Development of a precise age–depth model for the varved record of Lake Butrint (Albania): a reconstruction of environmental change in the central Mediterranean region during the last millennium

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1. INTRODUCTION: The varved record of Lake Butrint

STUDY SITE:
Lake Butrint (39°47 N, 21°1 E) is a lagoon of tectonic origin located on the southern Ionian Sea coast of Albania (Fig. 1). The lake basin occupies a N-S extending graben structure formed during the Pleistocene, which has experienced subsidence until recent times and was invaded by Mediterranean Sea water during the Holocene transgression. The sedimentary record of Lake Butrint provides an unique record of past hydrological changes in the Central Mediterranean region during the last millennia.

VARVED RECORD:
The relatively high water depth of the lake (ca. 21 m) and its progressive isolation from the sea has led to permanent water stratification, allowing the deposition of varved sediments formed by seasonal laminae (Zolitschka, 2007):
- endogenic calcite
- organic matter
- clay during the last millennia (Fig. 2).
Occasionally, the white carbonate pure component is missing.

2. METHODS AND RESULTS: An annually-resolved age-depth model

VARVE COUNTING:
- The uppermost 350 cm of core BUT-12 (Fig. 3) was selected for this high-resolution study due to the good preservation of the laminae. Large format thin sections (100x15=35 mm) were prepared using the freeze-drying technique and subsequent impregnation with epoxy resin (Araldit™) under vacuum conditions (Brauer and Casanao, 2001).
- The varve counting of the uppermost ca. 3.5 m of a 12 m long sediment core, through the petrographic analysis of thin sections (Fig. 4), enabled the construction of an annually-resolved age-depth model (Fig. 5) for the last millennium, supported by radiocarbon and 137Cs dating (Fig. 6), as well as the location of homogenites formed by mass-wasting activity associated to well-dated, historical earthquakes. The comp. depth doesn't consider the homogenites to be associated to instantaneous events.

3. CONCLUSIONS

CONCLUSIONS:
- The annually-resolved age–depth model for the last millennium enables discussion on the changes of microfacies in relation with hydrological variability.
- Variations in the presence and/or thickness of different laminae indicate fluctuations in water salinity, bioproductivity, and runoff, resulting from the interplay of climate variability and fluctuating human activity.
- The annually-resolved sedimentary record of Lake Butrint provides a detailed reconstruction of the climatic evolution of the Central Mediterranean region during the last millennium.

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