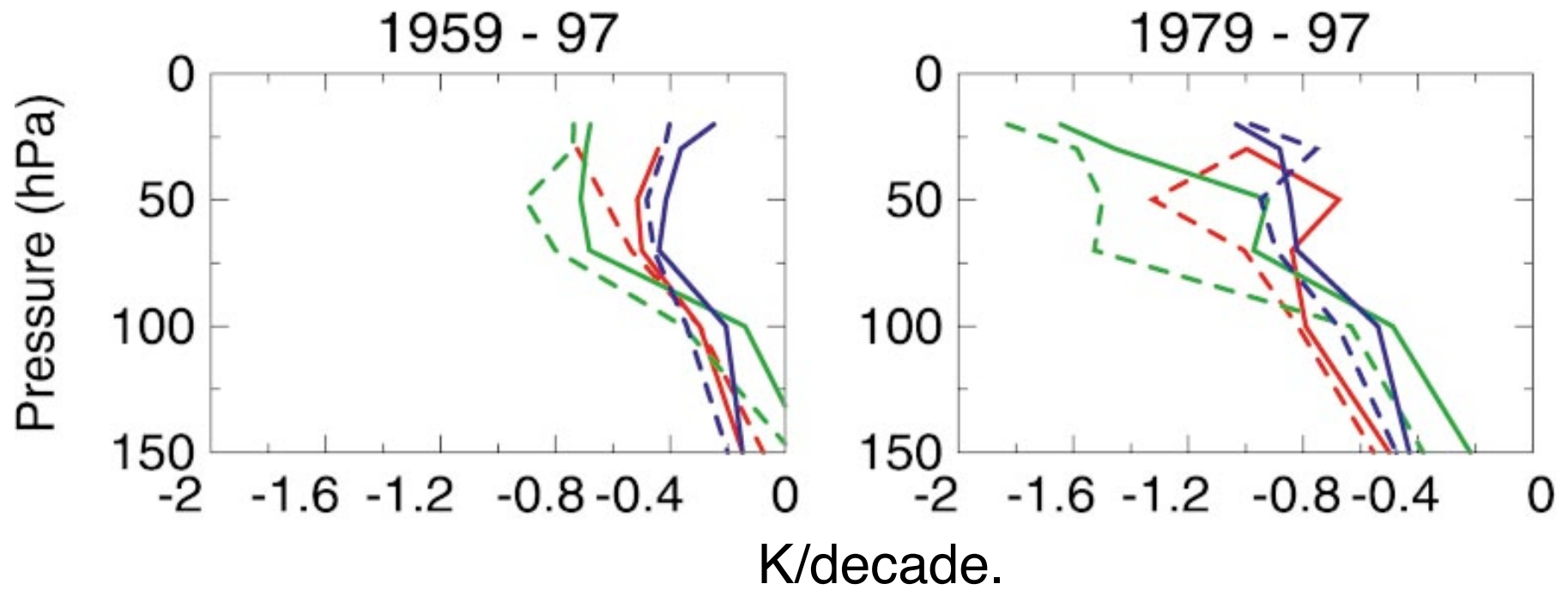


The meridional structure of recent stratospheric temperature trends

Dave Thompson
CSU

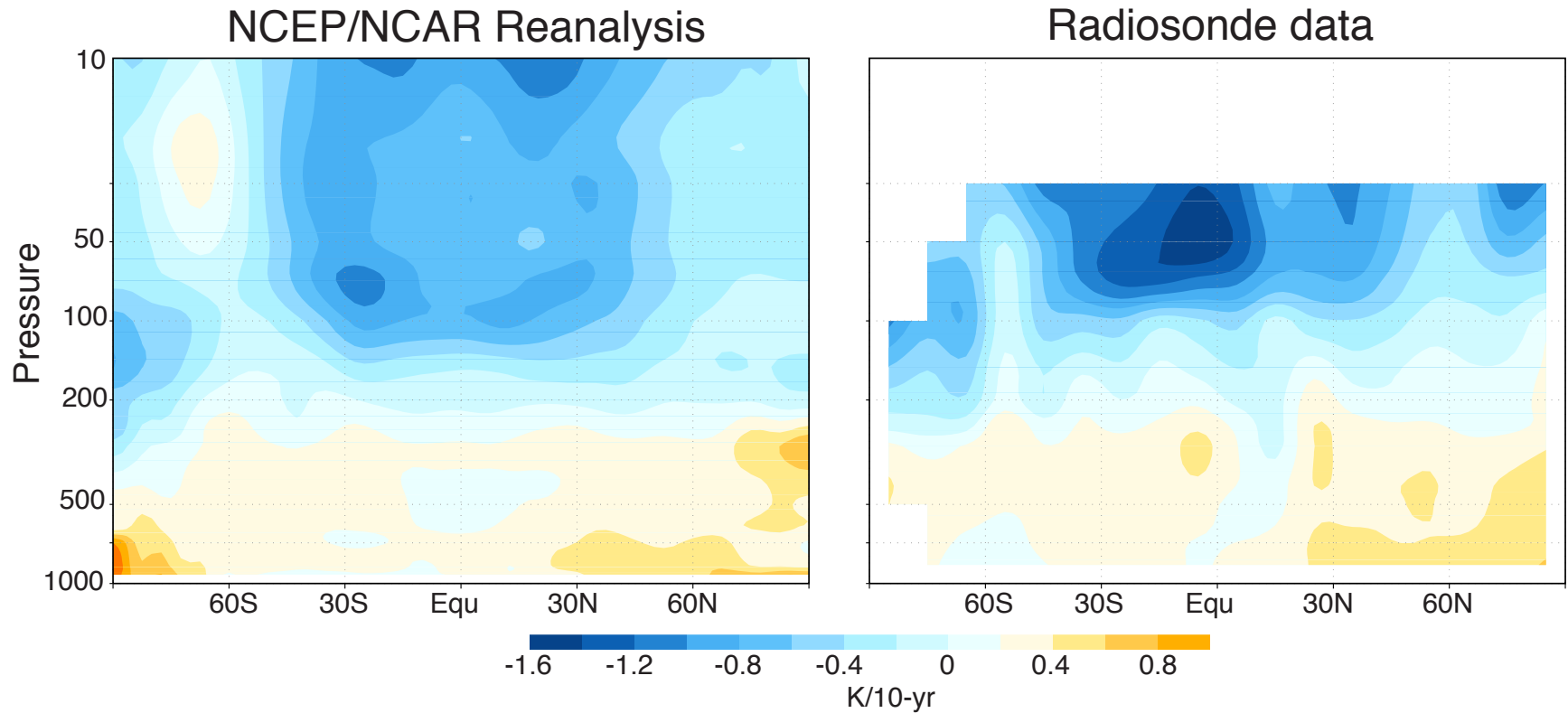
Susan Solomon
NOAA Aeronomy Lab

Temperature trends from Lanzante et al. 2003

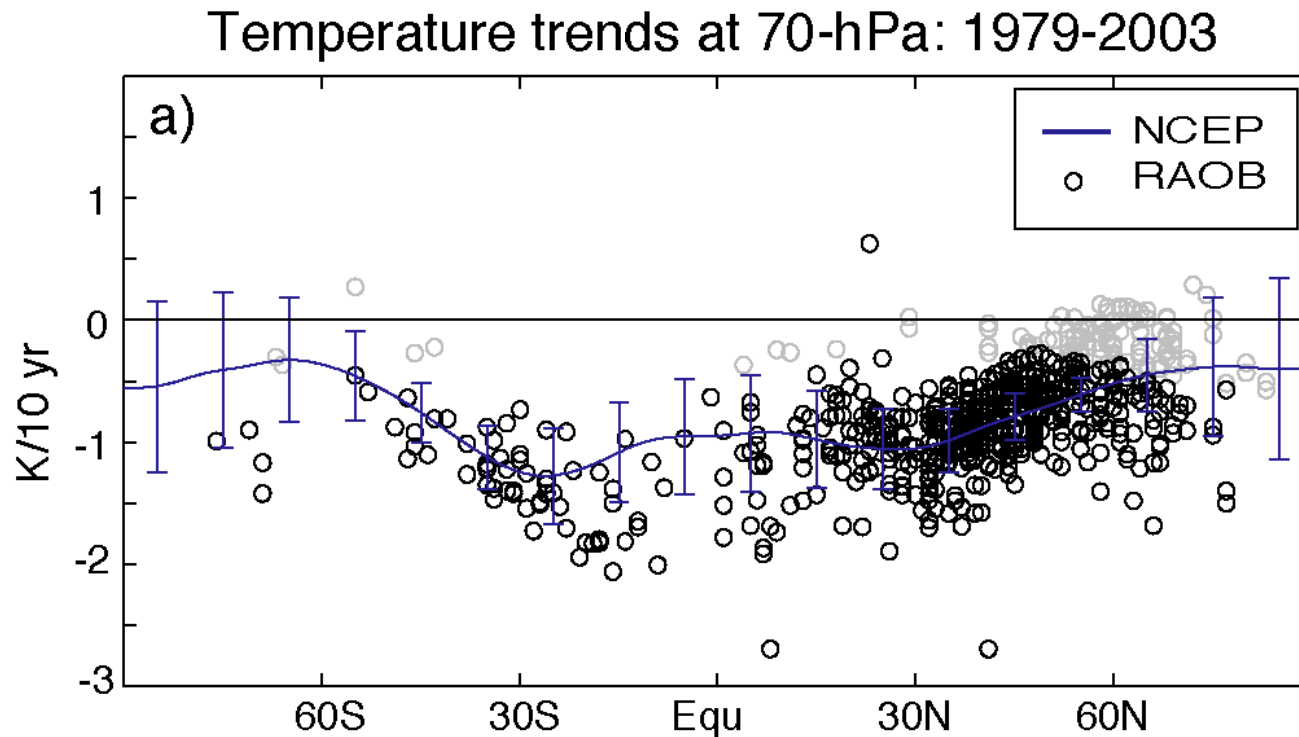


Green: tropics. Blue: NH. Red: SH.
Solid: corrected.

Meridional structure of stratospheric trends

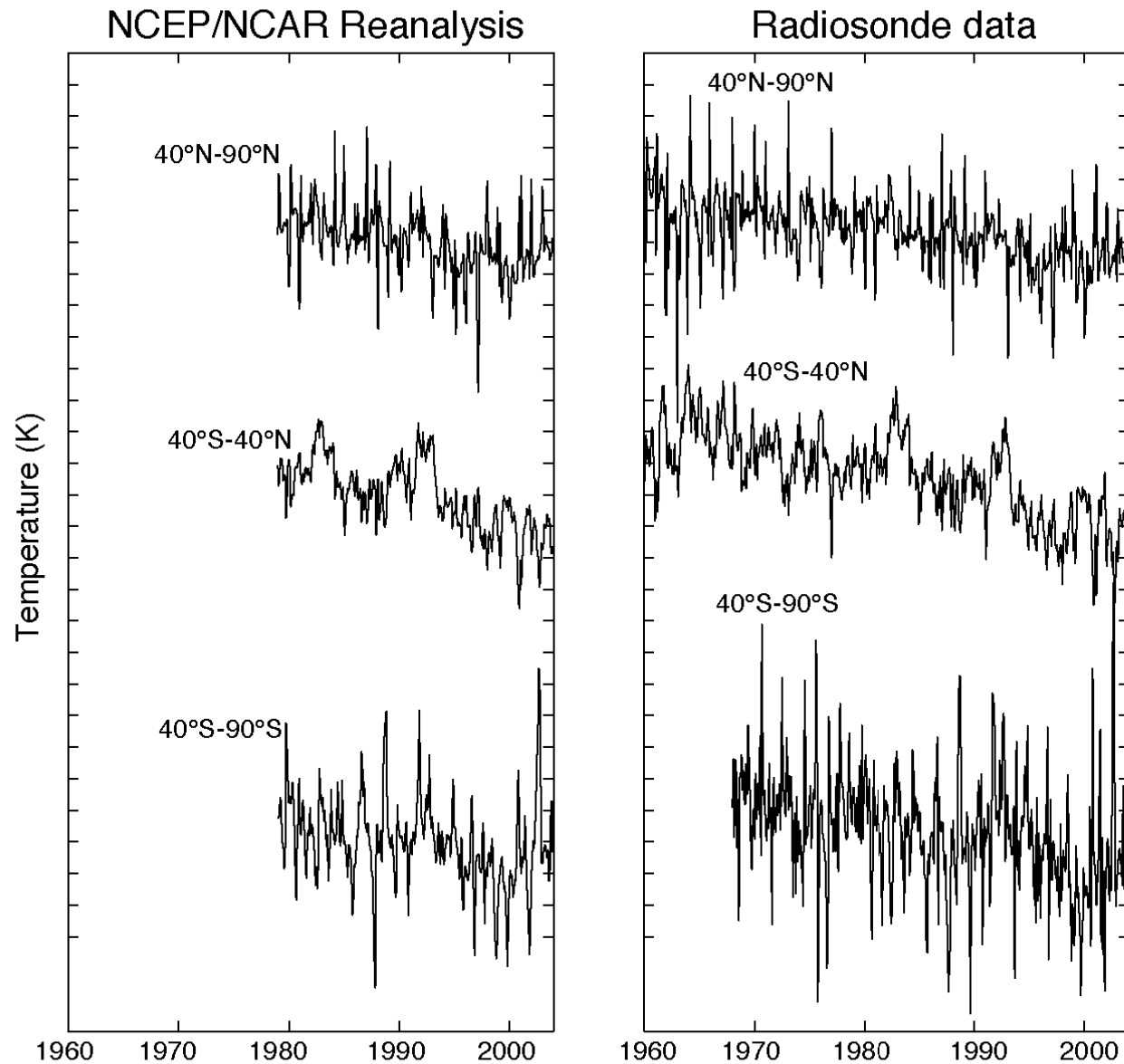


Meridional structure of stratospheric trends



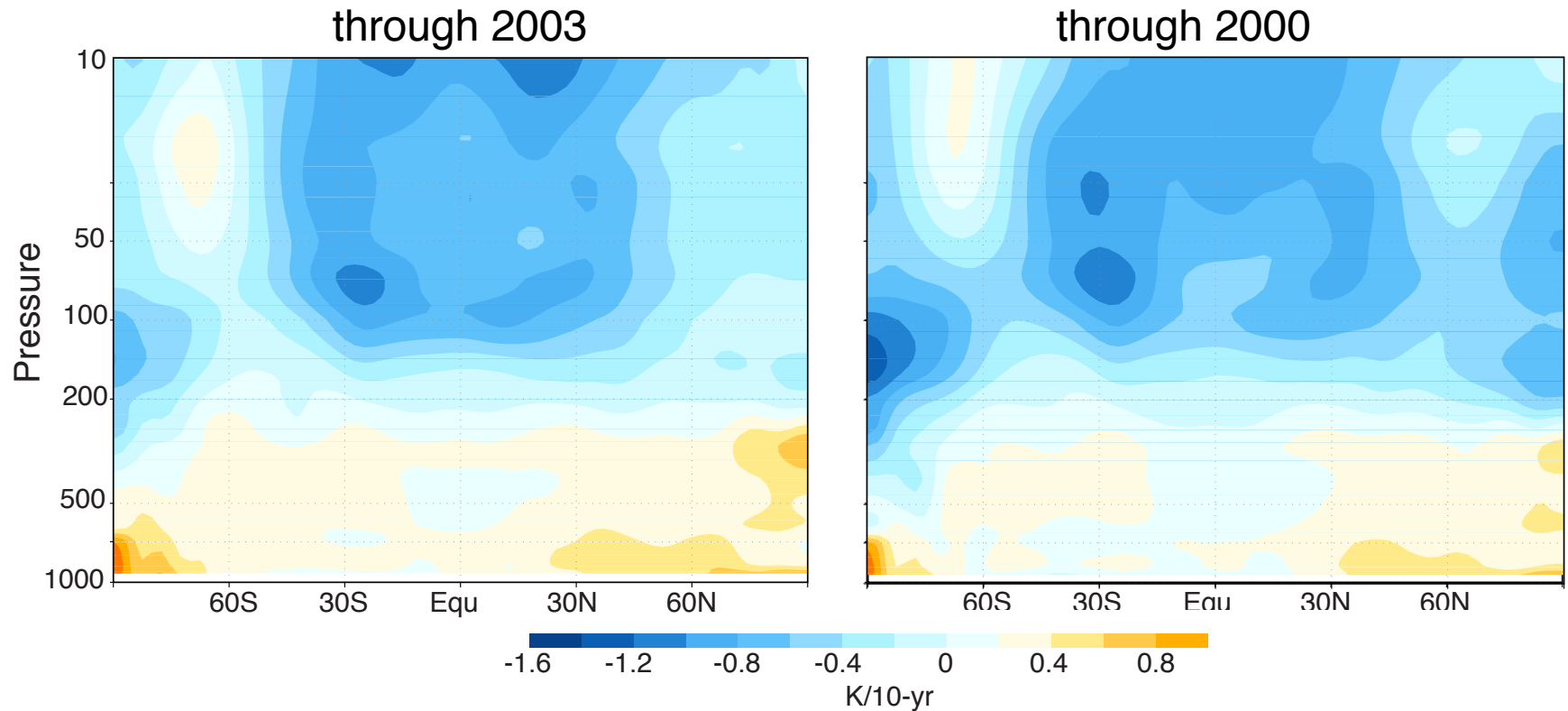
Circles: trends at all radiosonde stations.
Solid: trends from the Reanalysis.

Meridional structure of stratospheric trends



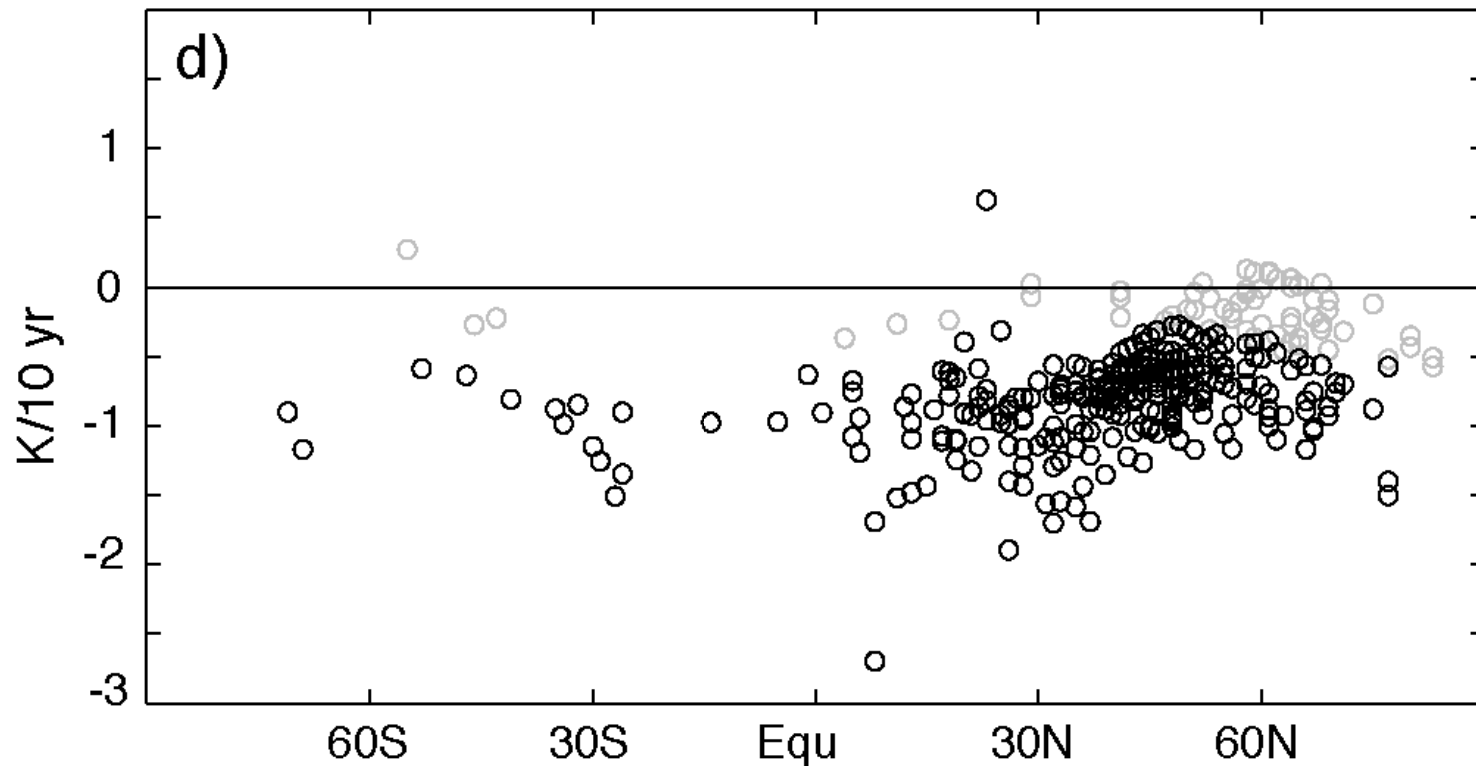
- Caveats:
- discontinuity in Reanalysis ~2001
- changes in instrumentation
- discrepancy with MSU4

Meridional structure of stratospheric trends



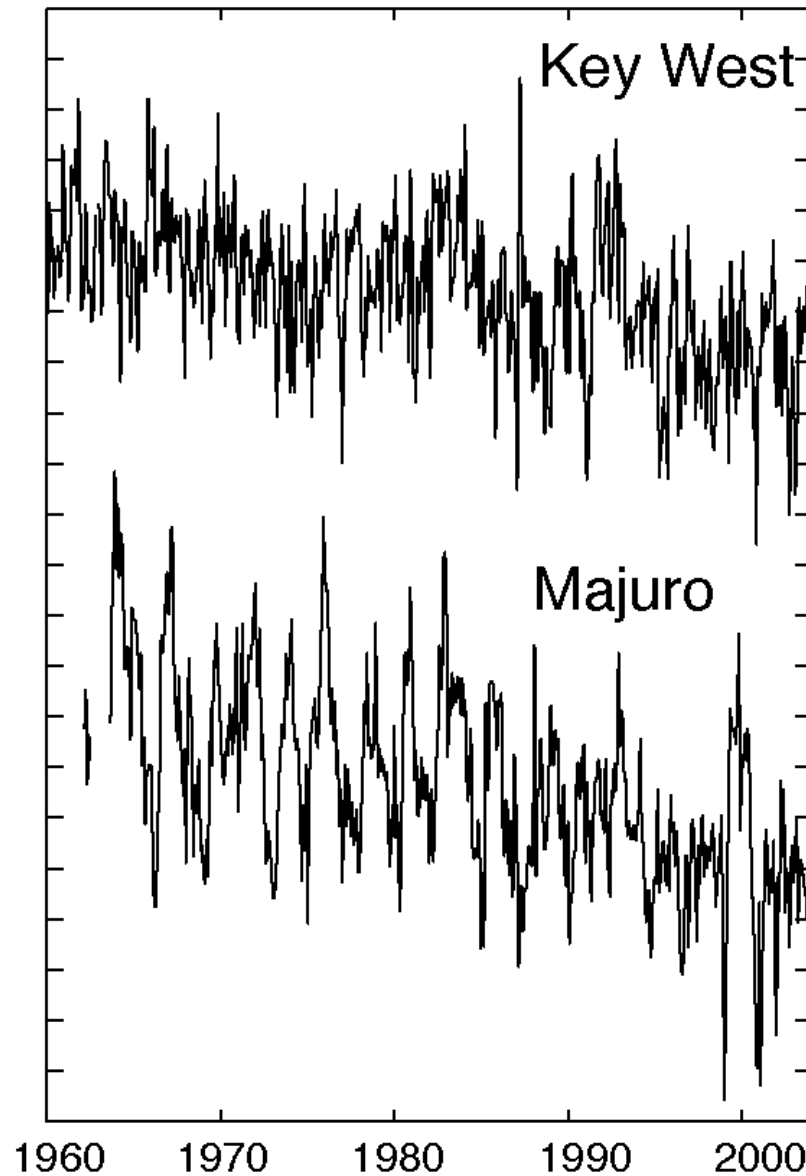
Meridional structure of stratospheric trends

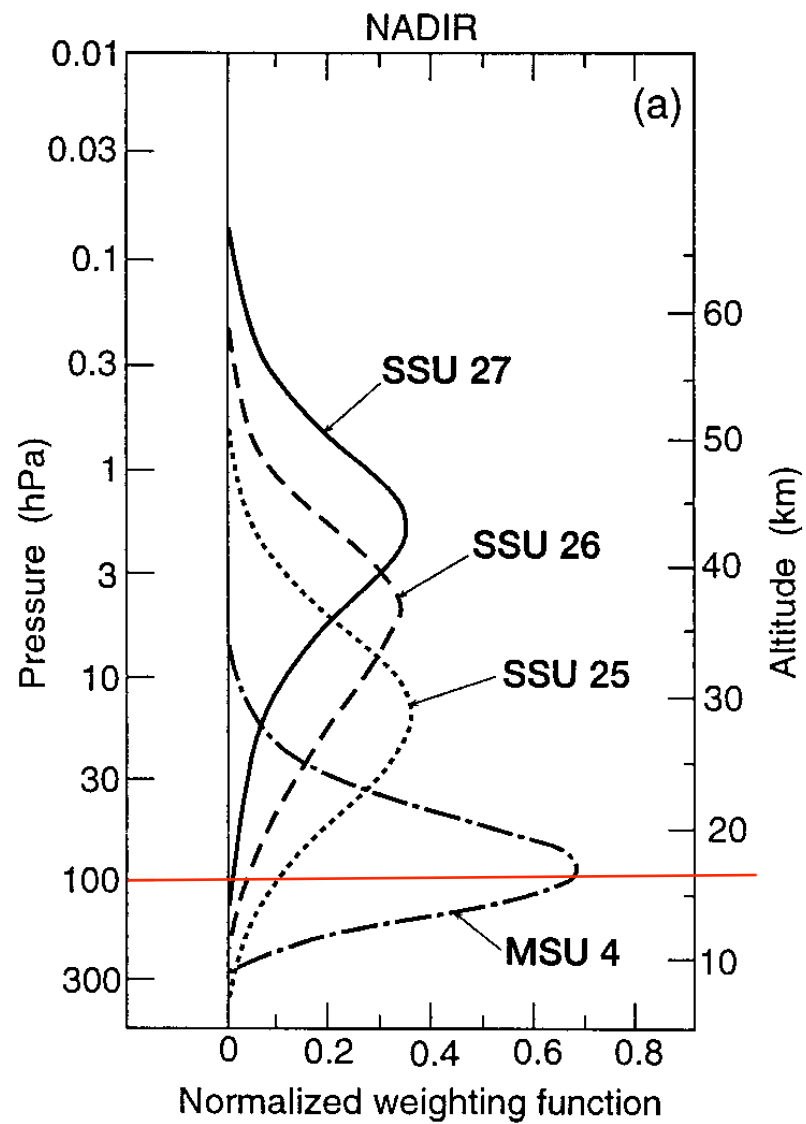
Temperature trends at 70-hPa: Nighttime data



Circles: trends at all radiosonde stations.
Solid: trends from the Reanalysis.

Meridional structure of stratospheric trends

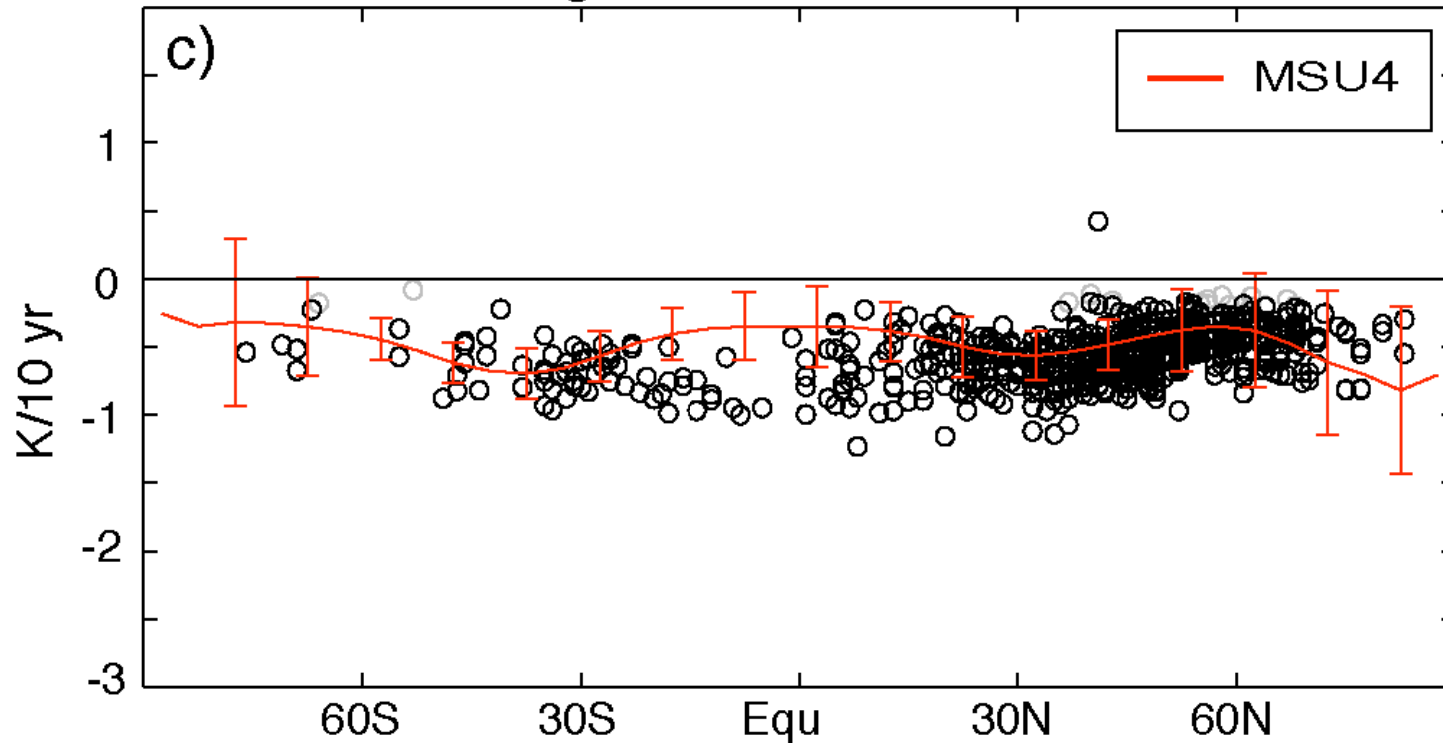




from Ramaswamy et al 1999

Meridional structure of stratospheric trends

MSU4 and weighted RAOB trends: 1979-2003



Circles: trends at all radiosonde stations.
Solid: trends from the Reanalysis.

The trend in the MSU4 data can be decomposed as:

$$\text{MSU4} = W_{100_10} * T_{100_10} + W_{300_100} * T_{300_100}$$

Where MSU4 is the trend in the MSU4 data and
T_{100_10} and T_{300_100} are the actual trends in those layers.

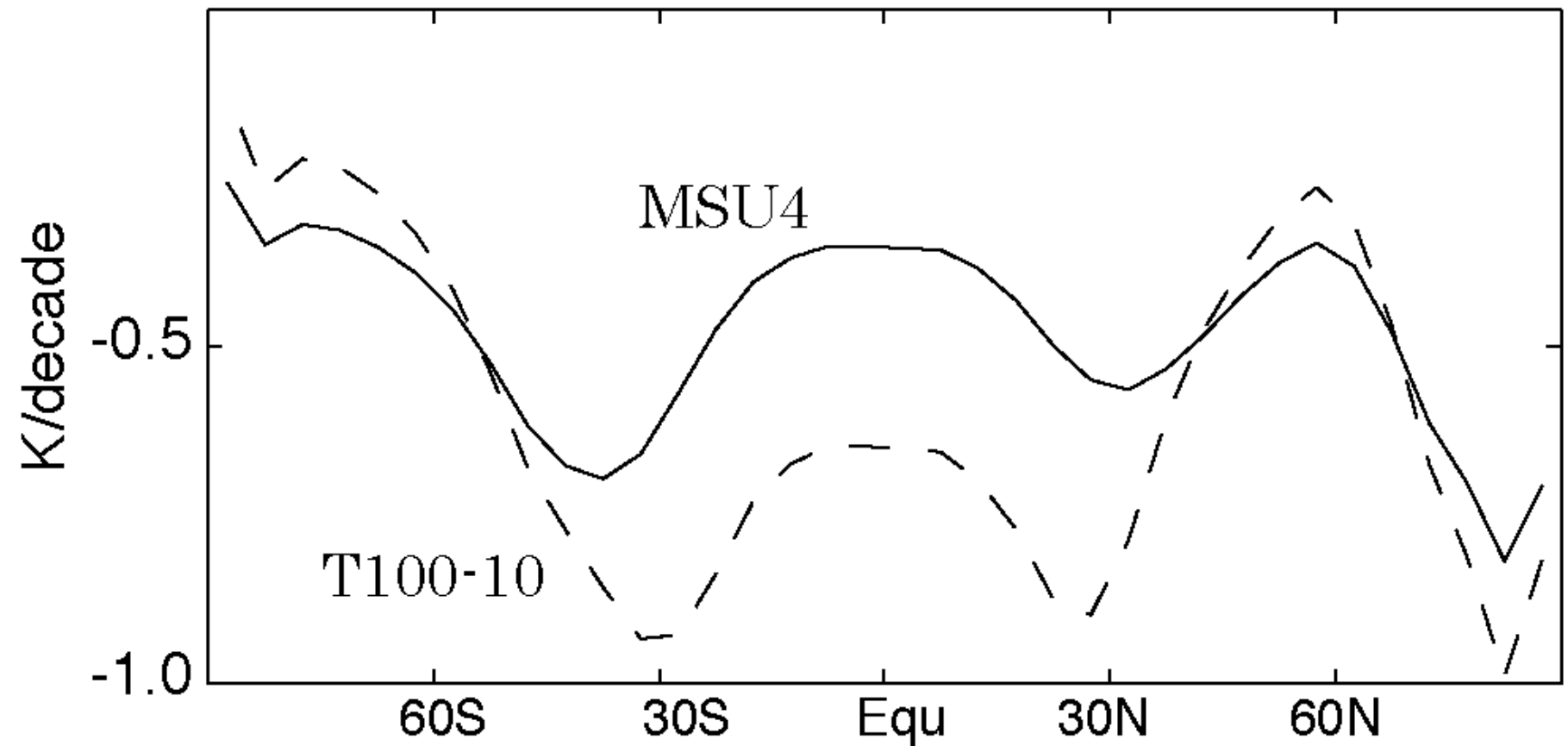
The weights on the MSU4 data are roughly:

$$W_{100_10} \sim 0.65$$

$$W_{300_100} \sim 0.35$$

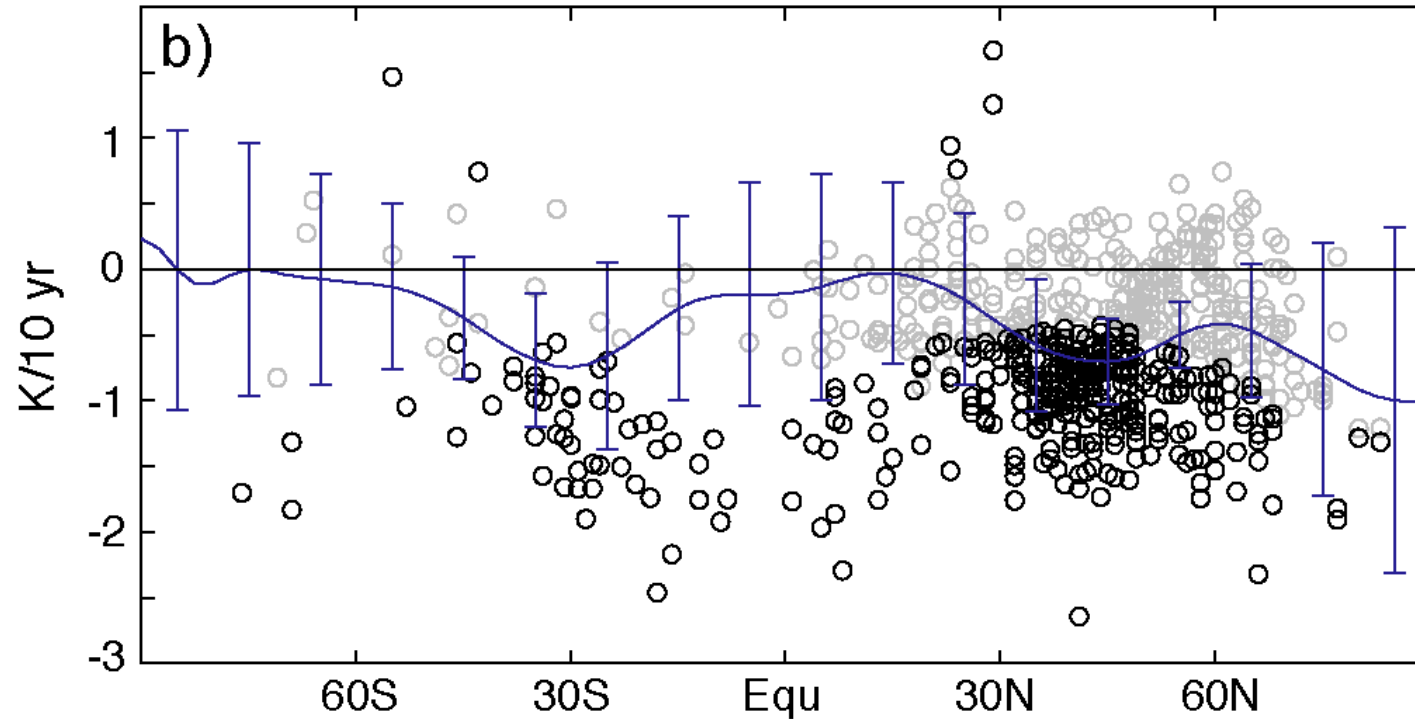
In the plot, T_{100_10} is the calculated trend for the 100-10-hPa layer assuming the temperature trend between 300-100-hPa is:
-0.5 K/decade poleward of ~30 degrees (consistent with WMO/UNEP)
+0.15 K/decade equatorward of ~30 (as argued in Fu et al)

Meridional structure of stratospheric trends



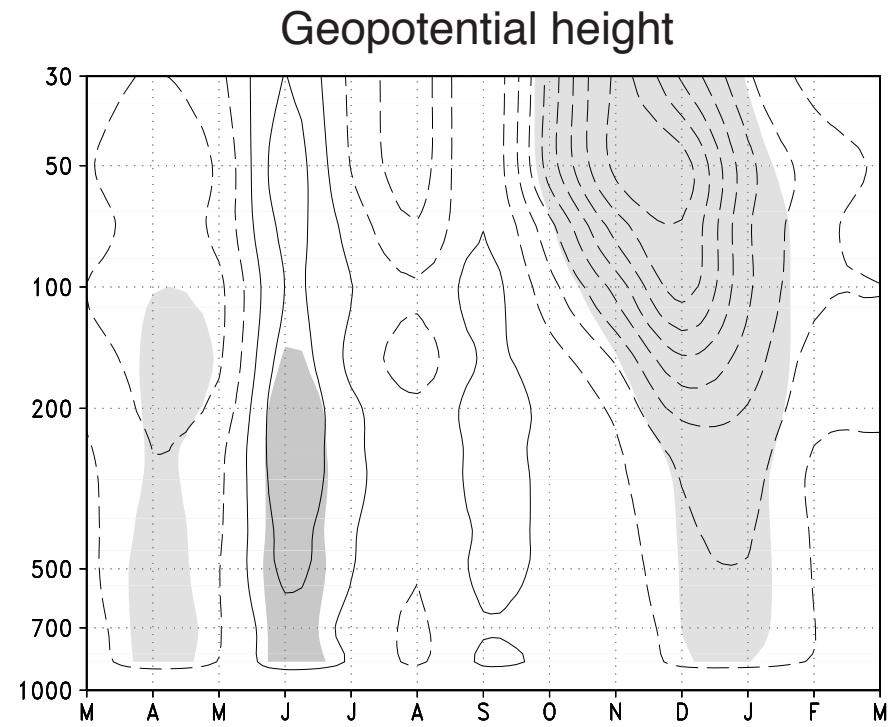
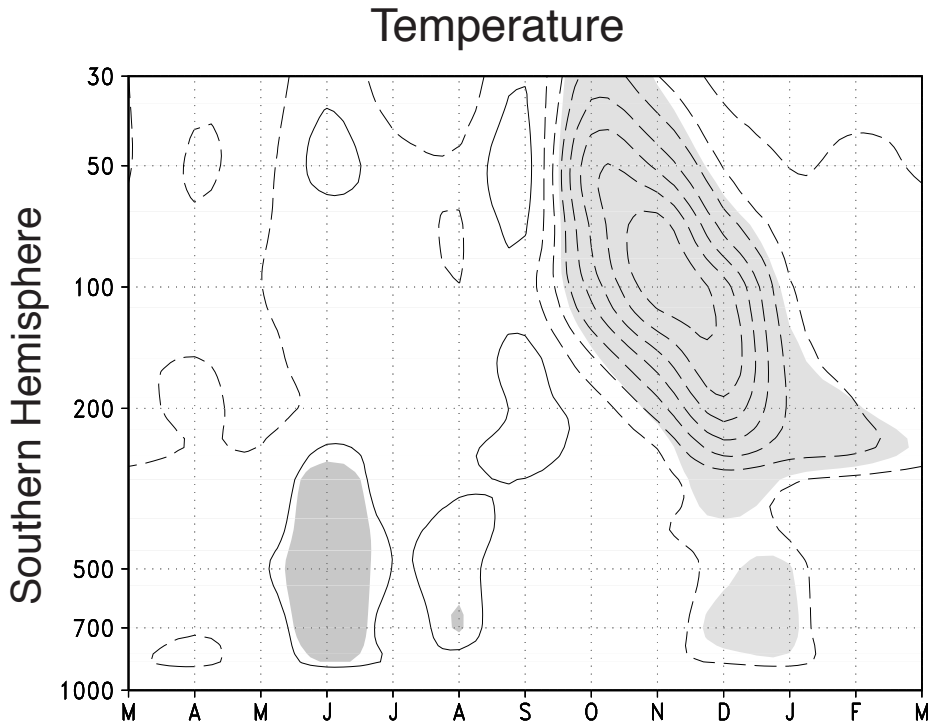
Meridional structure of stratospheric trends

Temperature trends at 70-hPa: 1979-1994



Circles: trends at all radiosonde stations.
Solid: trends from the Reanalysis.

Observed trends in the extratropical circulation



Observed trends in the extratropical circulation

