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Multiproxy assessment of Holocene relative sea-level changes in the western Mediterranean: sea-level variability and improvements in the definition of the isostatic signal

Matteo Vacchi (1), Alessio Rovere (2), Nick Marriner (3), Christophe Morhange (1), Giorgio Spada (4), and Alessandro Fontana (5)

(1) Aix-Marseille Université, CNRS-CEREGE, Aix en provence, France (matteo.vacchi@gmail.com), (2) University of Bremen, Marum, ZMT, Bremen, Germany, (3) CNRS, Chrono-Environnement UMR 6249, Universite´ de Franche-Comte´, Besançon, France., (4) Università degli Studi di Urbino, Via Santa Chiara 27, Urbino, Italy, (5) Università degli Studi di Padova, Dipartimento di Geoscienze, Via Gradenigo 6, Padova, Italy

After the review of 918 radiocarbon dated Relative Sea-Level (RSL) data-points we present here the first quality-controlled database constraining the Holocene sea-level histories of the western Mediterranean Sea (Spain, France, Italy, Slovenia, Croatia, Malta and Tunisia). We reviewed and standardized the geological RSL data-points using a new multi-proxy methodology based on: (1) modern taxa assemblages in Mediterranean lagoons and marshes; (2) beachrock characteristics (cement fabric and chemistry, sedimentary structures); and (3) the modern distribution of Mediterranean fixed biological indicators. These RSL data-points were coupled with the large number of archaeological RSL indicators available for the western Mediterranean. We assessed the spatial variability of RSL histories for 22 regions and compared these with the ICE-5G VM2 GIA model. In the western Mediterranean, RSL rose continuously for the whole Holocene with a sudden slowdown at ∼7.5 ka BP and a further deceleration during the last ∼4.0 ka BP, after which time observed RSL changes are mainly related to variability in isostatic adjustment. The sole exception is southern Tunisia, where data show evidence of a mid-Holocene high-stand compatible with the isostatic impacts of the melting history of the remote Antarctic ice sheet.
Our results indicate that late-Holocene sea-level rise was significantly slower than the current one. First estimates of GIA contribution indicate that, at least in the northwestern sector, it accounts at least for the 25-30% of the ongoing sea-level rise recorded by Mediterranean tidal gauges. Such contribution is less constrained at lower latitudes due to the lower quality of the late Holocene index points. Future applications of spatio-temporal statistical techniques are required to better quantify the gradient of the isostatic contribution and to provide improved context for the assessment of 20th century acceleration of Mediterranean sea-level rise.