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Tropopause Ozone

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The tropopause, however defined, is meant to describe the boundary between the well mixed troposphere and the stably stratified stratosphere. Ozone abundances in the vicinity of the tropopause exhibit large variations with latitude and season, being controlled by a combination of large-scale transport like the Brewer-Dobson circulation, small-scale turbulent mixing unresolved by global models, and photochemistry. A clear, instantaneous, 3-D definition of the tropopause is needed for diagnostics that separate stratosphere from troposphere, e.g., strat-trop exchange fluxes. In the UCI CTM, we define the stratosphere-troposphere boundary with what is effectively an age-of-air tracer: a tracer emitted uniformly from the surface with a uniform e-fold of 90 days (designated e90). Where the abundance of e90 falls below about 70% of the mass-median value (i.e., 33 days-old), we define as the stratosphere. With this diagnostic of the mixing barrier between stratosphere and troposphere the CTM with EC IFS forecast meteorology is able to match much of the observed seasonal cycle of the tropopause pressure and ozone abundance. With the CTM we examine the importance of chemistry vs. transport in controlling tropopause ozone. For example, we note that photolysis of molecular oxygen in the upper troposphere contributes significantly to tropopause ozone in the tropics and sub-tropics.