

Sea level changes into MIS 5: From observations to predictions

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BOGDAN P. ONAC¹, J.A. DORALE² AND J.J. FORNÓS³

¹Department of Geology, University of South Florida, Tampa, USA; bonac@usf.edu

²Department of Geoscience, University of Iowa, USA; ³Departament de Ciències de la Terra, Universitat de les Illes Balears, Palma, Spain

Sea level history throughout the Quaternary shows a complex spatial and temporal pattern, and provides a globally averaged record of continental ice volume variations (Alley et al. 2005; Lambeck and Chappell 2001). Observations of this variability provide key constraints on the timing and amplitude of the forcing mechanisms that trigger the growth and decay of ice masses. With over a third of the world's population living near coastlines, understanding the history and future impacts of global sea level change ranks as a top priority in the Earth sciences.

As uncertainties are inherent to the methodologies and settings of all sea level reconstructions, there is a continued need for additional, independent sources of sea level data that may provide unique insights and crosschecks to the existing framework of former eustatic changes in sea level. The coastal caves of Mallorca with their unique speleothem encrustations (Fig. 1) provide one such source of additional sea level data (Tuccimei et al. 2012), which can be used to precisely document the elevation and timing of various sea level stands in the western

Mediterranean region with sub-meter resolution (Dorale et al. 2010). The western Mediterranean was chosen as the workshop site so that participants (especially those working with corals, ice, or models) could visit the coastal caves of Mallorca and acquaint themselves with the setting of this promising approaches (Fig. 1).

The purpose of the workshop was to bring together an international group of researchers to discuss and promote opportunities for collaboration on the topics of sea level data acquisition, calibration, and modeling. The meeting attracted 43 participants from nine countries, including 15 students and early career scientists. The workshop focused on the interpretation of sea level changes during marine isotope stage 5 (MIS 5) and the onset of MIS 4.

The event was organized into three distinct sections: two days of presentations (both oral and poster), two days of field trips, and a half-day round table discussion that concluded the meeting and explored directions for future research. The first section included 20 oral presentations, of which six were

invited keynotes, and nine were posters. The speakers covered a wide spectrum of problems pertinent to sea level changes, including detailed studies of reef and marine terraces, submerged speleothems, marine notches, marine sediment sequences, phreatic overgrowth on speleothems, flank margin caves, cave minerals, timing of MIS 5, Quaternary fauna, and advanced sea level modeling studies. Sea level modeling was a major focus of discussion during the round table, which tackled the following topics: (1) ways of reconciling controversial MIS 5a data sets from sea level fields around the world, (2) the use of glacio-hydro-isostasy modeling to address the issue above, (3) challenges in addressing past sea level positions and how the community should bridge the gap between field observation and models, and (4) observational and modeling constraints on sea level rise/fall and ice extent/volume.

Finally, the workshop highlighted the interactions among researchers at various stages of their careers, from well-established scientists to junior faculty members, with particular emphasis on the participation of post-doctoral, undergraduate, and graduate students.

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References

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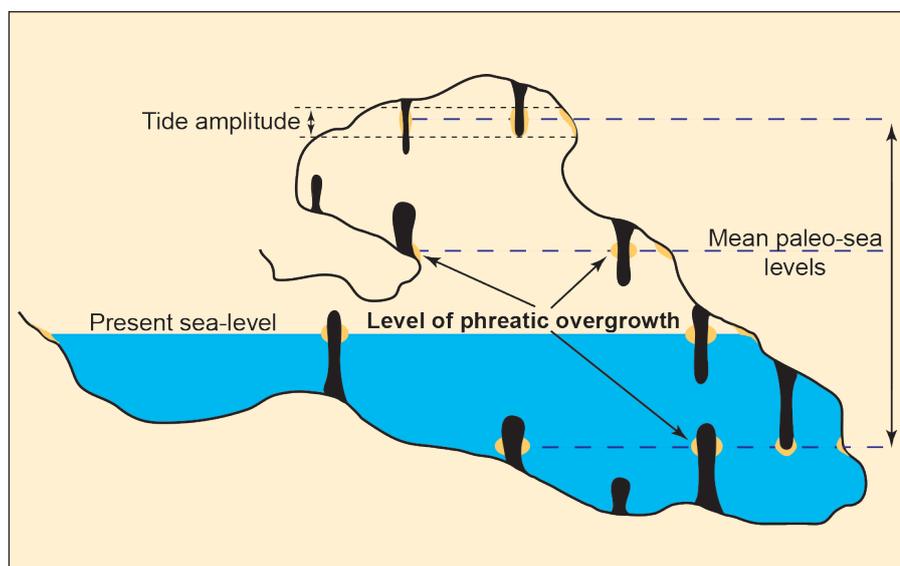


Figure 1: Schematic cross-section through a coastal cave in Mallorca showing multiple levels of phreatic overgrowth on speleothems. Past sea water levels (long dashed lines) left clear encrustation marks on existing speleothems or along the cave walls (shown in yellow). Figure modified after Tuccimei et al. (2012).