



Anomalous secular sea-level acceleration in the Baltic Sea caused by isostatic adjustment

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Abstract

Observations from the global array of tide gauges show that global sea-level has been rising at an average rate of 1.5-2 mm/yr during the last ~150 years [Douglas 1991, Spada and Galassi 2012]. Although a global sea-level acceleration was initially ruled out [Douglas 1992], subsequent studies [Douglas 1997, Church and White 2006, Jevrejeva et al. 2008, Church and White 2011] have coherently proposed values of ~1 mm/year/century [Olivieri and Spada 2013]. More complex non-linear trends and abrupt sea-level variations have now also been recognized. Globally, these could manifest a regime shift between the late Holocene and the current rhythms of sea-level rise [Gehrels and Woodworth 2013], while locally they result from ocean circulation anomalies, steric effects and wind stress [Bromirski et al. 2011, Merrifield 2011]. Although isostatic readjustment affects the local rates of secular sea-level change [Milne and Mitrovica 1998, Peltier 2004], a possible impact on regional acceleration has been so far discounted [Douglas 1992, Jevrejeva et al. 2008, Woodworth et al. 2009] since the process evolves on a millennium time scale [Turcotte and Schubert 2002]. Here we report a previously unnoticed anomaly in the long-term sea-level acceleration of the Baltic Sea tide gauge records, and we explain it by the classical post-glacial rebound theory and numerical modeling of glacial isostasy. Contrary to previous assumptions, our findings demonstrate that isostatic compensation plays a role in the regional secular sea-level acceleration.

Keywords

Sea-level change; Glacial isostatic adjustment; Rheology

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References

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
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