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Climate impact on Earth rotation speed from CMIP6 model simulations

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The Coupled Model Intercomparison Project (CMIP) is an effort to investigate the past, present and future state of a number of Earth system variables, using a variety of models developed by research centers around the globe. This broad initiative aims at understanding climate signals due to both natural variability and in response to changing radiative forcing. One of the so-called endorsed MIPs of the CMIP phase 6, the ScenarioMIP, is dedicated to providing multi-model climate projections based on alternative scenarios of future emissions and land use changes linked to socioeconomic factors. The climate of the 21st century is simulated based on different forcings, which are defined from a combination of possible future pathways of societal development, the Shared Socioeconomic Pathways (SSPs), and the Representative Concentration Pathways (RCPs), identified by what radiative forcing level might exist in 2100.

Our study will examine the integrated effect of atmosphere and ocean variability on the Earth rotation speed, represented as changes in the length of day (LOD). Angular momentum variations due to mass and motion terms will be calculated from different models for the four most prominent scenarios as well as for historical simulations. We will also analyze spatial patterns of the respective variables in order to identify those regions in the atmosphere and oceans that contribute the most to LOD excitation. Finally, we will compare trends in the total axial angular momentum functions among each other and to trends in the global temperature to show the influence of global warming on the rotation rate.