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Atmospheric tides in the upper stratosphere and lower mesosphere as inferred from coupled chemistry-climate model simulations

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Atmospheric tides are mainly forced by diurnal variations of the heating due to absorption of solar radiation by ozone and water vapor. Features of atmospheric tides under solar minimum and maximum conditions in the region from the upper stratosphere to lower mesosphere are examined by the use of coupled chemistry-climate models (CCMs) with sophisticated stratospheric chemistry developed at the Center for Climate System Research of the University of Tokyo (CCSR) / National Institute for Environmental Studies (NIES) and MRI (Meteorological Research Institute). Results show that in both CCM simulations diurnal tides are clearly seen in summer hemispheres of the stratosphere and lower mesosphere. The global structure is identifiable with the gravest external mode of diurnal tides based on the classical tidal theory: As concerns the geopotential height field, the maxima appear around 0.1 hPa at 40° in both summer and winter hemispheres, which travel westward behind the sun by about 6 hours. The maximum amplitude is larger in summer hemispheres than in winter hemispheres by a factor of 2. In addition, an internal diurnal mode having maxima over the equator is also seen in low latitudes ($<$ 30 degrees). Daily changes of tidal waves are relatively small in the summer hemispheres and larger amplitudes are seen in the solar maximum simulation almost throughout the period.