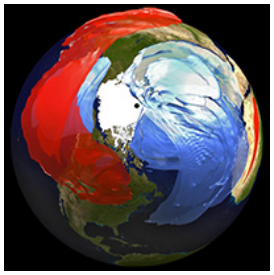

Contribution ID: **7** Type: **Oral presentation**

Remote presentation: Trace Gas Transport in the Stratosphere: Opportunities and Challenges

Tuesday, 19 November 2019 17:00 (30 minutes)

The transport of trace gases through the stratosphere impacts surface climate. Small changes in stratospheric water vapor, on the order of one part per million, can impact surface temperature by as much as a tenth of a degree. A sudden drop in stratospheric water vapor of this magnitude –a response to internal variability of the atmosphere –was observed in 2000. Chemistry climate model simulations of stratospheric ozone also depend critically on the transport of ozone and ozone depleting substances, and biases in transport are a leading source of uncertainty in the recovery of stratospheric ozone. Volcanic aerosols (and the possibility of injecting sulfur into the stratosphere for climate intervention) provides another example of the importance of stratospheric tracer transport for the climate at the surface.

In this talk, I'll present evidence that observations of trace gases provide an opportunity to improve our ability to characterize and understand the circulation of the stratosphere. In particular, recent work enabled a measurement based estimate of the overturning circulation of the stratosphere, a first order climatological quantity that has been a challenge for atmospheric reanalyses. This suggests that incorporation of trace gas measurements into reanalyses could improve their ability to capture the dynamics and circulation of the stratosphere.

In the second half, I'll focus on the challenge tracer transport presents to numerical atmospheric models. A simple benchmark test of atmospheric model dynamical cores reveals the sensitivity of both the circulation and tracer transport to numerics and resolution. State-of-the-art numerical cores developed by GFDL and NCAR struggle to capture a consistent representation of stratospheric transport, even when differences in the treatment of atmospheric physics (i.e., radiative transfer, gravity wave drag, and chemistry) are controlled. We conclude that model development, and the details of numerical schemes, are still very important for accurate climate projection.

Primary authors: GERBER, Edwin (Courant Institute, New York University); Mr GUPTA, Aman (Courant Institute, New York University); Dr LINZ, Marianna (UCLA); Prof. PLUMB, R. Alan (MIT (Emeritus))

Presenter: GERBER, Edwin (Courant Institute, New York University)

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