



Role of cumulonimbus and ice clouds in tropical tropopause desiccation

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The mechanisms responsible for the extreme dryness of the stratosphere have been debated for decades. A key difficulty has been the lack of models which are able to reproduce the observations. We present results from a new atmospheric chemistry general circulation model (ECHAM5/MESSy1) together with satellite observations. Our model results show that the entry of tropospheric air into the stratosphere at low latitudes is forced by large-scale wave dynamics; however, radiative cooling can regionally limit the upwelling or even cause downwelling. In the cold air above cumulonimbus anvils thin cirrus desiccates the air through the sedimentation of ice particles, similar to polar stratospheric clouds. Transport deeper into the stratosphere occurs in regions where radiative heating becomes dominant, to a large extent in the outer tropics.