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Drivers of Holocene sea-level change – using a global database of relative sea-level records from the Northern and Southern Hemisphere

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Many factors give rise to relative sea-level (RSL) changes that are far from globally uniform. For example, spatially variable sea-level responses arise because of the exchange of mass between ice sheets and oceans. Gravitational, flexural, and rotational processes generate a distinct spatial pattern – or "fingerprint" - of sea-level change associated with each shrinking land ice mass. As a land ice mass shrinks, sea-level rise is greater in areas geographically distal to the ice mass than in areas proximal to it, in large part because the gravitational attraction between the ice mass and the ocean is reduced. Thus, the U.S. mid-Atlantic coastline experiences about 50% of the global average sea-level-rise due to Greenland Ice Sheet melt, but about 120% of the global average due to West Antarctic Ice Sheet melt.

Separating the Greenland and Antarctic ice sheet contributions during the past 7,000 years requires analysis of sea-level changes from sites in the northern and southern hemisphere. Accordingly we present a global sea-level database for the Holocene to which we apply a hierarchical statistical model to: (1) estimate the Global Mean Sea Level Signal; (2) quantify rates of change; (3) compare rates of change among sites, including full quantification of the uncertainty in their differences; and (4) test hypotheses about the sources of meltwater through their sea-level fingerprints.