Geophysical Research Abstracts
Vol. 16, EGU2014-13399, 2014
EGU General Assembly 2014

GIA modelling of the Hanish and Camarinal Sills to generate isostatic corrections for continuous sea level curves

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Submarine sills are critical points that regulate the exchange flow between enclosed basins and the open ocean. Isostatic modelling of two sills is presented: The Hanish Sill, which regulates exchange between the Red Sea and the Indian Ocean, and the Camarinal Sill which performs a similar function between the Mediterranean Sea and the Atlantic Ocean. A 244 kyr ice history, based on the of the ICE-5G global ice model is used, and a spherically symmetrical, viscoelastic earth is parameterised over three lithospheric thicknesses and a range of upper and lower mantle viscosities. Though the sills are in geologically different settings, with one sill on the basin side, and one sill on the ocean side of the narrowest passage, the relative sea level response is strikingly similar. We determine that in each case, while the offset between relative and global mean sea level is not constant over time, it roughly scales proportionally with land-ice variations such that an estimation of global mean sea level, and thus global ice volume, can be recovered from continuous sea level curves generated at these sills. The relationship between global mean sea level (ESL) and relative sea level (RSL) at the Camarinal Sill can be expressed as ESL=1.23($\pm$0.08)RSL +0.5($\pm$1.9) with errors expressed at two standard deviations. The Hanish Sill response, which displays greater sensitivity to duration of interglacial, is better characterised by two equations which describe an envelope of possible behaviour dependent on phase of glaciation (ESL=1.13RSL +8.5) or deglaciation (ESL=1.24RSL -9.0).