

Transcom PBL Depth experiment
telecon of 22 Feb 2013

00:00 - 00:15 Introduction, Andy Jacobson

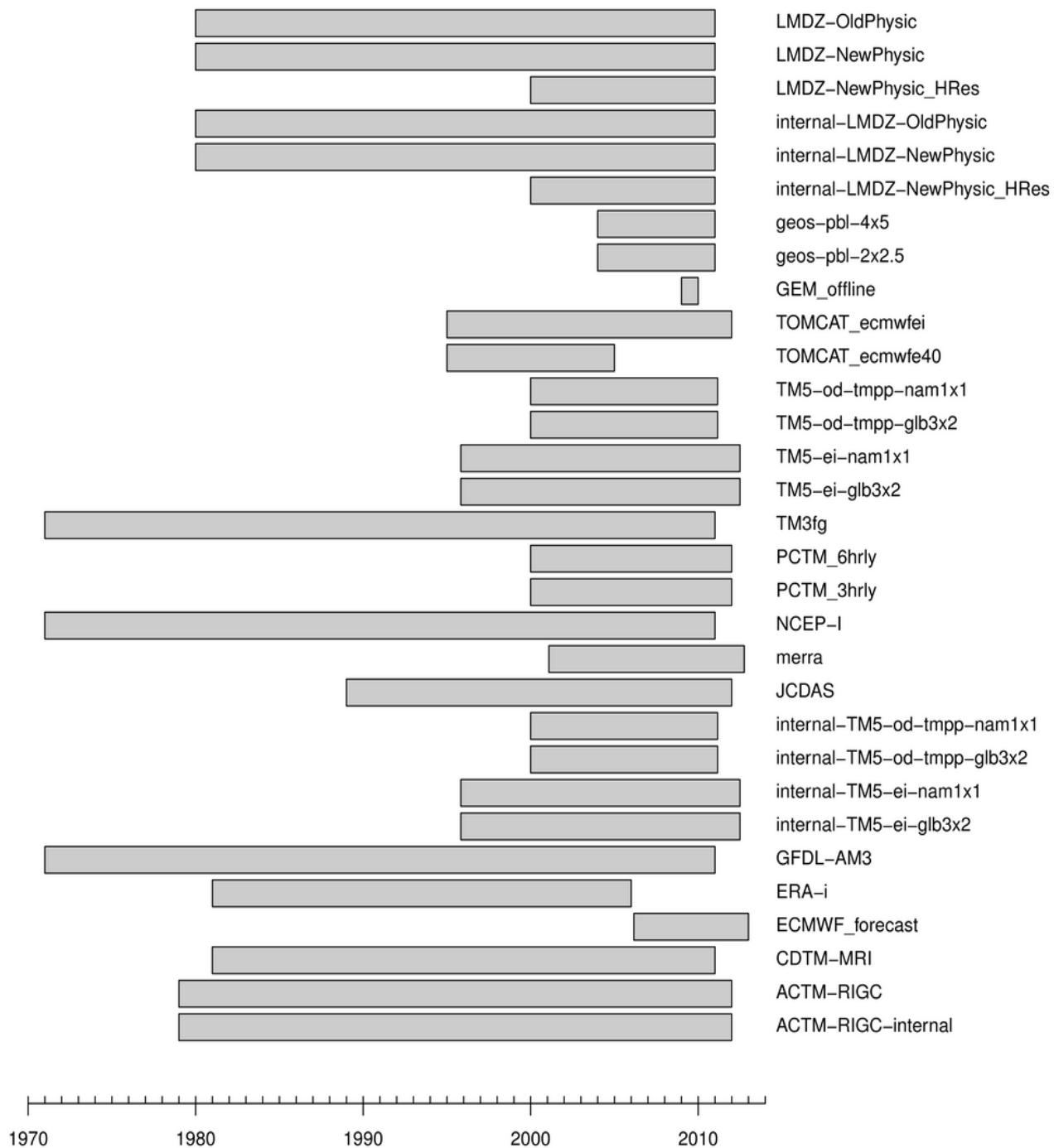
00:15 - 00:25 Characteristics of the IGRA radiosonde dataset, Dian Seidel

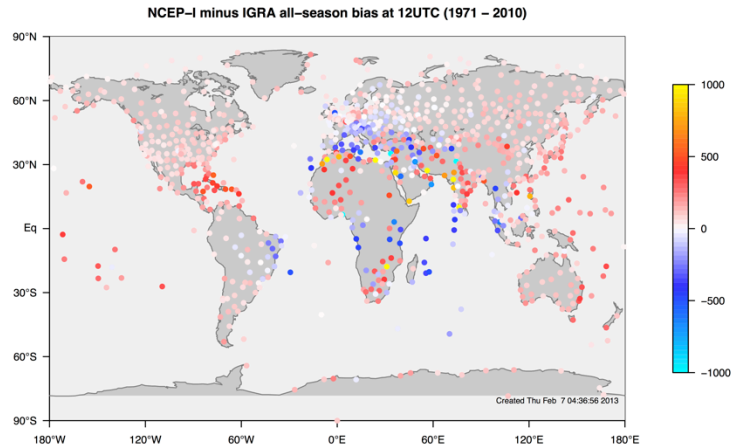
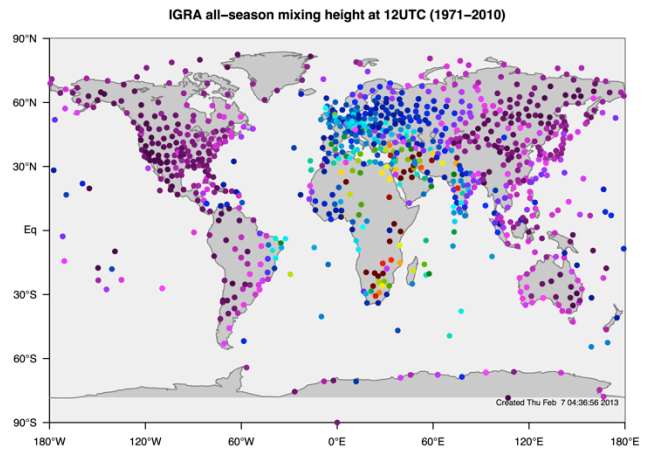
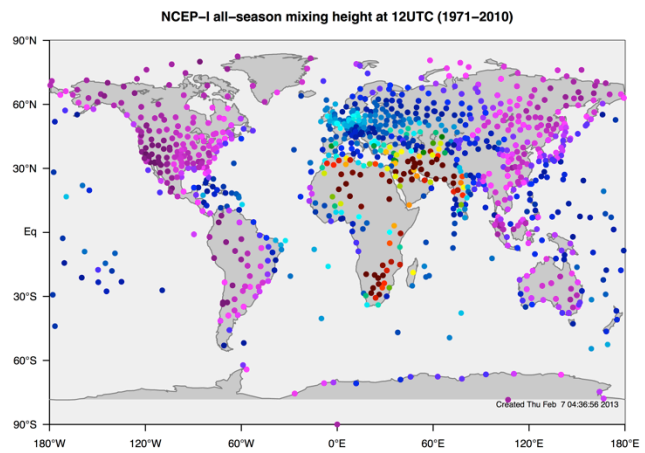
00:25 - 00:35 Covariance of surface CO₂ fluxes with BLH, Scott Denning

00:35 - 01:00 Discussion

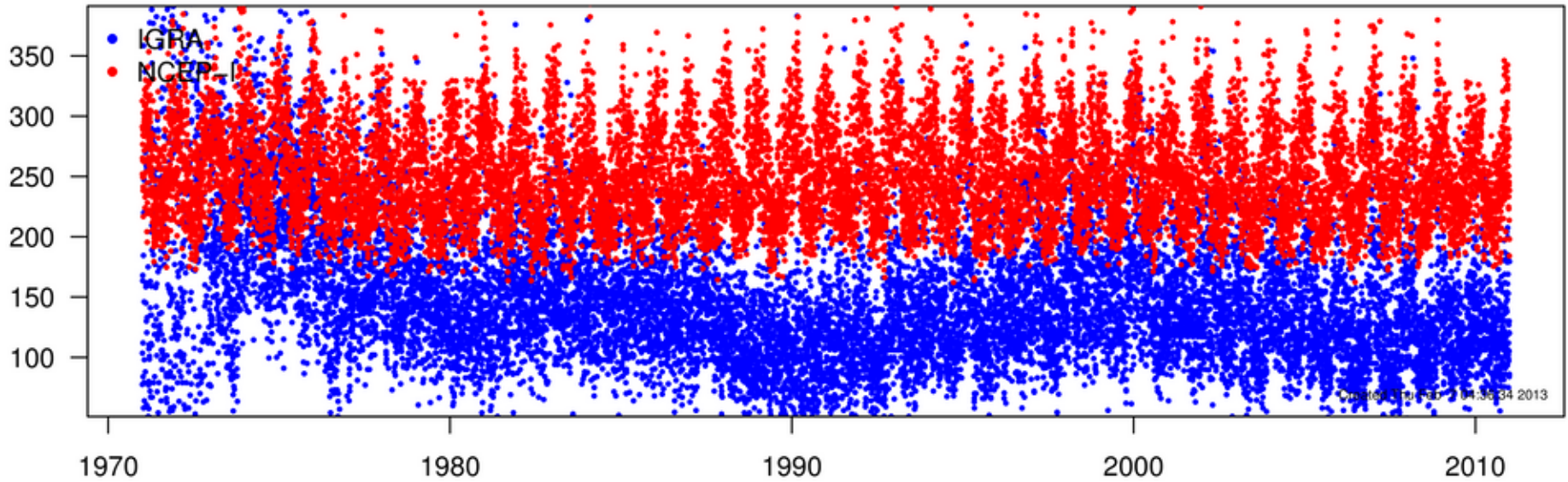
Discussion topics include:

1. Sharing of results among participants
2. Next steps for analysis
3. How to handle regional models? Free-running simulations?
4. New simulations to quantify large-scale vertical transport?

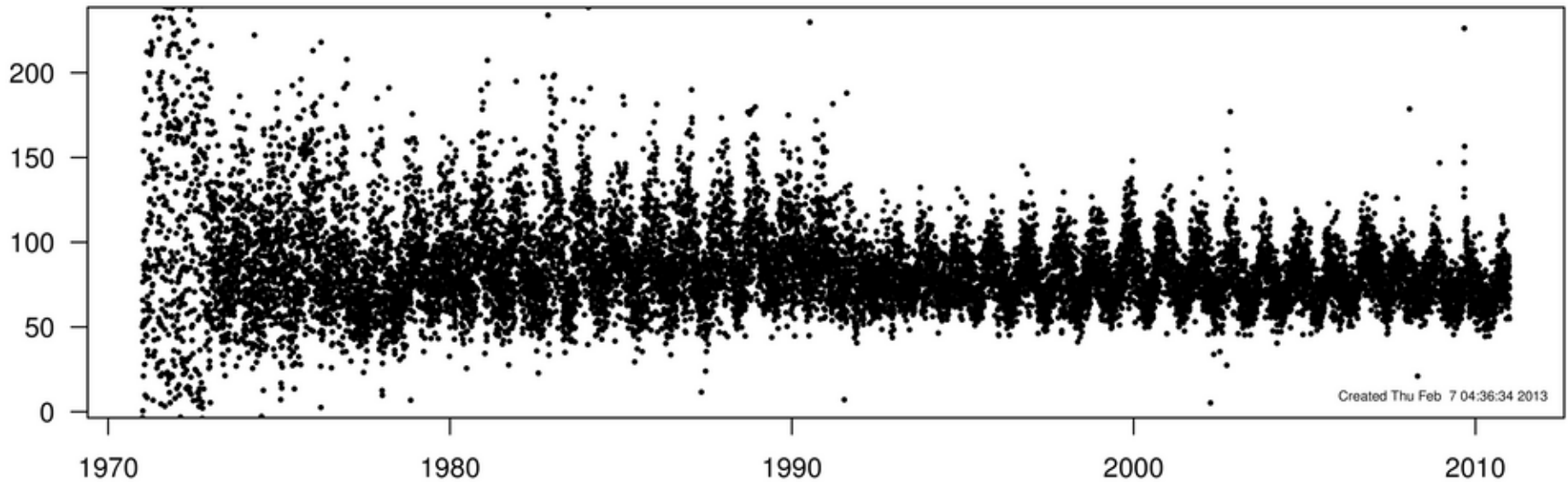




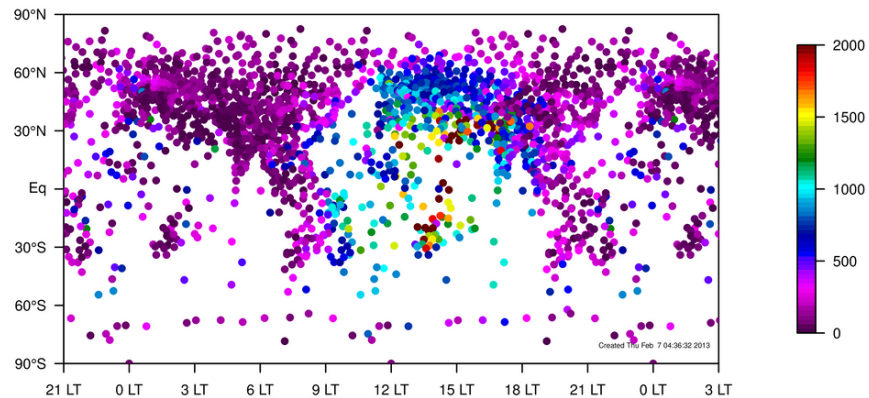
OUTC MHs, stations centered on Greenwich



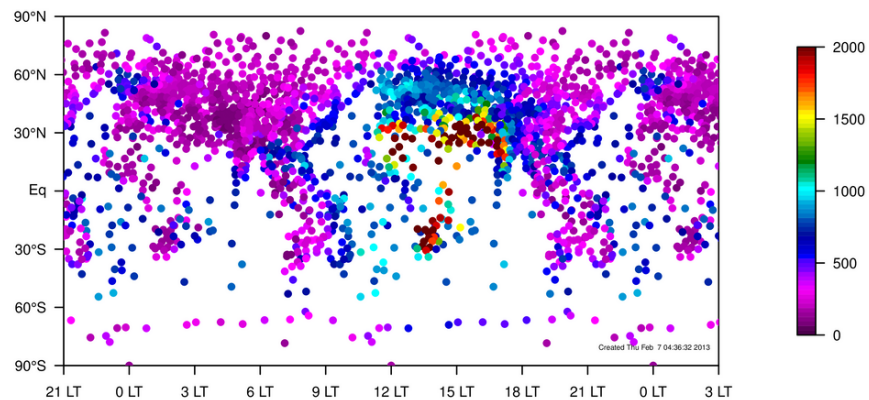
Model minus IGRA OUTC MH diffs for stations centered on Greenwich



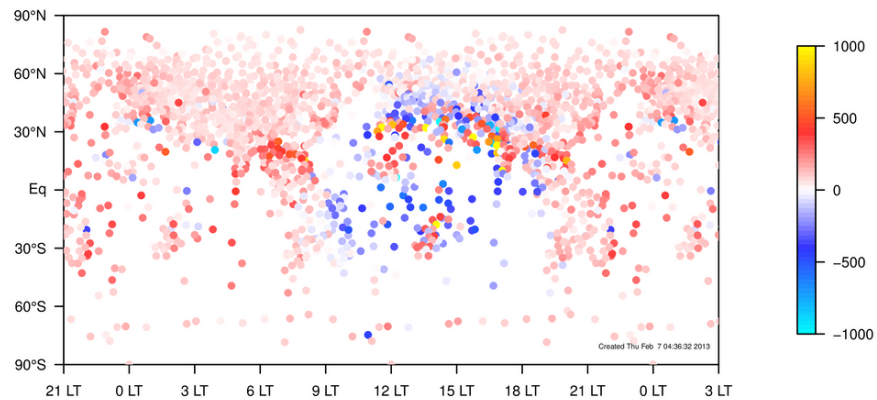
IGRA all-season mixing height median (1971–2010)

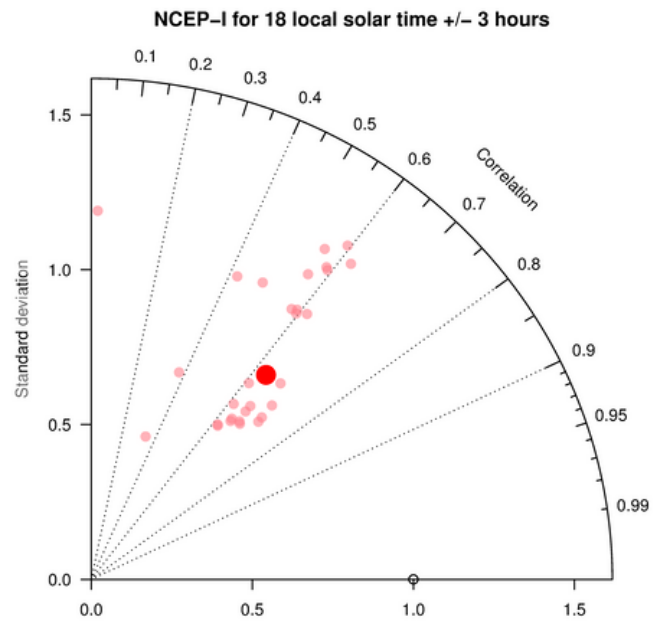
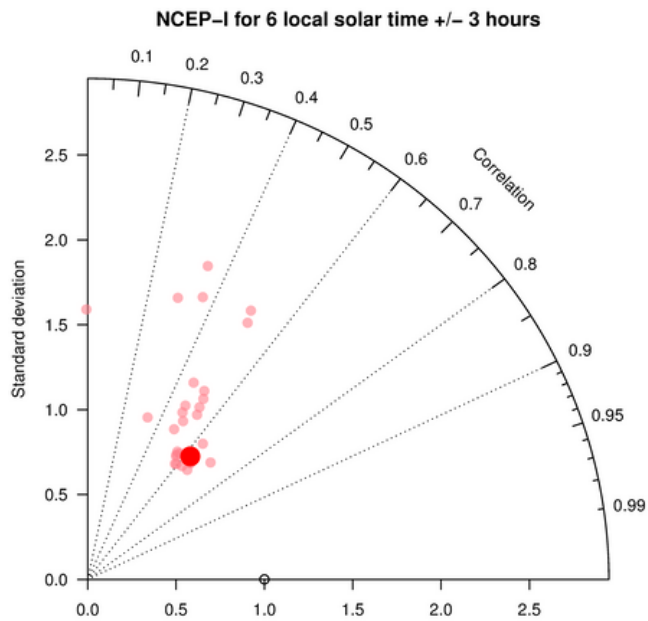
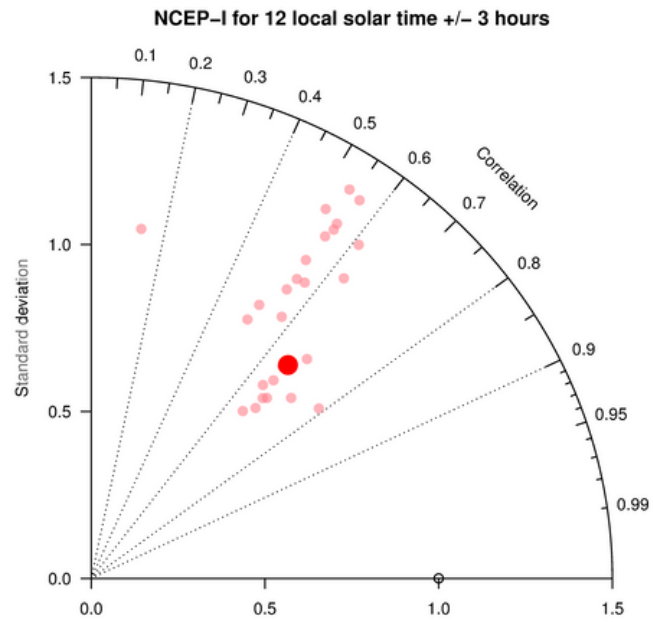
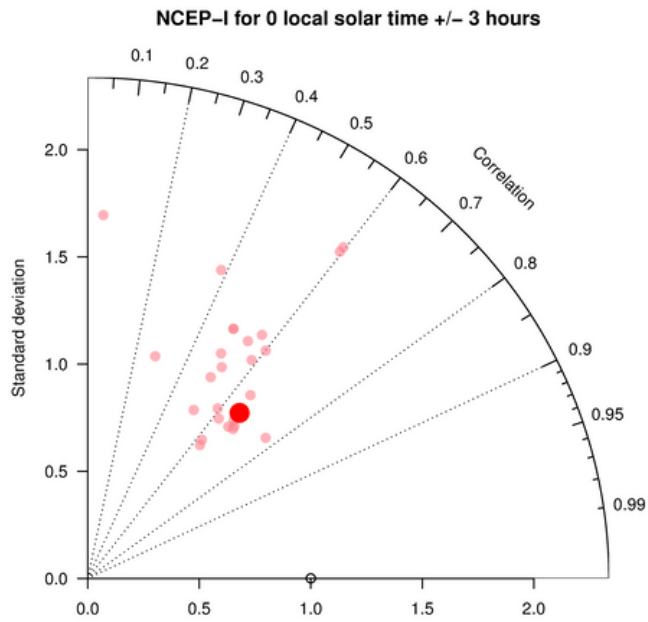


NCEP-I all-season mixing height median (1971–2010)

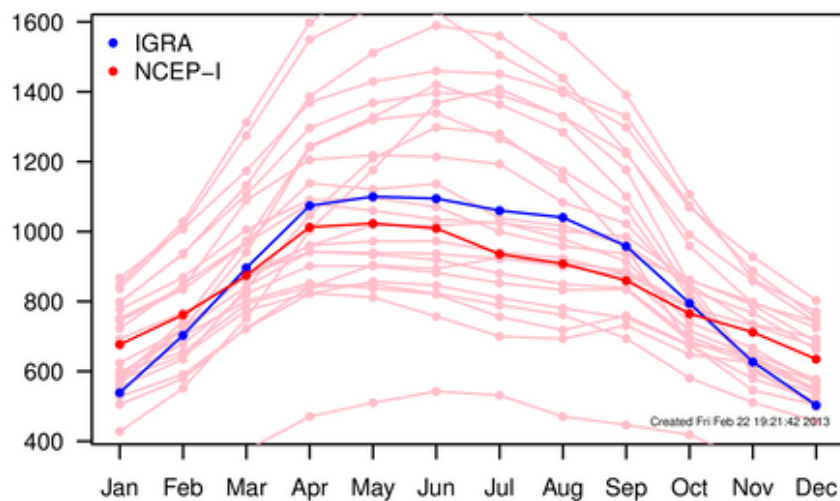


NCEP-I minus IGRA all-season mixing height median (1971–2010)

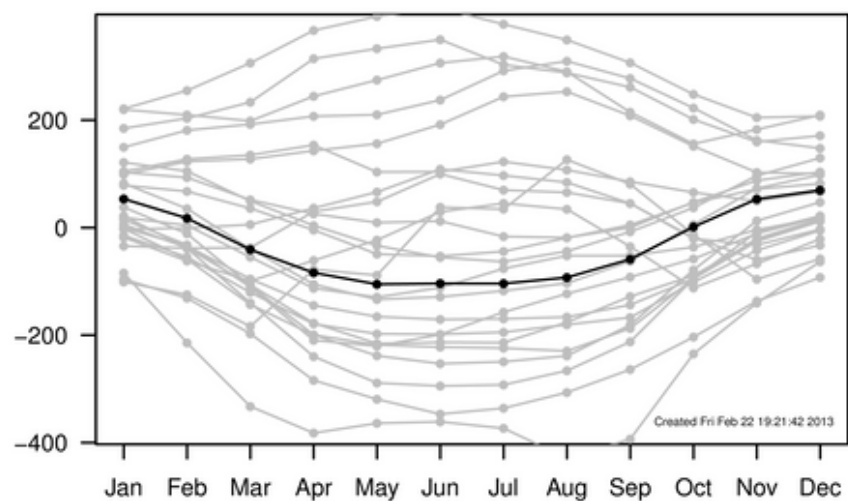




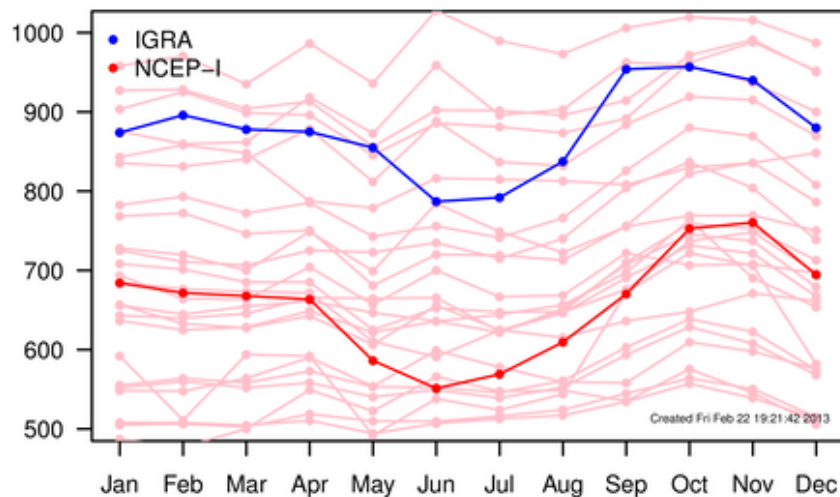
12UTC MHs, stations centered on Greenwich



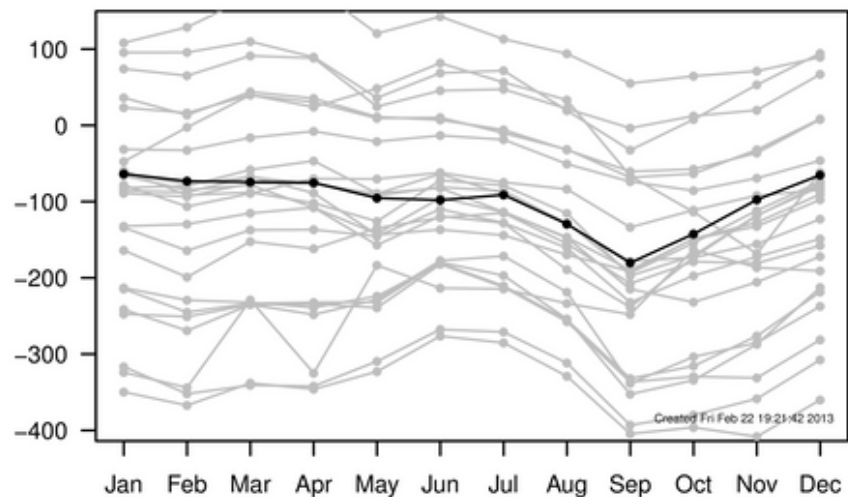
12UTC model-IGRA MHs, stations centered on Greenwich



0UTC MHs, stations centered on dateline



0UTC model-IGRA MHs, stations centered on dateline



Characteristics of the Radiosonde-Based Mixing Height Dataset

Transcom Telecon 22 February 2013

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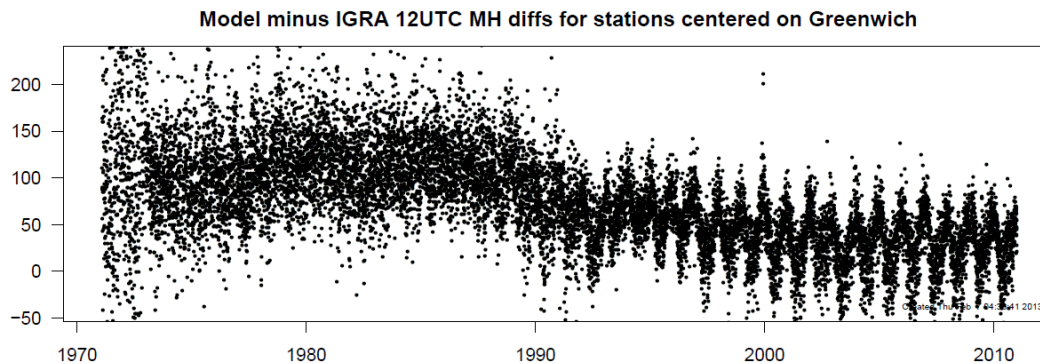
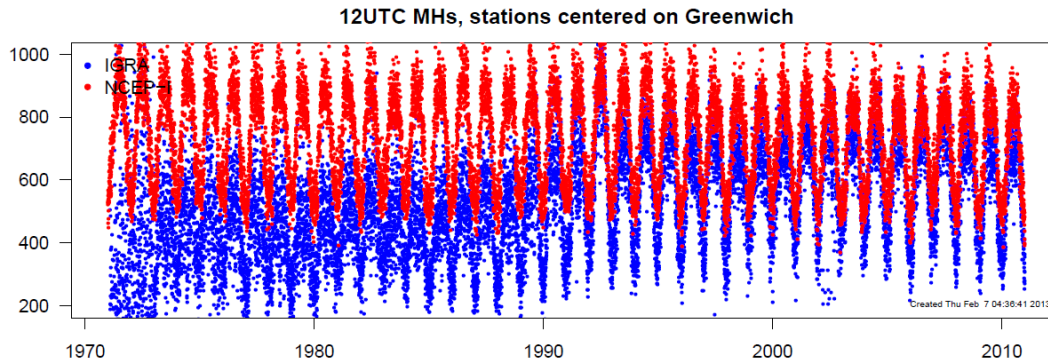
see http://www.arl.noaa.gov/CVCAAnalysis_Pubs.php for related papers

Main Message:

We are thrilled that Transcom is using the dataset,
but “*caveat emptor*”

- Transcom is the first use of this global dataset
 - Previous work used only data from US and Europe
 - Previous work focused on long-term seasonal mean climatology, not diurnal, interannual or decadal variability
- We are aware of some problems, but others will likely emerge through this project
- Highlighting three issues today:
 1. Large uncertainties in MH estimates, especially for shallow MH. See Seidel et al. (JGR, 2012) for details
 2. Changes over time in station sampling of the global network
 3. Changes over time in sounding resolution at individual stations

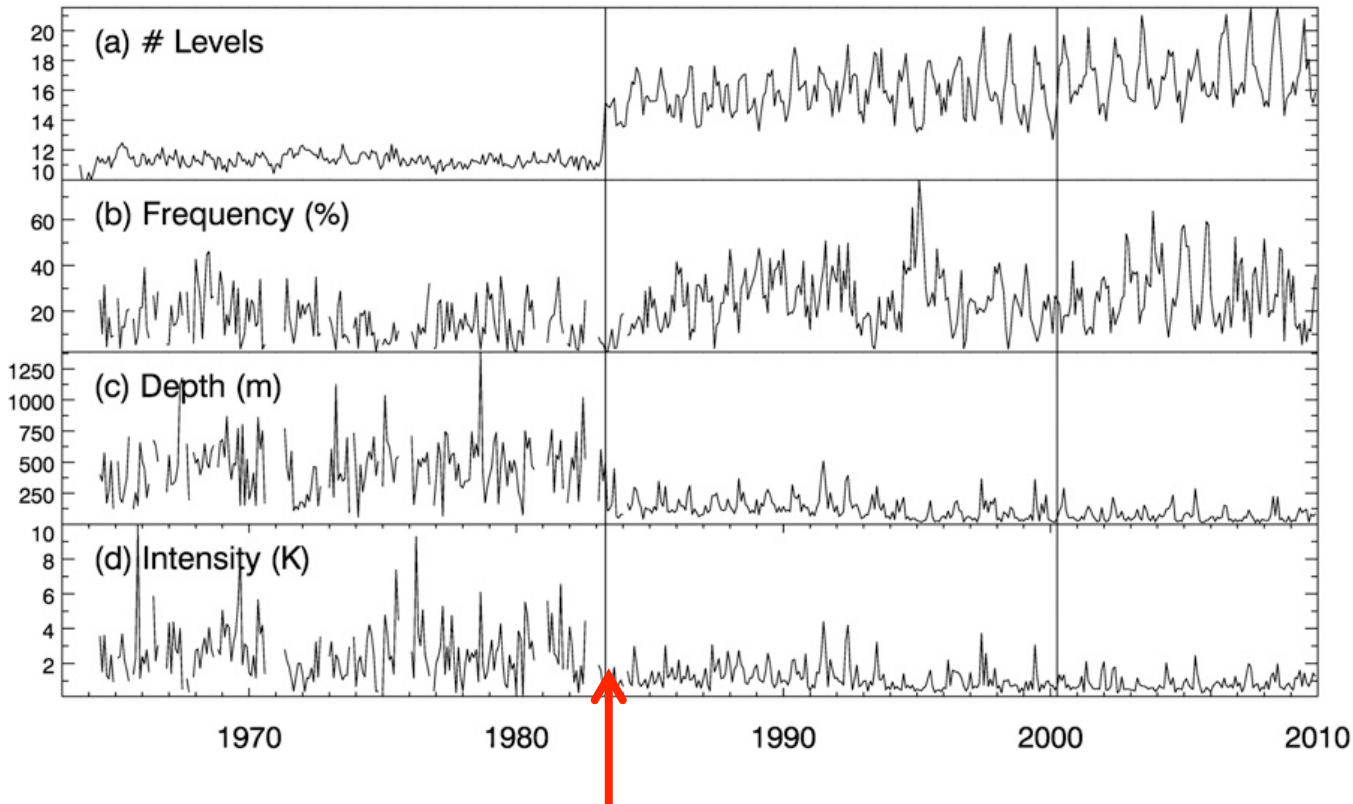
Global Network Changes



- Andy's analysis shows NCEP minus IGRA differences. After 1990, differences are smaller and have less scatter
- Plot is for 1/2 the globe
- Could be affected by:
 - Breakup of former USSR. Stations closed in those republics and in allied countries
 - Changes in navigational systems. Some stations in Africa and S. America closed
 - Consequent change in spatial sampling of the network
 - Emergence of Vaisala as dominant manufacturer
 - Implementation of automated data processing methods
- We suggest comparisons on smaller spatial scales, including individual station vs grid box comparisons

Changes in Surface-Based Inversion Characteristics at Jan Mayen, Norway (71N, 9W), 1963-2009

effect of 1983 increase in vertical resolution of soundings
(probably due to automated data processing)



1983 Changes In
Average Values

11 → 16 levels

16 → 25 %

456 → 131 m

2.5 → 1.2 K

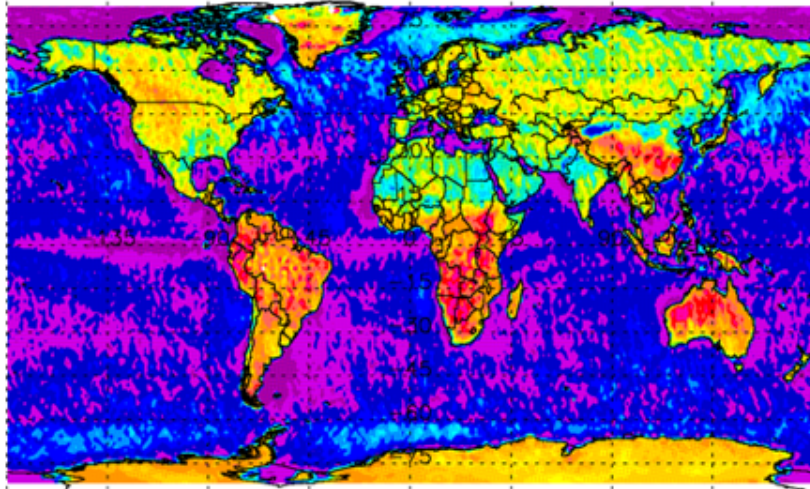
Similar data inhomogeneities probably
also affect MH estimates at many stations.

Scott Denning

Covariance of PBL depth and
surface CO₂ fluxes

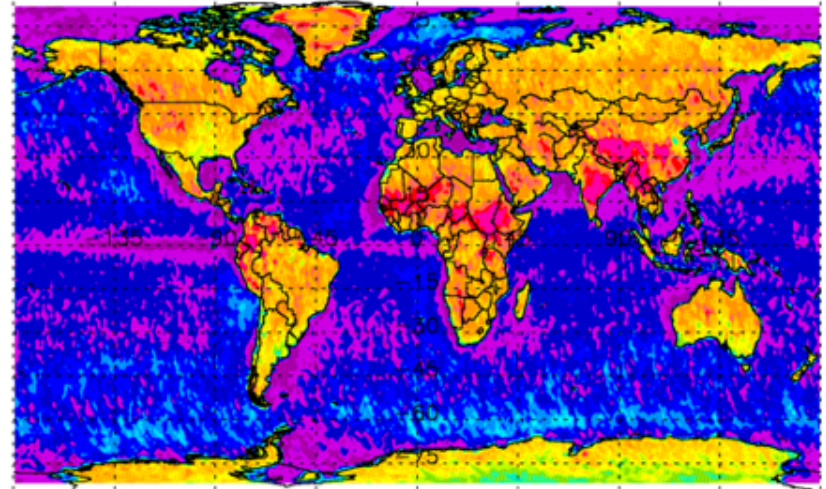
Global PBL Climatology of PBL Depth

DJF

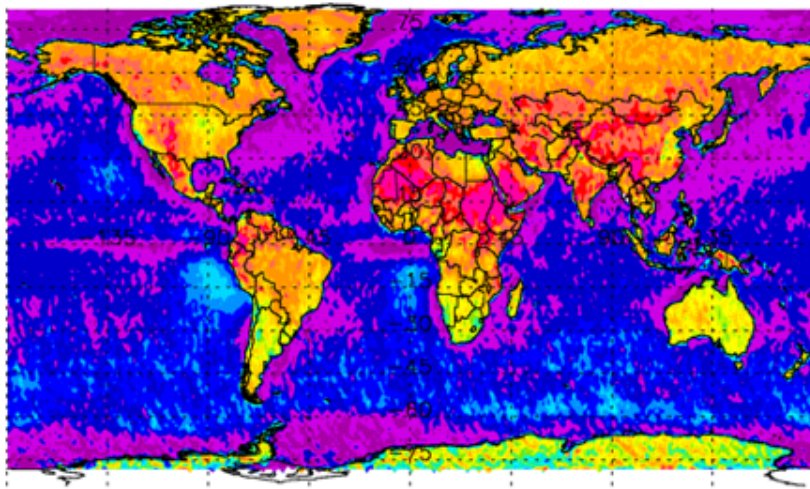


J

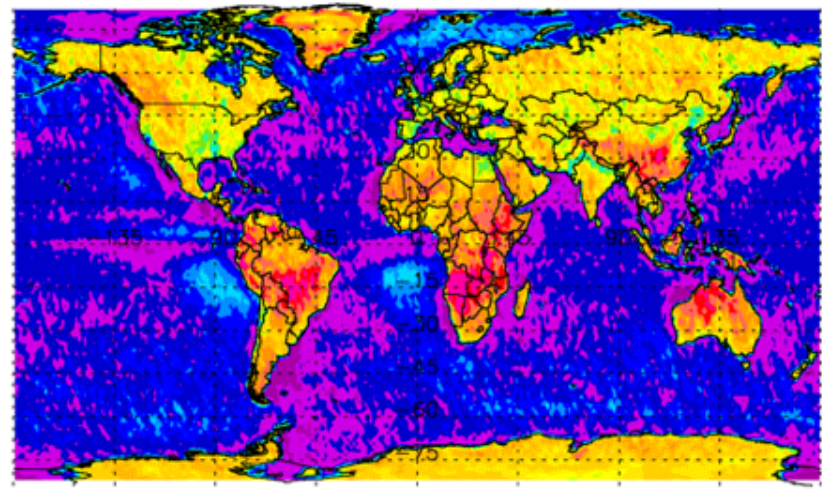
MAM



JJA



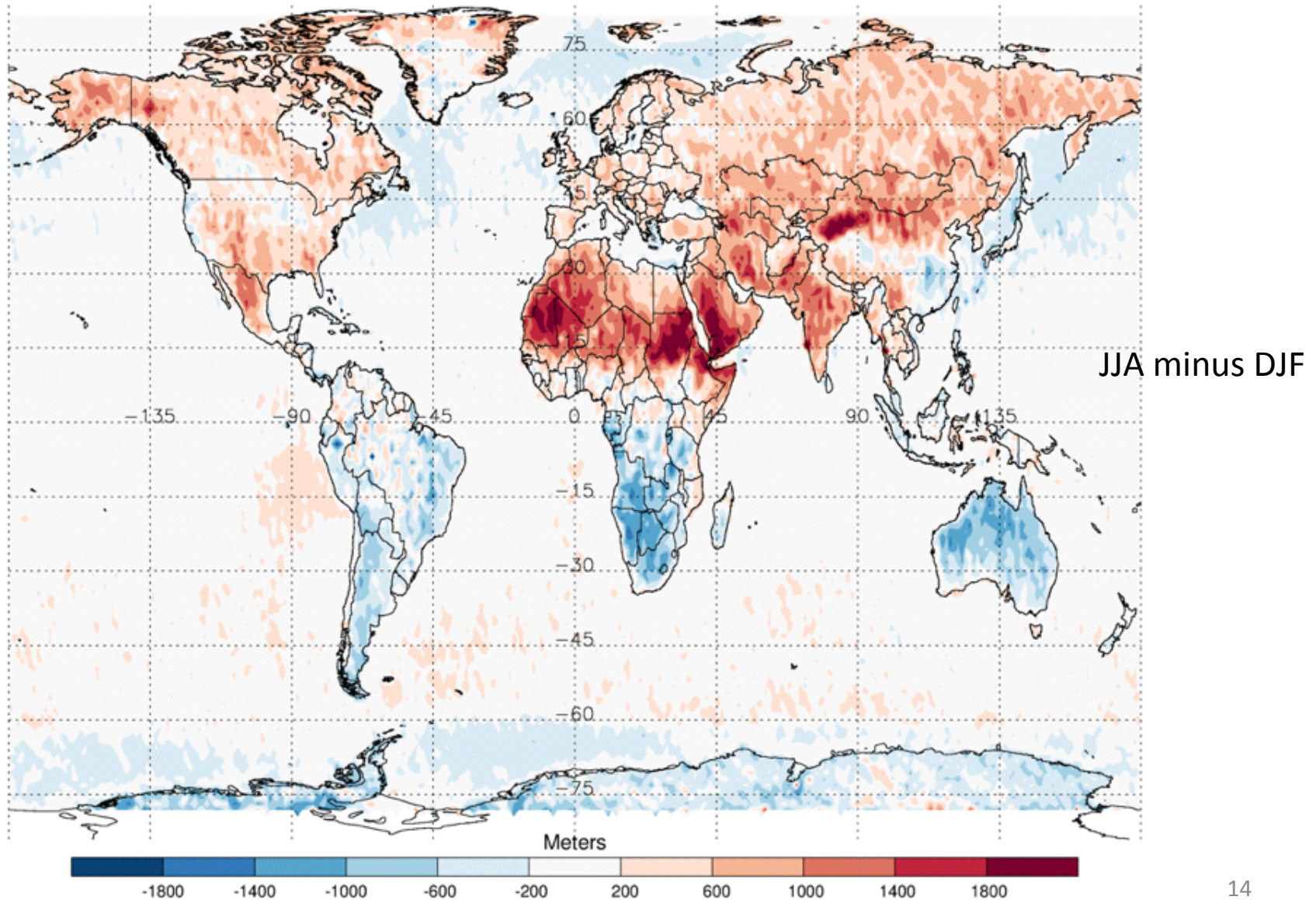
SON



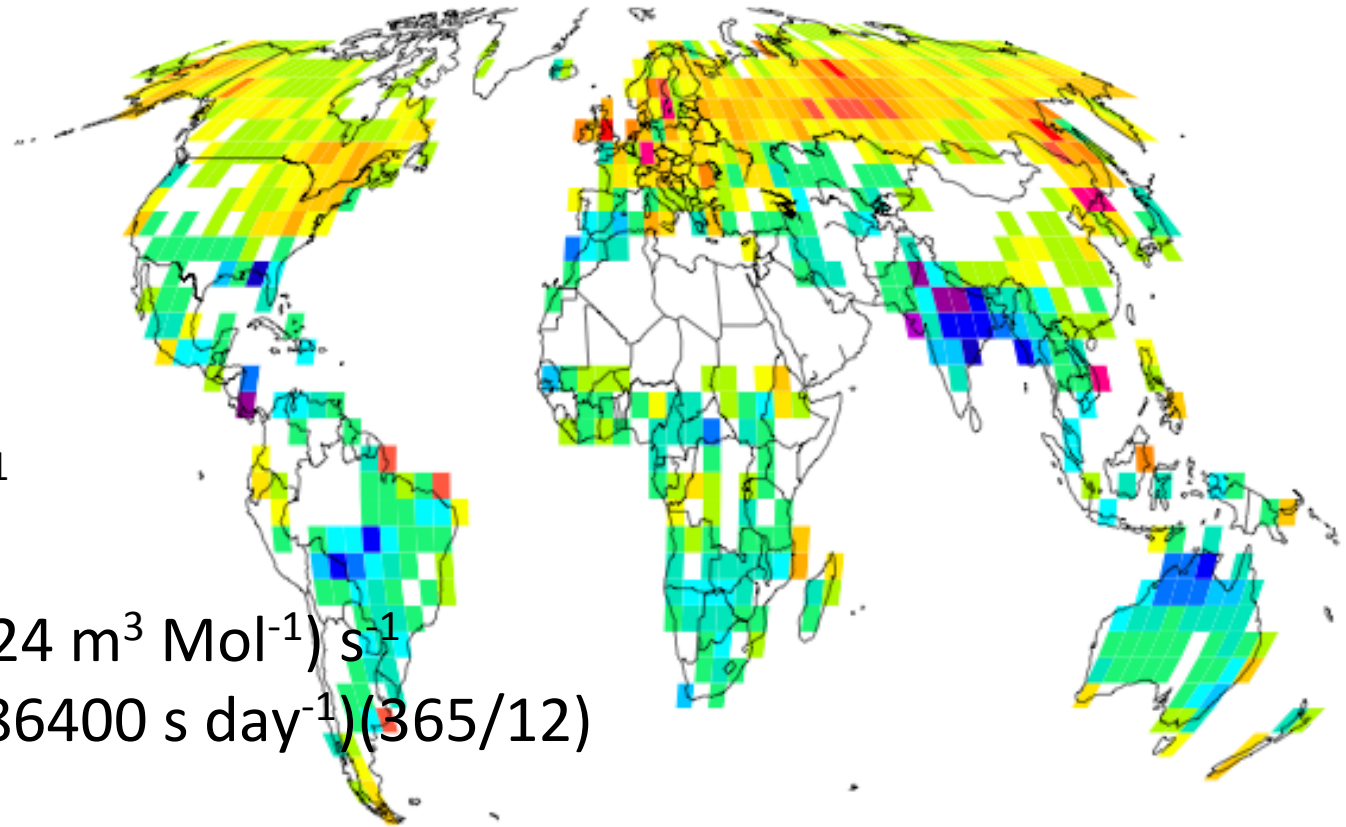
Meters



Seasonal Cycle of PBL Depth



Rectifier Forcing



$\text{cov}(\text{NEE}, z_i^{-1})$
 $\sim \text{mMol m}^{-2} \text{s}^{-1} \text{m}^{-1}$
 $= \text{mMol m}^{-3} \text{s}^{-1}$
 $= \text{mMol m}^{-3} (0.0224 \text{ m}^3 \text{ Mol}^{-1}) \text{s}^{-1}$
 $= \text{mMol Mol}^{-1} \text{s}^{-1} (86400 \text{ s day}^{-1})(365/12)$
 $= \text{ppm per month}$

