Atmospheric and Oceanic Excitation of Length-of-Day Variations During 1980–2000

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Although nontidal changes in the Earth's length-of-day on time scales of a few days to a few years are primarily caused by changes in the angular momentum of the zonal winds, other processes can be expected to cause the length-of-day to change as well. Here, the relative effectiveness of upper atmospheric winds, surface pressure, oceanic currents, and ocean-bottom pressure in changing the length-of-day during 1980–2000 is evaluated using estimates of atmospheric angular momentum from the National Centers for Environmental Prediction / National Center for Atmospheric Research reanalysis project, estimates of the angular momentum of the zonal winds in the upper atmosphere from the United Kingdom Meteorological Office, and estimates of oceanic angular momentum from the Estimating the Circulation and Climate of the Ocean consortium's simulation of the general circulation of the oceans. On intraseasonal time scales, atmospheric surface pressure, oceanic currents, and ocean-bottom pressure are found to be about equally effective in causing the length-of-day to change, while upper atmospheric winds are found to be less effective than these mechanisms. On seasonal time scales, the upper atmospheric winds are more important than the sum of currents and bottom pressure in causing the length-of-day to change, and, except at the annual frequency, are even more effective than surface pressure changes. On interannual time scales, oceanic currents and ocean-bottom pressure are found to be only marginally effective in causing the length-of-day to change.