



The sea level rise commitment of Paris Agreement emission reduction pledges

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In the context of the Paris Agreement long-term temperature target, global emission reduction pledges are routinely translated into Global Mean Temperature (GMT) projections for 2100. While the 2100 GMT signal is as a powerful predictor for future climate impacts on land, it does not inform well on future sea level impacts due to the delayed response of sea level rise to emissions. To overcome this issue, we here use a sea level emulator coupled to a simple climate model to estimate 2100 and 2300 Global Mean Sea Level Rise (GMSLR) attributable to current greenhouse gas (GHG) emission shares and emission reduction pledges of countries under the Paris Agreement. This allows us to also attribute committed sea level contributions to GHG emission trajectories of individual countries. We apply two accounting periods based on the National Determined Contributions (NDCs) available in 2018: the 1991-2030 “IPCC Period” and the 2016-2030 “Paris Period”. Based on our state-of-the-art probabilistic sea level rise emulator, pledged global GHG emission reductions until 2030 are projected to yield a median sea level rise commitment of close to one meter by 2300. A sizeable share of this sea level commitment can be linked to the near-term GHG trajectories of major emitters. For 2300, we find that about 40% (IPCC Period) and 20% (Paris Period) of the projected long-term NDC sea level commitment is caused by the emissions of the top 5 GHG emitting countries. Our analysis clearly shows how GHG emissions in the first decades of the 21st century shape the long-term sea level rise response. It further highlights the need for rapid emission reduction efforts in line with the Paris Agreement to minimize severe impacts from long-term sea level rise.