Geophysical Research Abstracts
Vol. 15, EGU2013-6586, 2013
EGU General Assembly 2013

Deep convective transport of water vapor into the stratosphere and its possible connection to large scale circulations

Pao Wang (1)

(1) University of Wisconsin-Madison, Atmospheric and Oceanic Sciences, Madison, United States (pao@windy.aos.wisc.edu), (2) Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan

More and more evidence show that deep convective storms play an important, possibly the major, role in transporting water vapor into the lower stratosphere. Since convective storms occur in troposphere, this phenomenon would imply that the tropospheric storm variability can be transported into the stratosphere via this mechanism. Since the residence time of water vapor in the stratosphere can be longer than a year, the variability in stratospheric vapor concentration can be an important climate forcing because of the strong interaction between water vapor and infrared radiation.

But the occurrence of convective storms cannot be random but must be connected to large scale circulations. Such a connection serves as a conduit to pass large scale variability to convective storms which then provide feedback. This paper intends to explore on this connection.

We will first review the latest evidence of troposphere-to-stratosphere transport of water substance by deep convective storms using both ground-based, aircraft, and satellite (especially A-Train) observations. Both tropical and midlatitude storm cases will be reviewed. Then the physical mechanisms responsible for this phenomenon will be explained using cloud model simulation results. We will then use the model physics to explore the possible connection between the deep convective storm variability and large scale circulations. Factors such surface warming and changing baroclinity will be discussed.