



Eclipse-induced changes of Titan's meteorology at equinox

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Titan experiences solar eclipses by Saturn on ~ 20 consecutive orbits around equinox for durations of up to ~ 6 hours. The impact of these eclipses on Titan's surface, lower atmosphere and middle atmosphere is investigated by a global climate model. When an eclipse commences, the surface temperature on the subsaturnian side drops by up to 0.3 K, so that the diurnal maximum surface temperature remains lower than on the antisaturnian side, which is never eclipsed. By contrast, the tropospheric air temperature does not abruptly decrease during the eclipses because of the large thermal inertia, but the diurnal mean temperature slightly decreases. The surface wind at low latitudes becomes less gusty in the presence of eclipse due to damping of turbulence. The troposphere outside the planetary boundary layer is not sensitive to eclipses. In most parts of the stratosphere and mesosphere the temperature decreases by up to 2 K due to eclipses, but there are also layers, which experience relative warming due to thermal contraction of the underlying layers. The temperature in the middle atmosphere rapidly recovers after the end of the eclipse season. Eclipse-induced cooling and warming changes the zonal wind speed by a few m s^{-1} due to thermal wind adjustment to changing latitudinal temperature gradients.