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Axial atmospheric Earth rotation excitation predicted from CMIP6 model simulations

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One special component of the Coupled Model Intercomparison Project phase 6 (CMIP6) is the so-called ScenarioMIP. Different Earth system variables are provided within this project originating from numerous models and model runs operated by research centers around the globe. The models simulate future climate, based on alternative scenarios of future greenhouse gas emissions and land use changes linked to socioeconomic factors. The simulations, which cover the 21st century, use different forcings that 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. In this study, we focus on the analysis of multi-model projections of zonal wind fields, stemming from historical simulations and from the four tier 1 alternate scenarios SSP1-2.6, SSP2-4.5, SSP3-7.0 and SSP5-8.5. We investigate the integrated effect of variations in the atmosphere on the axial component of the Earth rotation vector, quantified as length of day (LOD) variations. Generally, larger emissions lead to some stronger zonal wind patterns in much of the upper atmosphere. The long-term variability and trends in LOD are examined w.r.t. a multi-model-mean and compared with the respective variations in the projected global temperature to study the potential impact of global warming on the Earth rotation speed.