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Impact of climate change scenarios on wind and atmospheric mass regimes, and consequent atmospheric angular momentum effects

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Changes to greenhouse gas concentrations and other climate forcings are already impacting the Earth's climate system and are likely to have an increasing impact in the future. However, part of the uncertainty in estimating such effects depends on how future climate forcing scenarios are formulated. The IPCC has created various scenarios based on projections of economic and population growth, energy usage, and technology efficiency, which in turn effect the greenhouse gas emissions and other climate forcings. The coupled ocean-atmosphere models contributing to the Coupled Model Intercomparison Project - Phase 3 (CMIP3) simulate the consequences of the various IPCC scenarios as well as over the 20th century using known climate forcings. Using outputs from certain CMIP3 models, we will evaluate the effects of such climate change on the wind and mass distribution, and note how they are related to other aspects of climate forcing by dynamics and thermodynamics. In this way we can judge how changes in the overall atmospheric angular momentum (AAM) can lead to changes in the Earth rotation parameters over this century and over the next 100-200 years. We will examine variations and trends in AAM by latitude band and height in order to unravel the contributions of atmospheric mass distribution and wind changes. We note already from our prototype model from NASA/Goddard Institute for Space Studies, that particularly strong increases in zonal winds can occur in the upper troposphere subtropics in both hemispheres, strengthening the zonal jets there. We note the start of the increase in axial AAM likely occurred in the last quarter of the century.