, ODP Sites 1033 and 1034, sulfate reduction, microbial methanogenesis via carbonate reduction, carbon stable isotopes, Pacific.


Whyte MA (1992) The use of “Photomount” adhesive as a medium for peels of unconsolidated sediments. *Journal of Sedimentary Research* 62 (4), 741-742. [http://jssedres.geosciencepub.com/content/62/4/741.full.pdf+html](http://jssedres.geosciencepub.com/content/62/4/741.full.pdf+html); method to make sediment peels, surface needs to be smooth, then apply Scotch Photomount adhesive spray, dry for 20 min, slightly re-spray, wait a few minutes, apply strong paper, etc.


Organic geochemical evidence for environmental changes since 34,000 yrs BP from Lago di Mezzano, central Italy. *Journal of Paleolimnology* **22** (4), 349-365. [http://dx.doi.org/10.1023/A:1008051821898](http://dx.doi.org/10.1023/A:1008051821898); organic matter in 34,000 yr sediment profile, lipid distributions, biomarkers, fatty acids, n-alkanols, n-alkanes, cuticular waxes of terrestrial plants, Late Pleistocene, Holocene, algal and bacterial lipids, Hydrogen Index, Oxygen Index, Rock-Eval pyrolysis, total organic carbon TOC, preservation of organic matter.


Climatic cyclotid recorded in varves within the Late Precambrian Elatina Formation (ca. 680 million years old), periglacial lake deposit in the Flinders Ranges, South Australia, solar variability suggested.


A 2000 year long seasonal record of floods in the southern European Alps. *Geophysical Research Letters* **40**(15), 4025-4029. [http://dx.doi.org/10.1002/2014GL060741](http://dx.doi.org/10.1002/2014GL060741); lake sediments, seasonality, solar variability, flood frequency and intensity reconstruction from lake sediment, North Italy, flood frequency increased during solar minima, most extreme autumn floods occurred during a period of warm Mediterranean sea surface temperature, prediction of decreased summer floods, but increased autumn floods at the South-Alpine slope.

Holocene flood frequency across the Central Alps - solar forcing and evidence for variations in North Atlantic atmospheric circulation. *Quaternary Science Reviews* **80**, 112-128. [http://dx.doi.org/10.1016/j.quascirev.2013.09.002](http://dx.doi.org/10.1016/j.quascirev.2013.09.002); lake sediments are a valuable terrestrial archive of past flood events, high flood frequency in the Alps is driven by low solar activity, widening/shrinking of the Hadley cell brings dry/wet conditions to the Alps, south-alpine flood frequency indicates changes in a paleo-NAO pattern, frequent S-alpine floods suggest a southerly position of the N-Atlantic Atlantic.

Carbon- and oxygen-stable isotopic signatures of methanogenesis, temperature, and water column stratification in Holocene siderite varves. *Chemical Geology* **389**, 153-166. [http://dx.doi.org/10.1016/j.chemgeo.2014.09.016](http://dx.doi.org/10.1016/j.chemgeo.2014.09.016); freshwater Otter Lake, Michigan, USA, manganese siderite (Fe,Mn)CO3 up to 19% dry weight as endogenic carbonate in summer layer of the varve couplet, water column alkalinity fluctuations driven by algal calcite dissolution.


Young DR, Johnson JN, Soutar A, Isaacs JD (1973) Mercury concentrations in dated varved sediments collected off southern California. Nature 244, 273-275. http://dx.doi.org/10.1038/244273a0; anthropogenic mercury pollution, Santa Barbara Basin, marine sediment, Pacific Ocean, the past 150 yr, two layers estimated age 1,500 yr BP before mining activity, Los Angeles, California Current.


Organic Geochemistry 31, 903-917. http://dx.doi.org/10.1016/S0146-6380(00)00346-7; California Borderland, Pacific Ocean, marine sediment, alkenones, total organic carbon, El Niño, paleo sea surface temperature, SST, Little Ice Age. Note: the findings of this study were partially revised by Hendy et al.'s (2012) new chronology. Note that subsequent radiocarbon compound-specific studies proved that a significant fraction of biomarkers derives from older, re-suspended sediments. Mixing of old with new biomarkers influences the biochemical signal in accumulating varves (e.g., Mollenhauer and Eglinton, 2007).


Zolitschka B (1996) Image analysis and microscopic investigation of annually laminated lake sediments from Fayetteville Green Lake (NY, USA), Lake C2 (NWT, Canada) and Holzmaar (Germany): a comparison. In: (Kemp AES, ed.) *Palaeoclimatology and Palaeoceanography from Laminated Sediments*. Geological Society Special Publication **116**, London, 49-55. http://dx.doi.org/10.10144/9SL.SP.1996.116.01.06; digitalization of thin sections, automated varve count, density variation, scanning, light transmission data alone do not allow the counting of varves, composite nature of laminations causes high-frequency noise which is hard to distinguish from thin varves without additional microscopic information, image analysis.


Zolitschka B (2007) Varved lake sediments. In: (Elias SA, ed.) *Encyclopedia of Quaternary Science*. Elsevier, Amsterdam, 3105-3114. http://dx.doi.org/10.1016/B0-44-452747-8/00065-X; definition of lacustrine varve, historic first definition of varves by De Geer (1912) was restricted to rhythmically deposited proglacial clays, a century later the meaning was extended to include all annually laminated sediments deposited on continents and in the ocean, modes of formation of varves, absolute dating, eutrophication.


Zolitschka B, Negendank JFW (1996) Sedimentology, dating and palaeoclimatic interpretation of a 76.3 ka record from Lago Grande di Monticchio, southern Italy. Quaternary Science Reviews 15 (2-3), 101-112. http://dx.doi.org/10.1016/0277-3791(95)00022-4; varve chronology agrees with radiocarbon dates and with View the MathML source dates on tephra layers from the same lacustrine sediment sequence, occurrence of varves relates to variations in the trophic state of the lake and to changing runoff, clastic varves were deposited in early Last Glacial Maximum, organic varves using the Holocene.


Zolitschka B, Negendank J W, Lottermoser BG (1995) Sedimentological proof and dating of the Early Holocene volcanic eruption of Ullmener Maar (Vulkaneifel, Germany). Geologische Rundschau 84 (1), 213-219. http://dx.doi.org/10.1007/BF00192252; tephra in early postglacial organic sediments from five maar lakes (West Eifel Volcanic Field, Germany) apparently derived from nearby volcano at Ullmener Maar, 9560 years BP radiocarbon date of wood associated with eruption, varve chronology provides an age of 10017 years VT (varve time in years before 1950) or 10 895 years corrected VT, high values of natural remnant magnetization intensity, increased values of total trace elements.

Zolitschka B, Wulf S, Negendank JFW (2000) Circum-Mediterranean lake records as archives of climatic and human history. *Quaternary International* **73-74**, 1-5. [http://dx.doi.org/10.1016/S1040-6182(00)00061-6](http://dx.doi.org/10.1016/S1040-6182(00)00061-6); editorial introducing special issue of Quaternary International, dedicated to “Mediterranean Lacustrine Records” related to the European Lake Drilling Programme (ELDP) — an ESF research programme to further the interpretation of lacustrine palaeoclimatic and palaeoenvironmental archives.