

Probabilistic projection of sea-level change along the world's coastlines

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Climate change causes global mean sea level to rise due to thermal expansion of seawater and loss of land ice from mountain glaciers, ice caps and ice-sheets. Locally, where impacts occur, sea-level changes can strongly deviate from the global mean due to ocean dynamics. In addition, gravitational adjustments redistribute seawater away from shrinking ice masses, an effect currently not incorporated in climate models. Here, we provide probabilistic projections of sea level change along the world's coastlines for the 21st century, taking into account uncertainties across the cause-effect chain from greenhouse-gas emissions to ocean heat uptake and regional land-ice melt. At low latitudes, especially in the Indian Ocean and Western Pacific, sea level will likely rise more than the global mean (by 10-20%, possibly up to 45% in Tokyo area). Around the North Atlantic and the North-Eastern Pacific coasts, sea level will rise less than average or, in extreme cases, even drop. Despite large uncertainties for the ice-sheet contributions, the pattern of relative sea level change along the coastlines appears robust. Our probabilistic regional sea level projections provide an improved basis for consistent coastal impact analysis and infrastructure planning for adaptation to climate change.