

Welcome to the Workshop on
Dynamics, Transport and Chemistry
of the UTLS Asian Monsoon



A little history and context for this workshop

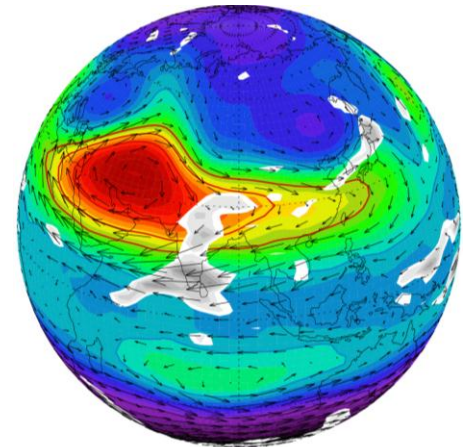
Much work over the past decade on the monsoon anticyclone, motivated to a large degree by satellite measurements, meteorological data and global modeling.

More recently aircraft and balloon observations, and hopefully field campaigns in the near future. Much work in the community on:

- Dynamics and transport
- Composition and chemistry
- Clouds / aerosols / radiation

One goal of this this workshop is a synthesis of current understanding within and among these topics.

One-day snapshot
of monsoon anticyclone



Dynamics

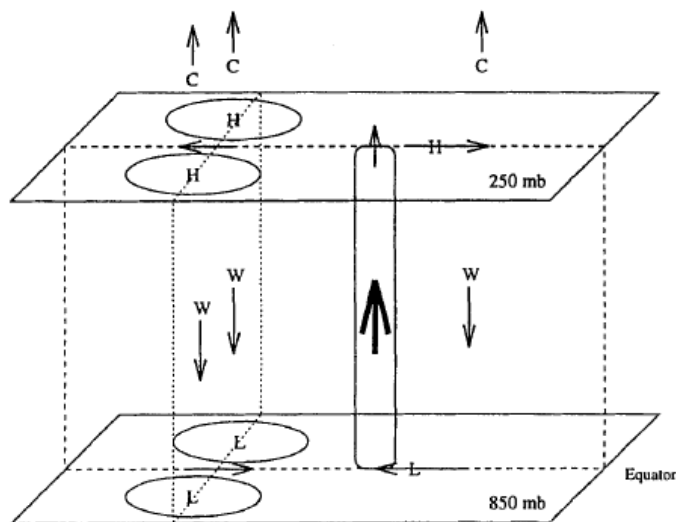
A mechanism for moistening the lower stratosphere involving the Asian summer monsoon

By A. DETHOF^{1*}, A. O'NEILL¹, J. M. SLINGO¹ and H. G. J. SMIT²

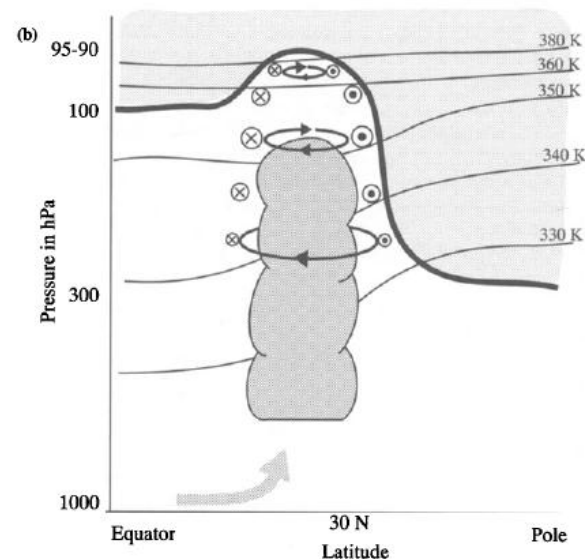
The tropical tropopause

By E. J. HIGHWOOD* and B. J. HOSKINS

QJRM, 1998



'Matsuno-Gill' response
to steady tropical heating



A Model of the Asian Summer Monsoon. Part I: The Global Scale

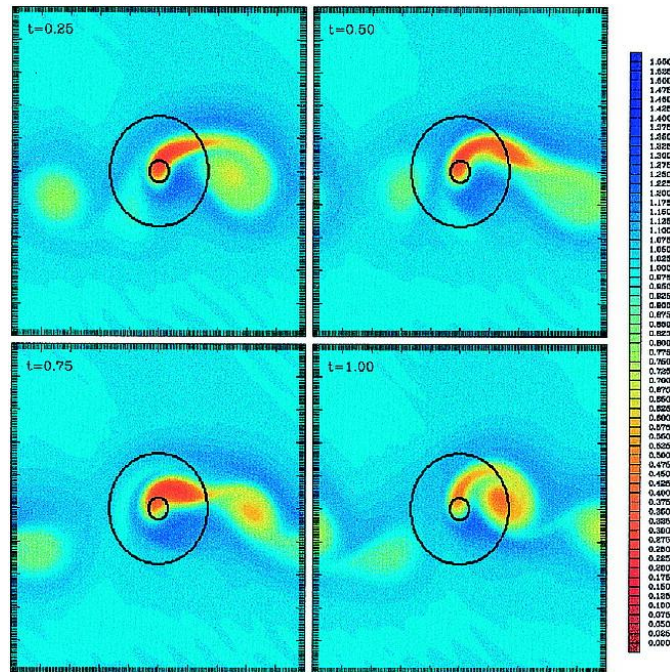
JAS, 1995

BRIAN J. HOSKINS AND MARK J. RODWELL

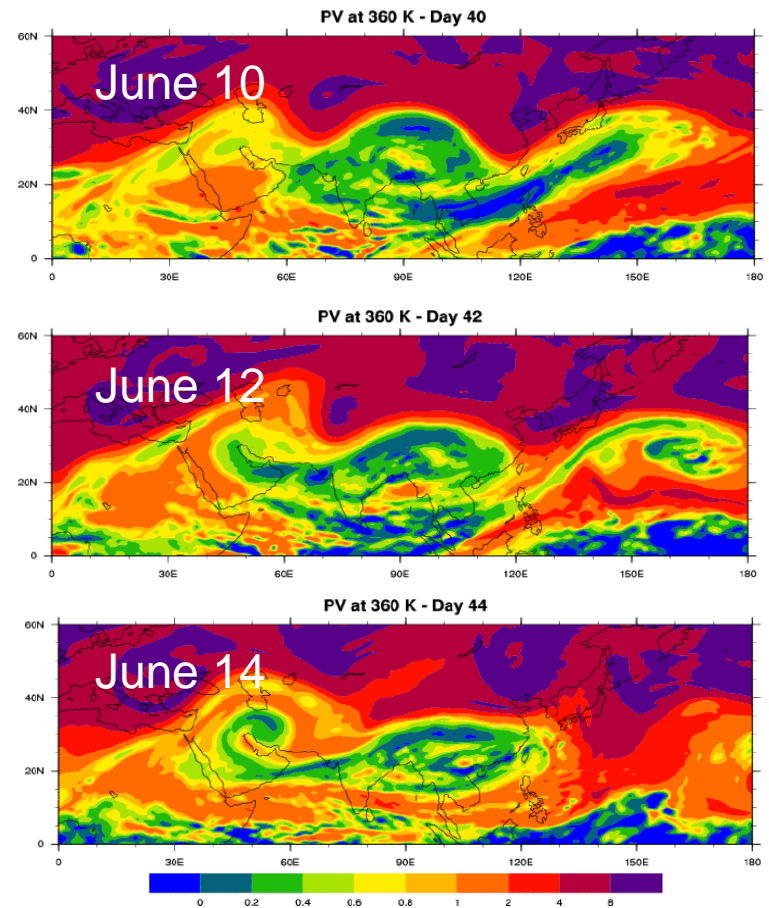
Monsoon circulation is inherently unstable

Hsu and Plumb 2000 JAS

'eddy shedding' from
monsoon circulation



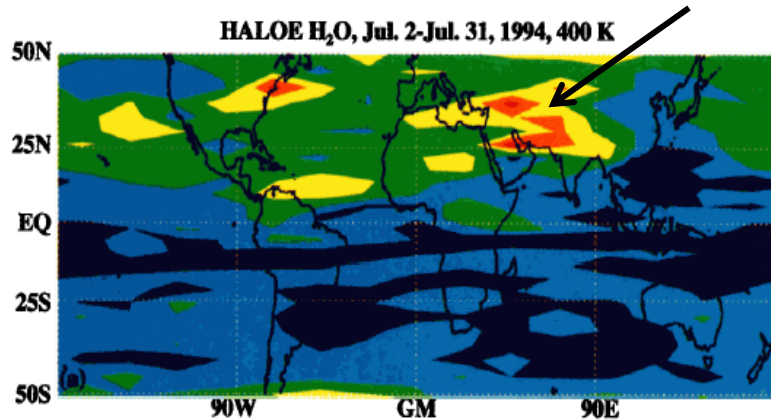
Eddy shedding in observations:
PV at 360 K



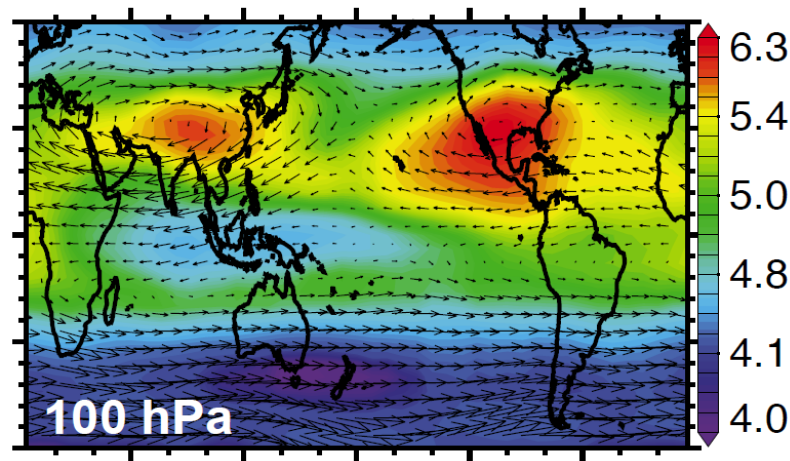
Popovic and Plumb, 2002
Garney and Randel, 2013

Composition/chemistry

UARS HALOE observations of lower stratosphere H₂O

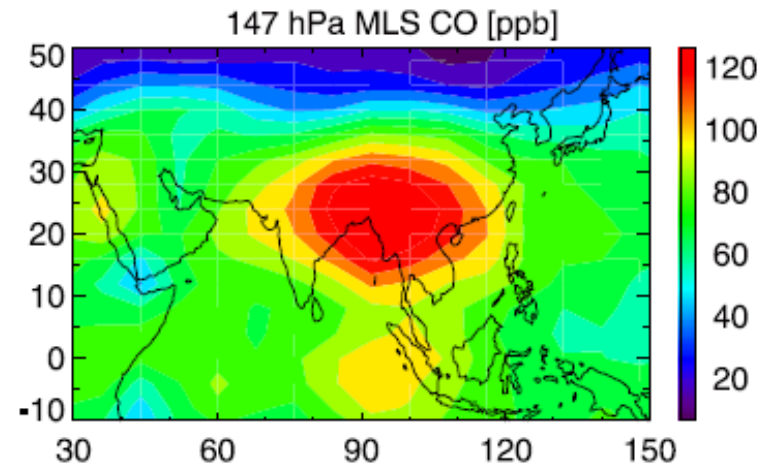


Rosenlof et al, 1997



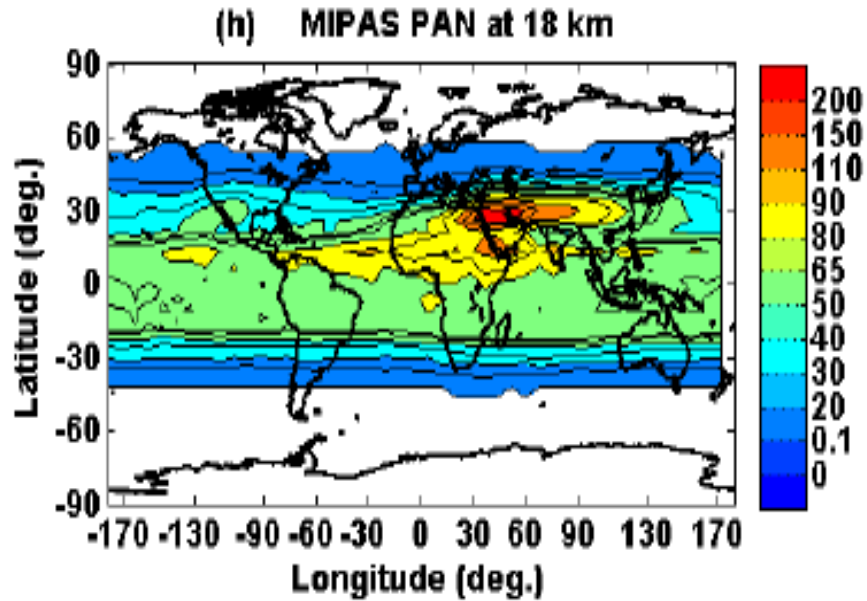
MLS H₂O climatology

First CO observations from Aura MLS

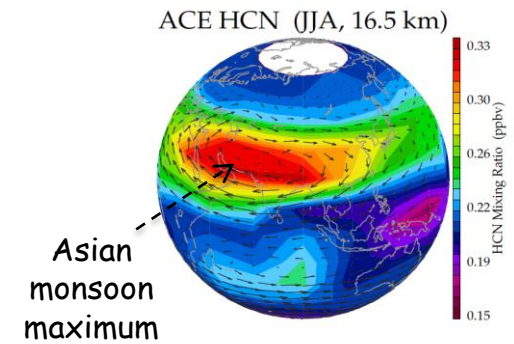


Li et al, 2005

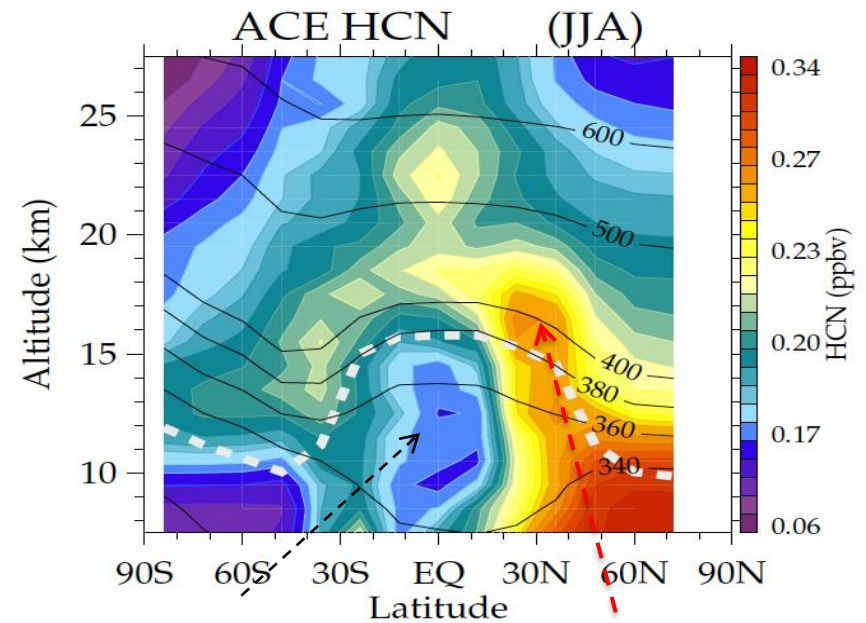
other species



Fadnavis et al 2015



Randel et al 2010

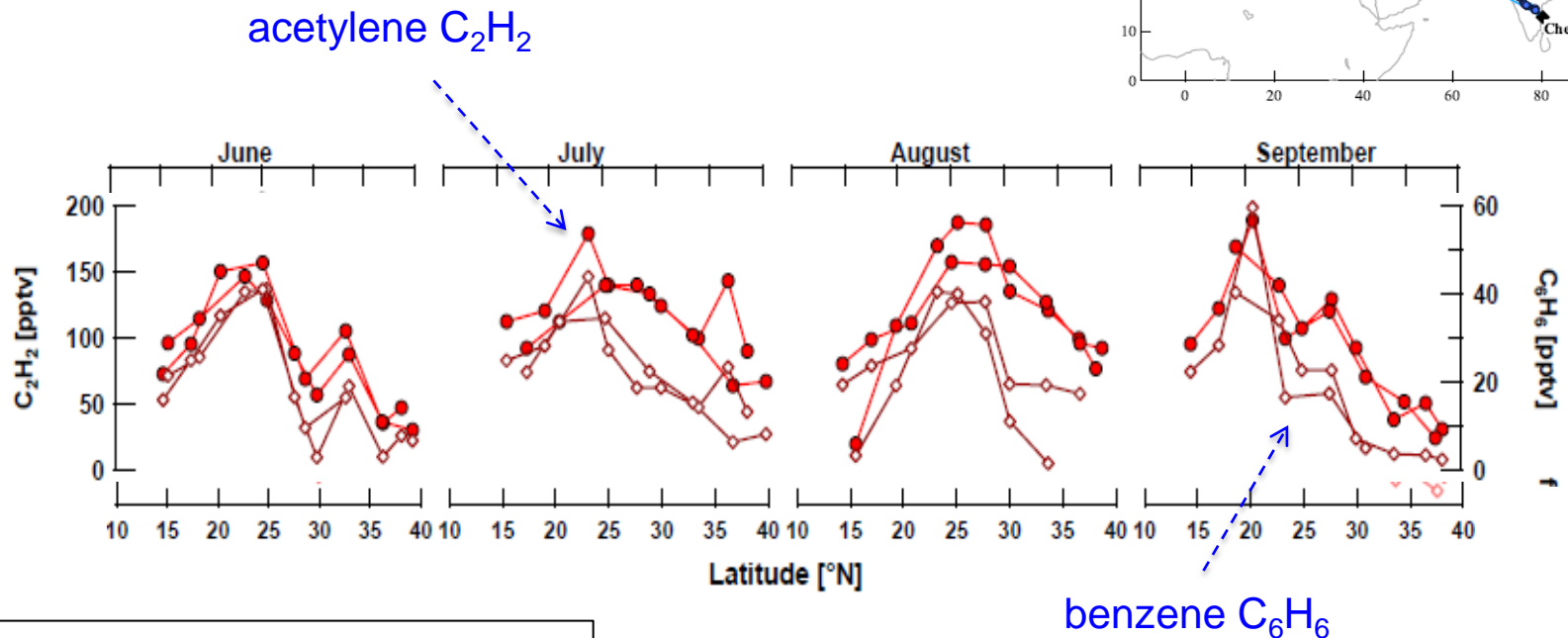
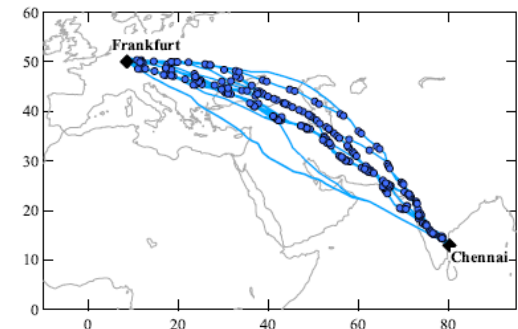


Aircraft
measurements

Characterization of non-methane hydrocarbons in Asian summer monsoon outflow observed by the CARIBIC aircraft

A. K. Baker¹, T. J. Schuck¹, F. Slemr¹, P. van Velthoven², A. Zahn³, and C. A. M. Brenninkmeijer¹

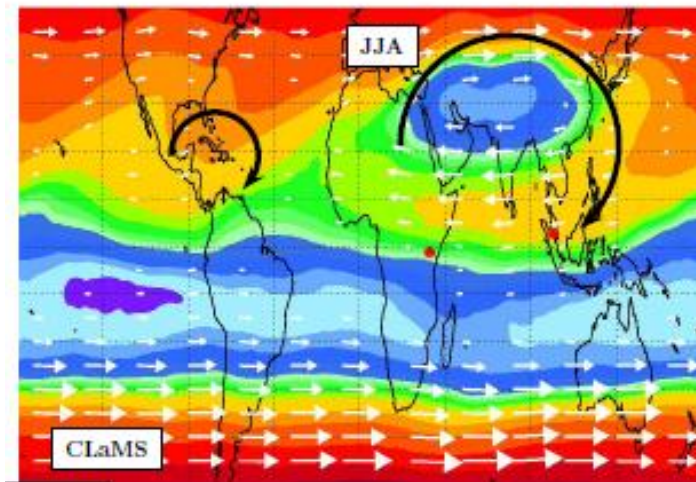
ACP, 2011



short-lived species demonstrate
rapid transport to anticyclone

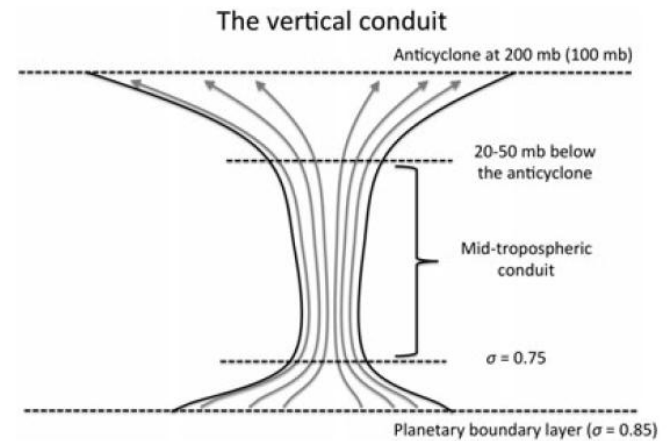
Circulation and Transport

Impact on tropics



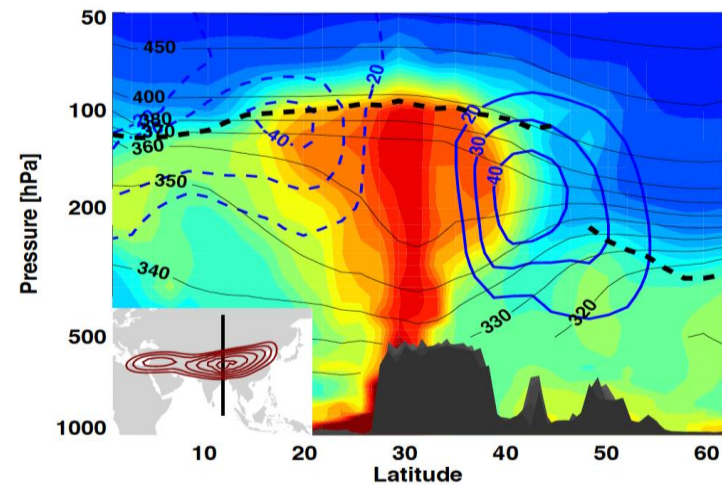
Konopka et al 2009

Trajectory studies



e.g. James et al, 2008; Bergman et al 2013

Chemistry transport models

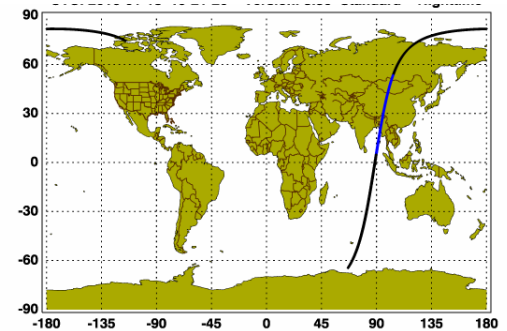
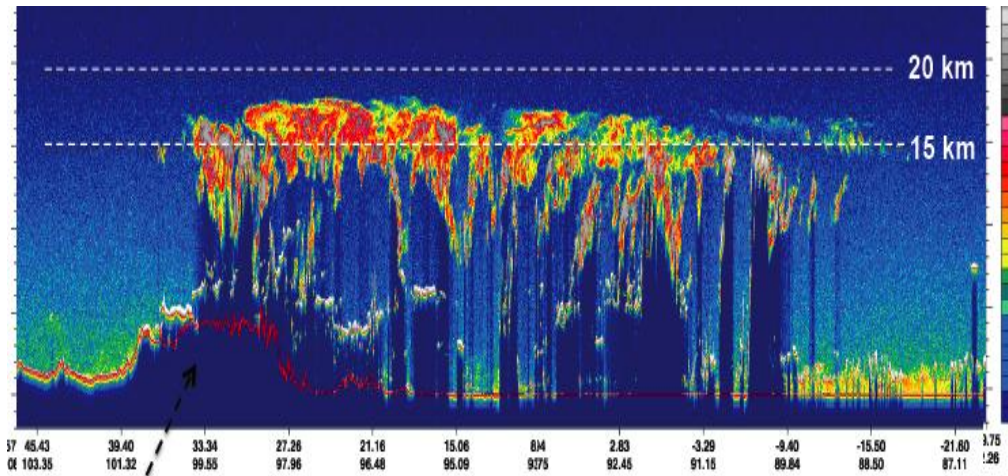
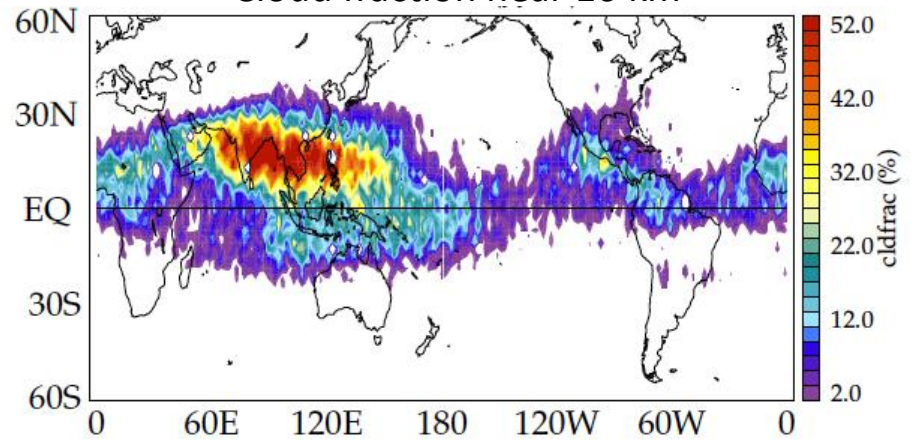


from Laura Pan

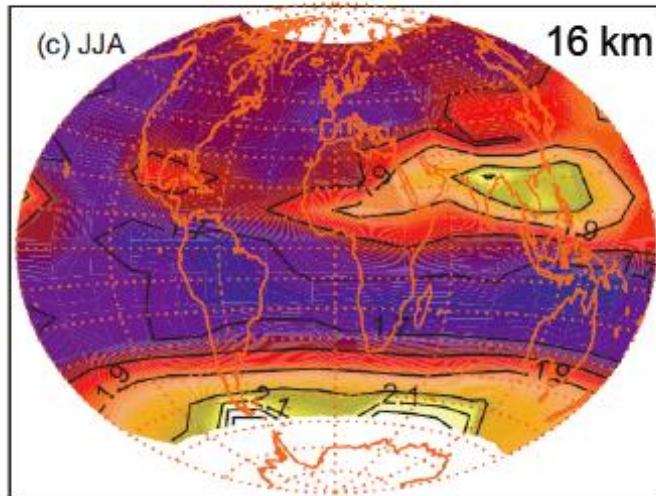
Clouds/aerosols

CALIPSO lidar
in space

Cloud fraction near 16 km

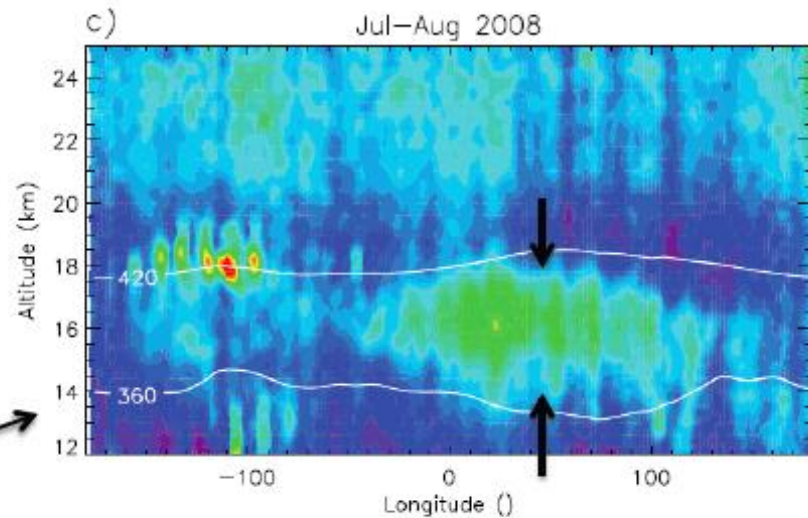


Monsoon aerosol layer



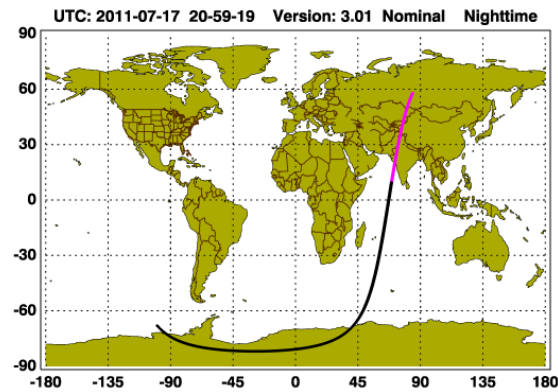
SAGE II measurements 1999-2005
Thomason and Vernier, ACP, 2013

CALIPSO measurements
Vernier et al, GRL, 2011

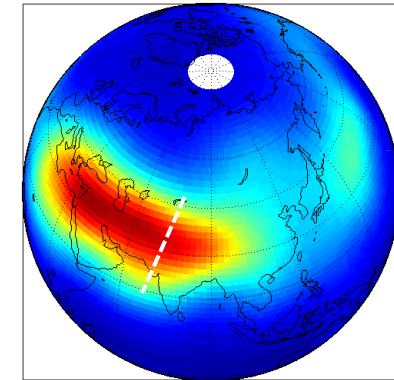


Narrow layer
near tropopause

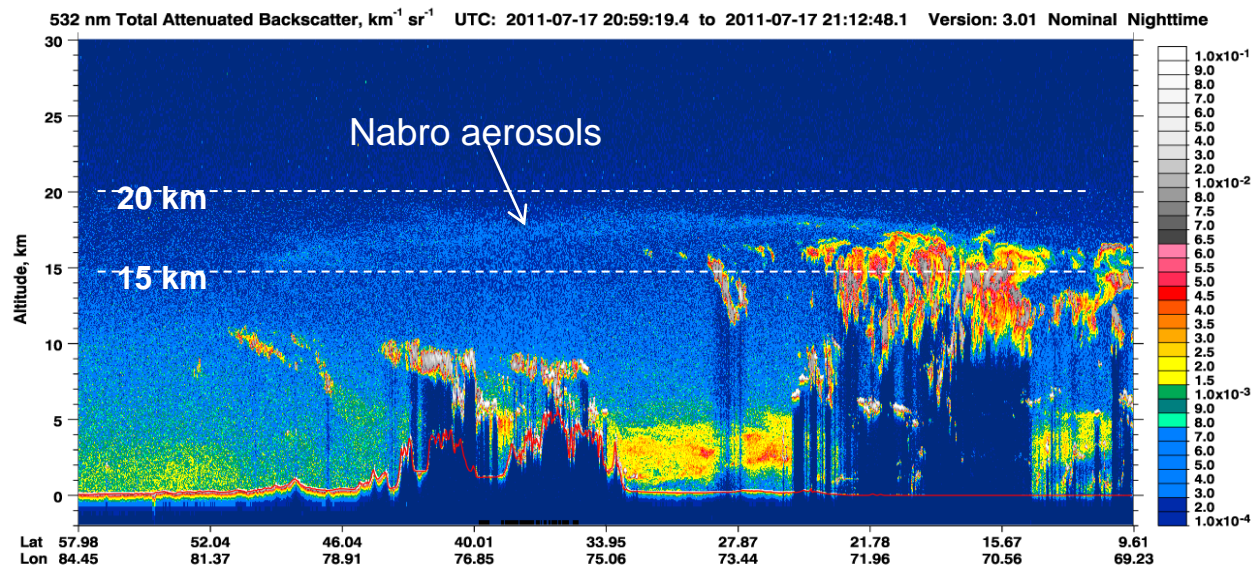
Mt. Nabro Eruption June 2011



OSIRIS aerosol

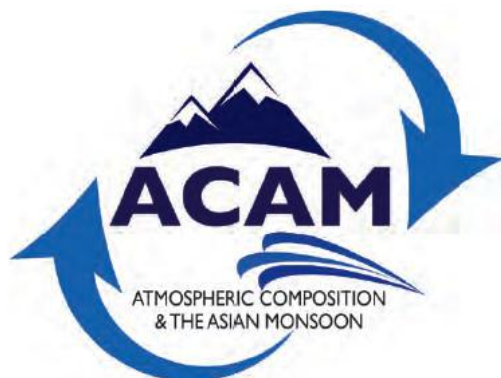


Bourassa et al 2012





Atmospheric Composition and the Asian Monsoon initiative (ACAMi)



<https://www2.acom.ucar.edu/acam>

<http://www.igacproject.org/ACAM>

Co-chairs: Laura Pan and Jim Crawford

Four Science Themes of ACAM:

- Emissions and air quality in the Asian monsoon region
- Aerosols, clouds, and the Asian monsoon
- Asian monsoon convection and chemistry/microphysics
- UTLS response to Asian monsoon

Goals for this week

- Newest science related to UTLS Asian monsoon
- Help define outstanding science questions
- Identify observational and modeling requirements
- Network with colleagues and have fun!

Schedule:

- 30-minute science talks Monday-Thursday am.
- Reception Monday evening
- Tuesday lunch with posters
- Long lunch on Wednesday; Group dinner Wednesday evening
- Thursday afternoon discussion session.

Thursday afternoon discussions led by rapporteur groups

Dynamics/transport

Chiara Cagnazzo, Laura Pan and Karen Rosenlof

Composition/chemistry

Rolf Mueller, Markus Rex and Michelle Santee

Microphysics/radiation

Jianchun Bian, Eric Jensen and Holger Voemel

*Note: We would like to collect all of the talks and post on the workshop web site.
Please tell us if you would like to not have your talk posted.*

Thanks to Scientific Organizing Committee

Jianchun Bian
Chiara Cagnazzo
Rolf Muller
Laura Pan
William Randel
Michelle Santee

And especially Barb Petruzzi for local organization