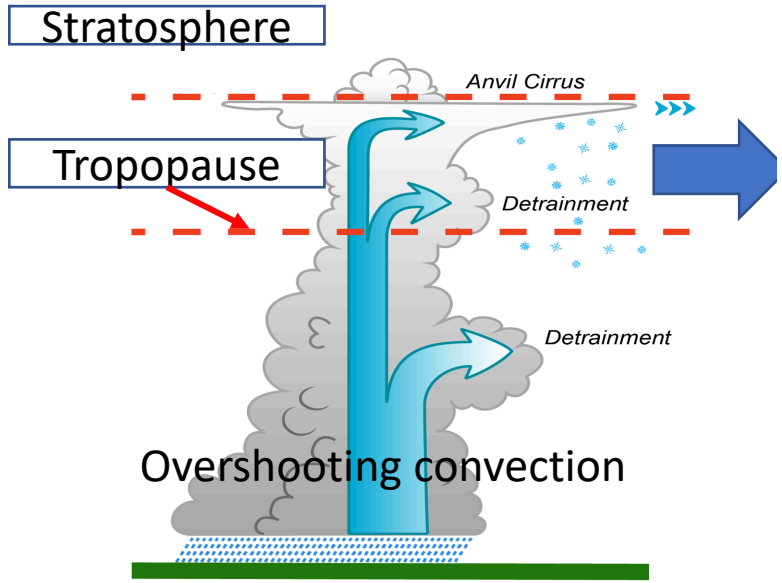
Erythemal Radiation, Column Ozone, and the North American Monsoon

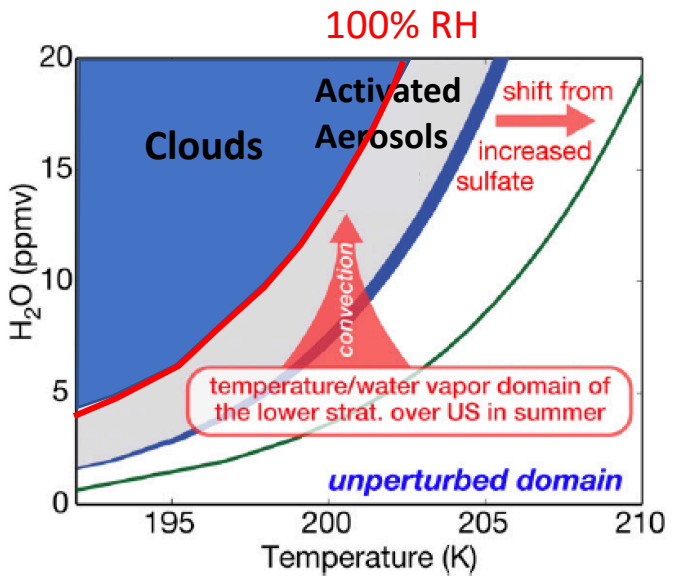
M. Schoeberl, L. Pfister, J. Kummer, T. Wang, A. Dessler

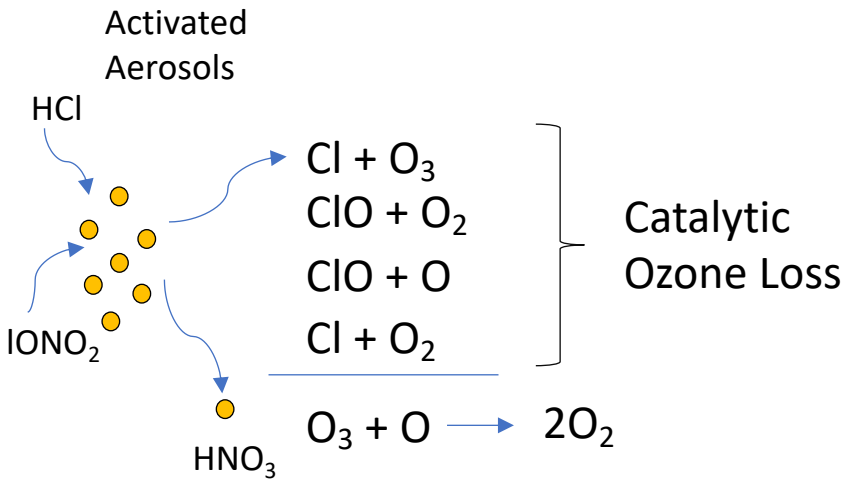
Overview

- Anderson and co workers (2012-2018) hypothesized that overshooting convection during the summer North American monsoon (NAM) might lead to lower stratospheric ozone loss through heterogeneous chemistry on activated aerosols. The result would be increase in surface UV radiation.
- We investigate the dynamics of the monsoon, changes in trace gases and convection during the NAM

Anderson [AC] hypothetical mechanism





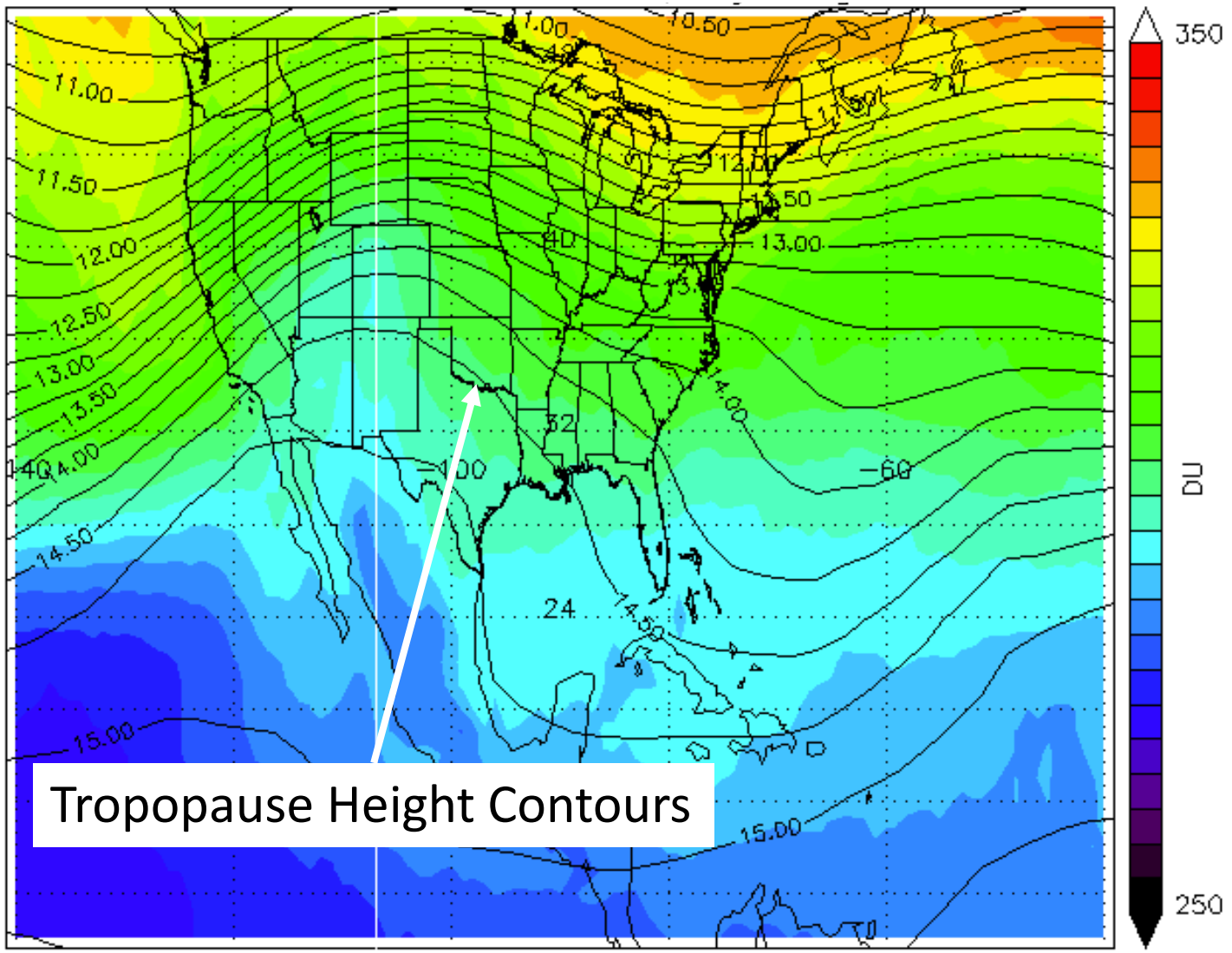


Less Ozone, More UV

Key Results

- We see a correlation between upper tropospheric/ lower stratospheric water vapor and decrease in column ozone
- This occurs because the monsoon lifts the tropopause reducing the ozone column and associated convection increases water vapor.
- The subsequent increase in surface UV radiation due to column lifting is 2x larger than any chemical depletion could produce.
- Little evidence of widespread chemical depletion through changes in column ozone

Column Ozone 2006-2015 July-August



Significance

- NAM tropopause lifting is a more plausible mechanism that explains increases in UV surface radiation during the summer monsoon and its correlation with lower stratospheric water vapor.
- Chemical processing may occur, but the impact on the column is much smaller than tropopause lifting.
- Future intensification of monsoons may lead to increases in UV radiation over monsoon regions.
- A similar process is likely occurring over the Asian Monsoon.
- NASA DCOTTS airborne mission will provide much more information on the chemical and dynamical environment of the NAM.

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