

Amplification of the diurnal tide in the mesosphere in response to CO₂ doubling

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The impact of doubled CO₂ on the vertically propagating migrating diurnal tide in the mesosphere is studied using the Canadian Middle Atmosphere Model (CMAM), a coupled chemistry-climate model that extends from the Earth's surface to the lower thermosphere. A linear tidal model forced by the tidal heating from the CMAM is used to attribute cause and effect. The CMAM results exhibit a tidal temperature amplitude increase of up to 2 K in the equatorial upper mesosphere. This occurs in conjunction with an increase in both tropospheric and stratospheric solar heating, with the former resulting from an increase in water vapor and the latter from an increase in ozone. The tidal amplitude increase is attributed to the increase in tropospheric solar heating; the increase in stratospheric heating is found to have little impact.