



## **The Importance of Ocean Dynamics and Gravity Changes Induced by Ice Melt for Regional Scenarios of Sea Level Rise**

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For a low-lying country like the Netherlands, it is of crucial importance to consider regional projections of sea level rise, since they may differ considerably from projections for the global mean. Here, we present a set of regional climate scenarios of sea level rise constructed for the northeast Atlantic Ocean. In contrast to the projections reported by IPCC 4AR (2007), regional effects are incorporated in these scenarios in two ways.

First, the difference between the local thermosteric sea level rise and the global mean deduced from climate models is accounted for. It appears closely related to modeled changes in the meridional overturning circulation in the region of interest.

Second, the effects of changes in the Earth's gravity field induced by melting of land-based ice masses are included. When land-based ice masses shrink, the release of fresh water does not result in a uniformly distributed (eustatic) sea level rise over the oceans. Local gravity changes associated with the redistribution of mass yield a distinct pattern of local sea level rise referred to as its fingerprint (Mitrovica et al 2001). In the regional climate scenarios, the impacts of gravitation changes are incorporated by scaling the estimates for the contributions from land-based ice masses based on their respective fingerprints. Notably, melting of the Greenland ice sheet will amount to an actual sea level rise along the coast of Western Europe of only about 25% of the eustatic rise. For the Netherlands, changes in the Antarctic ice sheet may be of greater importance,

as they induce a local sea level rise equal to 110% of the eustatic rise.