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High resolution gradient fingerprint mapping and its impact on urban planning.

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Title: High resolution gradient fingerprint mapping and its impact on urban planning.

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Abstract:

Local sea level rise is a measure of several competing processes, such as the contribution of melting ice from polar ice sheets, short-term processes related to ocean and atmospheric circulation, vertical land motion, viscoelastic adjustment of the mantle and crust and intense storm flooding. Of all these components, polar ice sheets will contribute most in the near to long-term future. It is therefore paramount to understand how sensitive local sea level is to spatio-temporally variable patterns of ice thickness in glaciated areas around the world.
Here, we propose a new tool to assess this sensitivity based on gradient fingerprint mapping (GFM). This method quantifies exactly the derivative dS/dH, where S is local sea level and H ice thickness around the world. This derivative can be used to compute local projections of sea level using the following approach: S = dS/dH * DH + deltaS, where dS/dH is the gradient fingerprint (as it relates to ice) and DH any projected change in ice thickness (be it from observations extrapolated in time, or semi-empirical approaches, or model-based projections). deltaS encompasses other time variable components (assumed of a lower order) described above. Using high-resolution GFM, urban planners can assess which glaciated areas around the world will be of relevance to sea level change at their specific location, and how to instantly transfer projections of polar ice sheet evolution into localized sea-level change projections, along with associated uncertainties.

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