Geophysical Research Abstracts
Vol. 21, EGU2019-3316, 2019
EGU General Assembly 2019

Reconstruction of the 1.5 ka relative sea-level change and climate change in the northeastern Adriatic using geochronological tools

Sanja Faivre (1), Tatjana Bakran-Petricioli (2), Jadranka Barešić (3), and Davor Horvatić (4)

(1) Department of Geography, Faculty of Science, University of Zagreb, Croatia (sfaivre@geog.pmf.hr), (2) Department of Biology, Faculty of Science, University of Zagreb, Croatia, (3) Ruđer Bošković Institute, Radiocarbon Laboratory, Zagreb, Croatia, (4) Department of Physics, Faculty of Science, University of Zagreb, Croatia

Accurate age determination is a crucial variable in the study of past global environmental changes, which contributes to our ability to predict future changes. Growing interest in predicting relative sea level changes and identifying causes requires precise knowledge about past changes.
Coralline algae are the most significant framework builders outside the coral-reef belt. Among them, littoral rims built by the coralline rhodophyte Lithophyllum byssoides are a particularly precise archive of relative sea-level histories in the microtidal environment. Their potential has been underutilized due to the unresolved question of the size of the marine radiocarbon reservoir effect (MRE), which is needed for accurate calibration of dates obtained from marine-derived carbon samples. Because this intertidal alga is submerged during high tide and exposed to the atmosphere during low tide there are questions regarding the source of the carbon it uses and the level of MRE. Previous research assumes that rim building alga Lithophyllum byssoides do not appear to be subject to any kind of reservoir effect. However, today it is generally accepted that all organisms containing marine carbon demonstrate some form of radiocarbon reservoir effect. Consequently, here we provide direct evidence regarding the L. byssoides MRE based on samples of known age from museum collections and of the importance of the precise knowledge of the MRE (or R(t)) of the organism in the studies of relative sea-level change.
The latest research on relative sea-level change along the eastern Adriatic has been centred on algal rims. Here we present new precise relative sea-level reconstruction for the past 1500 yr based on the study of four algal rims from the Istrian peninsula. The chronology is based on 47 radiocarbon dates which were accurately calibrated in order to provide precise relative sea-level curve, to relate the sea level changes to periods of climate changes and to try to distinguish land-level changes in the studied area. The relative sea-level reconstruction was quantitatively analysed using an error in-variables integrated Gaussian process (EIV-IGP) model to identify sea-level trends with full consideration of the available uncertainty.
The data from the algal rims enabled the quantification of the relative sea-level rates through the studied period and the distinction of four phases of relative sea-level changes. Furthermore, L. byssoides δ18O records show that those periods of different sea-level changes can be related to changes in temperature and to periods of rapid climate changes.
This research was supported by the Croatian Science Foundation (project no. HRZZ-IP-11-2013-1623, Reconstruction of the Quaternary environment in Croatia using isotope methods – REQUENCRIM) and by University of Zagreb Grants.
We would also like to thank the Muséum National d'Histoire Naturelle in Paris, especially Bruno de Reviers, for providing algal samples from its collections. We also thank Universitat Hamburg, Biozentrum Klein Flottbek und Botanischer Garten, Dr. Matthias Schultz (curator at Herbarium Hamburgense) as well as Naturhistorisches Museum, Wien (Dr. Anton Igersheim, Curator of the Cryptogamic Collection) for kindly providing samples without which this study could not be effectuated.