

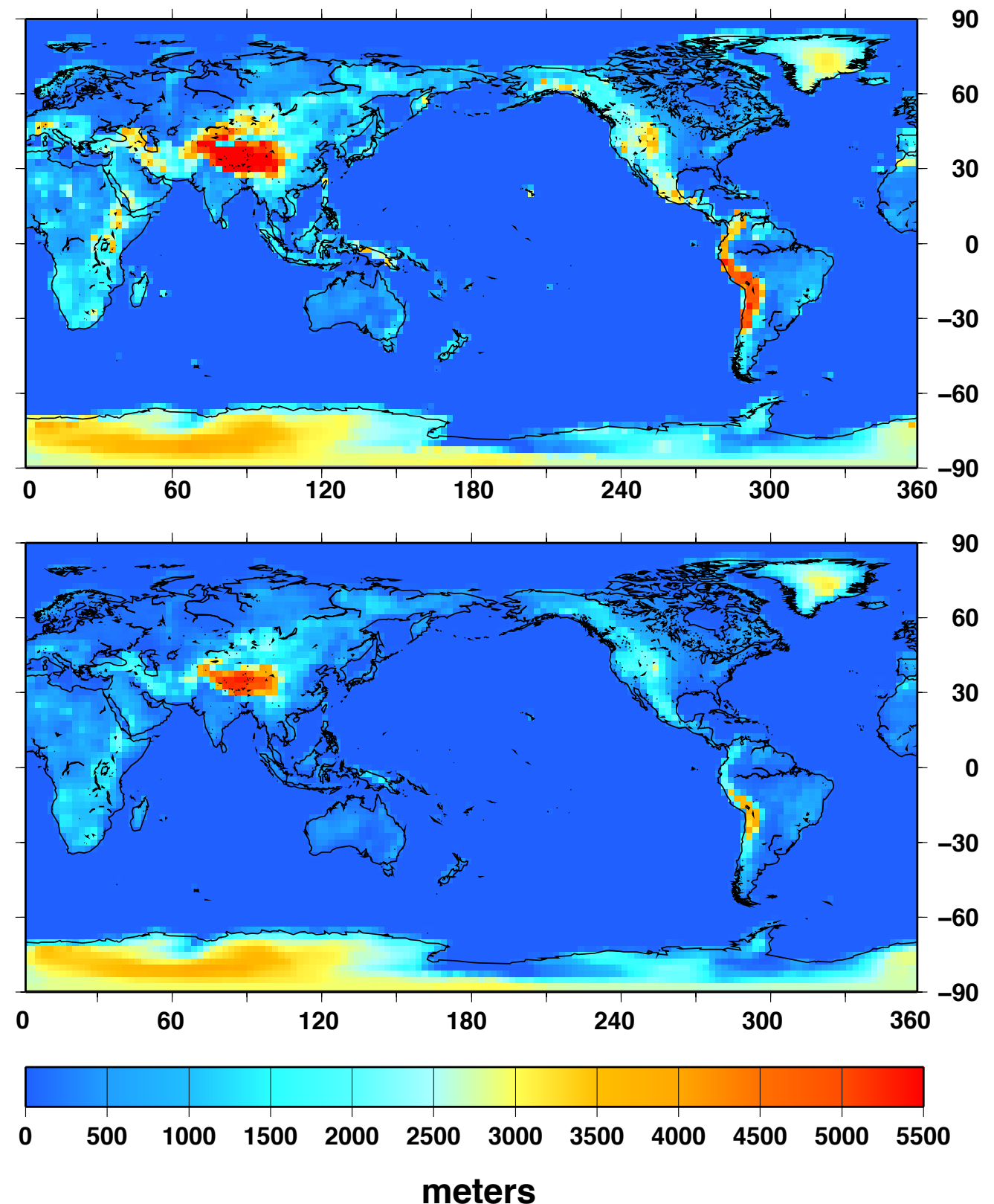
Terrain Effects in estimates of ATML

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Problem

- output from NCEPR, ECMWF, etc...at a limited spatial scale
- topography highly variable over this small scale
- top: Maximum of 5' topography in 2.5 deg. units
- bottom: RMS

Figure 1



Method

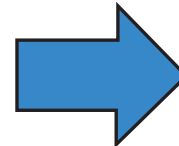
DATA SET 1, NCEPR-FINE:

NCEPR

$$2.5^\circ \times 2.5^\circ \Rightarrow p_{2.5}, T_{2.5}$$

$$\text{ETOPO5} \Rightarrow H_{5'}$$

$$\frac{\sum_{i=1}^n H_{5'i}}{n} = \bar{H}_{2.5} \Rightarrow z_{2.5}$$



NCEPR-FINE

each 2.5 x 2.5 from
NCEPR subdivided into
20 x 20, 0.125 deg units...
where

$$p_{0.125} = p_{2.5}$$

$$T_{0.125} = T_{2.5}$$

$$z_{0.125} = z_{2.5}$$

DATA SET 2, NCEPR-TOPO:

NCEPR-FINE

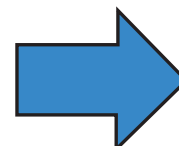
$$0.125^\circ \times 0.125^\circ$$

$$p_{0.125}, T_{0.125}, z_{0.125}$$

$$\text{ETOPO5} \Rightarrow H_{5'}$$

$$\frac{\sum_{i=1}^n H_{5'i}}{n} = \bar{H}_{0.125} \Rightarrow z'_{0.125}$$

$$\Delta z = z_{0.125} - z'_{0.125}$$



NCEPR-TOPO

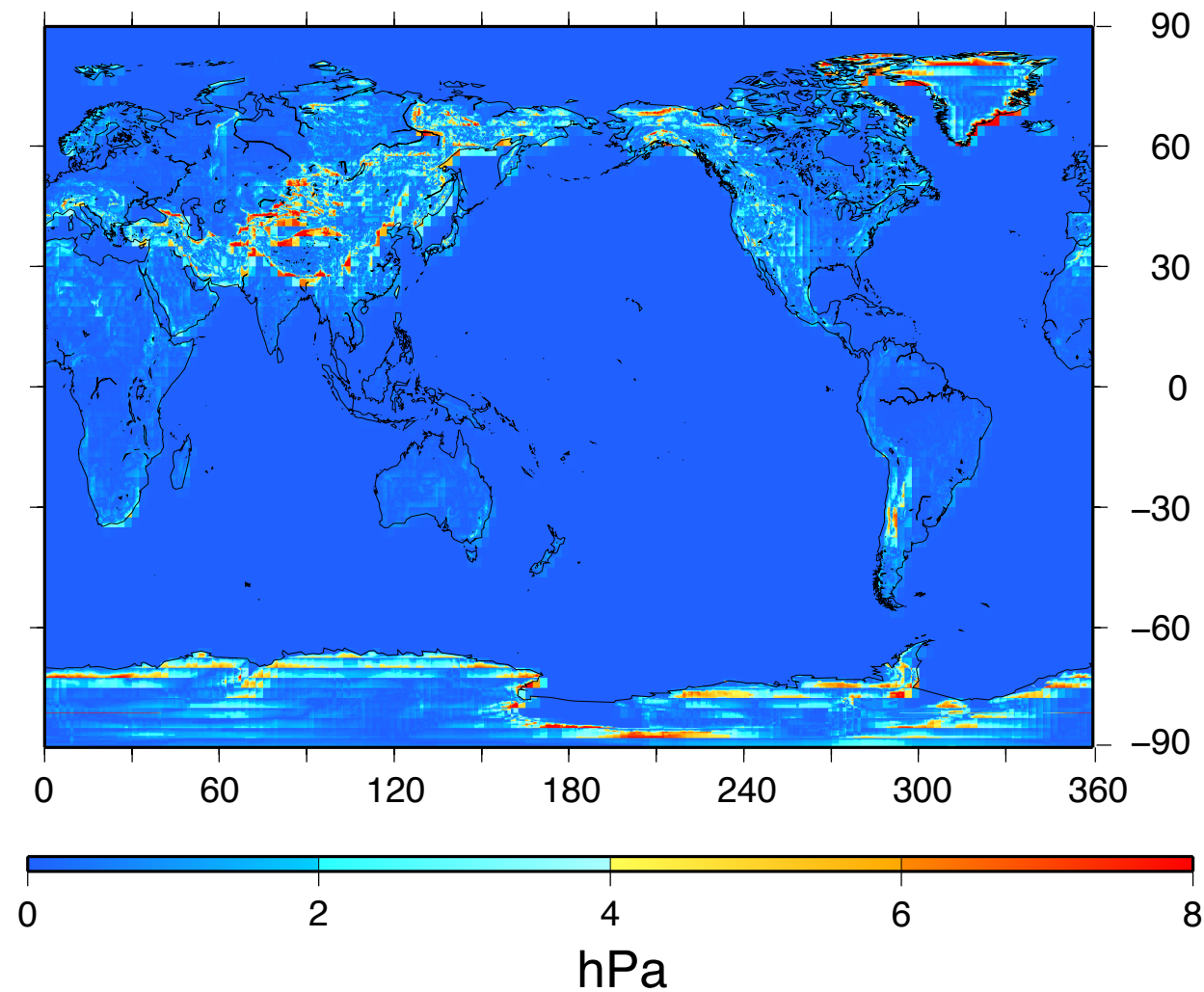
where

$$T'_{0.125} = T_{0.125} - \Gamma \Delta z$$

$$p'_{0.125} = p_{0.125} \left[\frac{T_{0.125} - \Gamma \Delta z}{T_{0.125}} \right]^{\frac{g}{R\Gamma}}$$

surface pressure difference

Figure 2



- RMS of difference between the pressure data sets

surface pressure difference

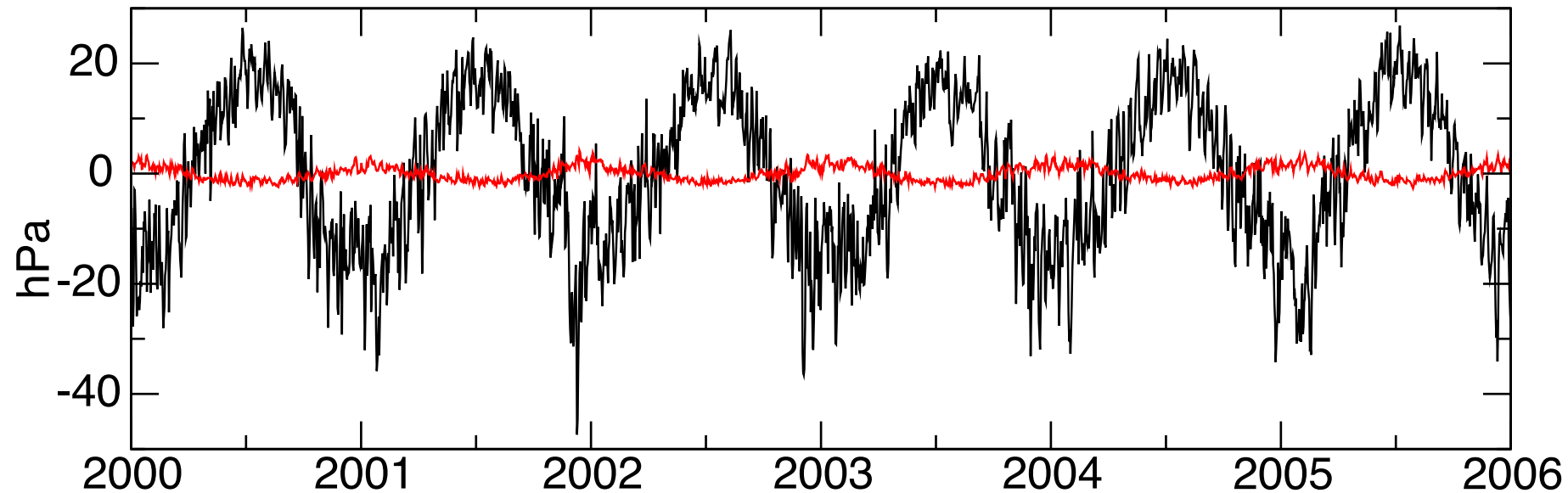
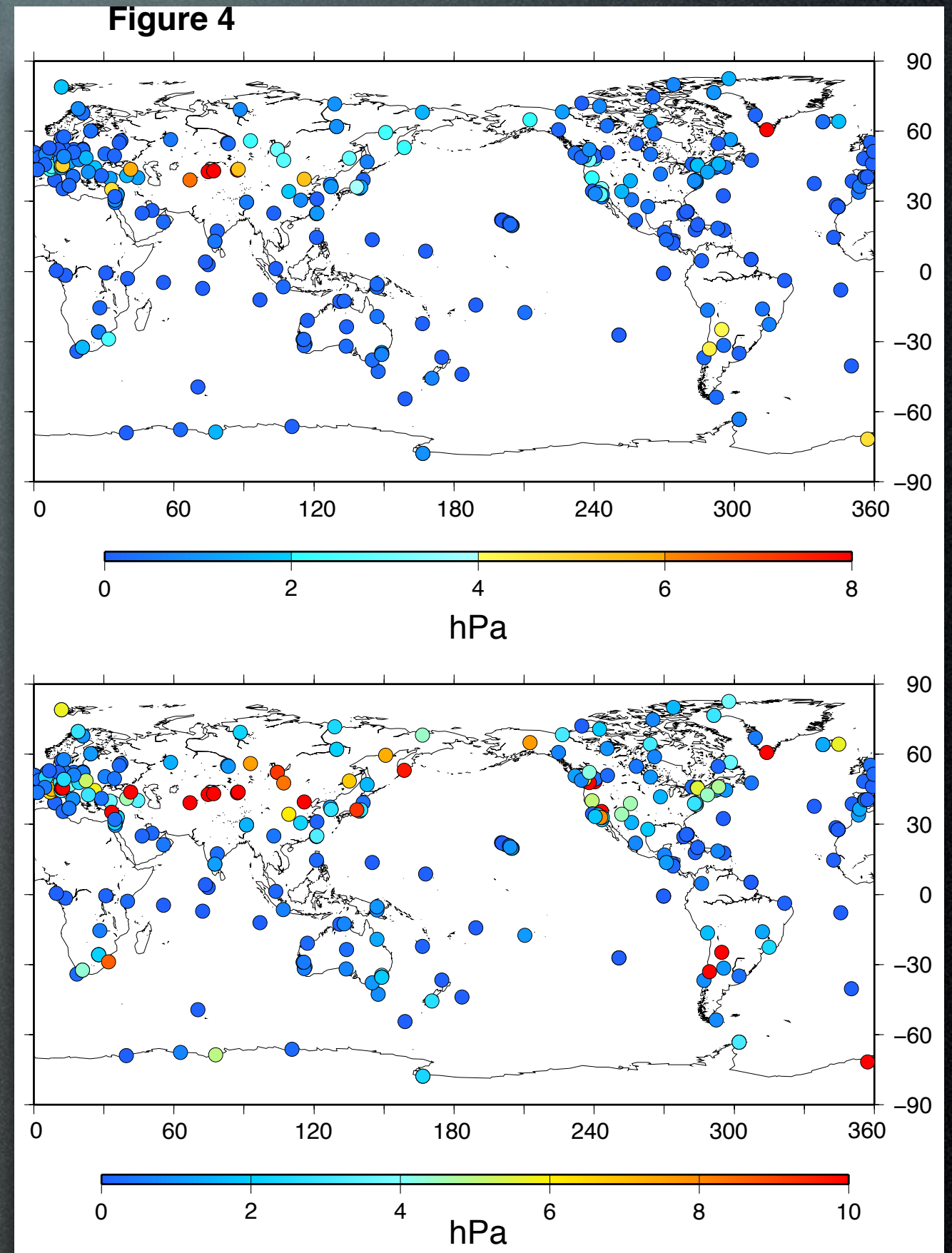


Figure 3

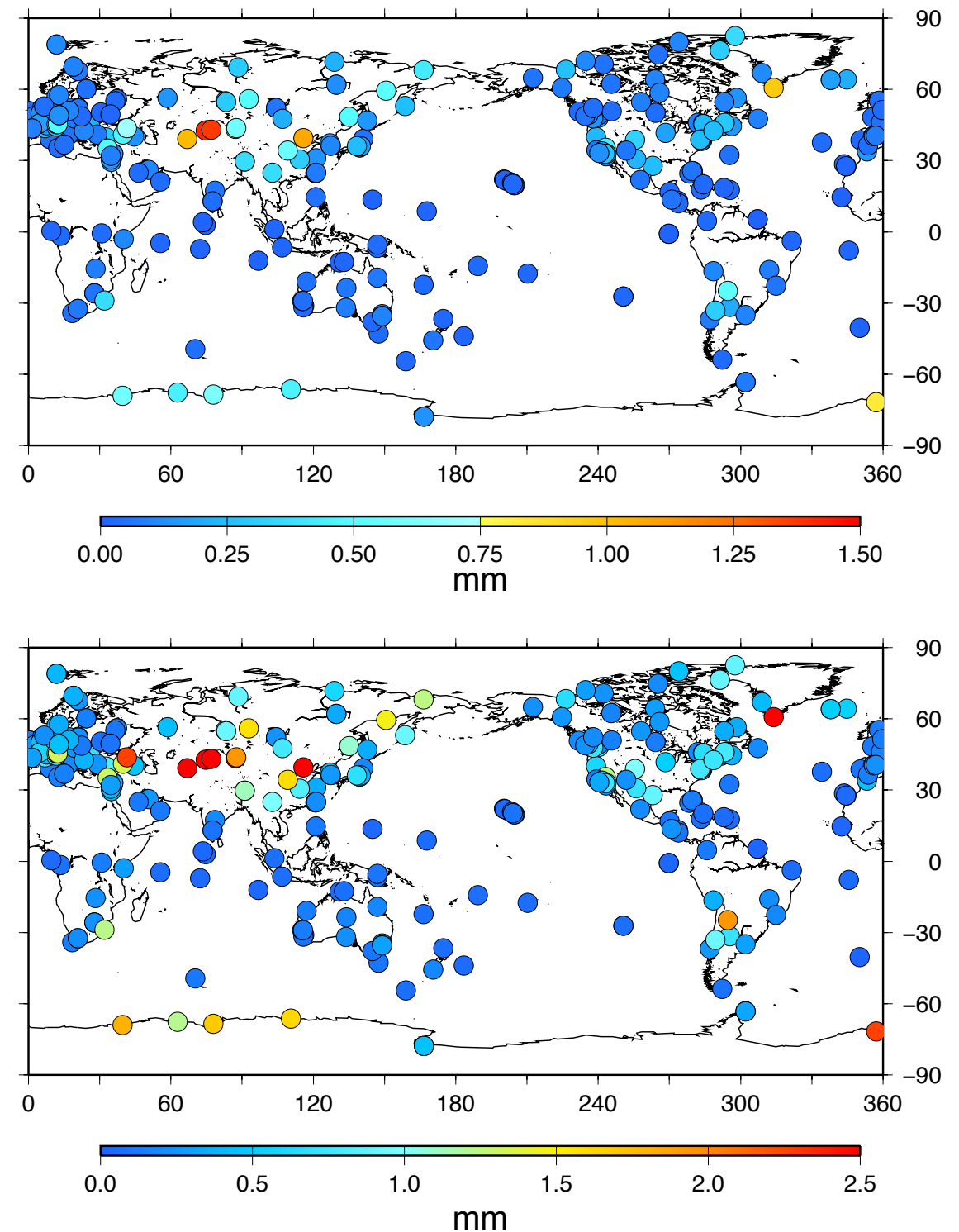
- Pressure difference at two stations POL2 (black) and GRAZ (red)

- Pressure
- top: RMS of global set of stations
- bottom: Maximum



- Surface Displacement
- top: RMS of global set of stations
- bottom: Maximum

Figure 5



surface displacement

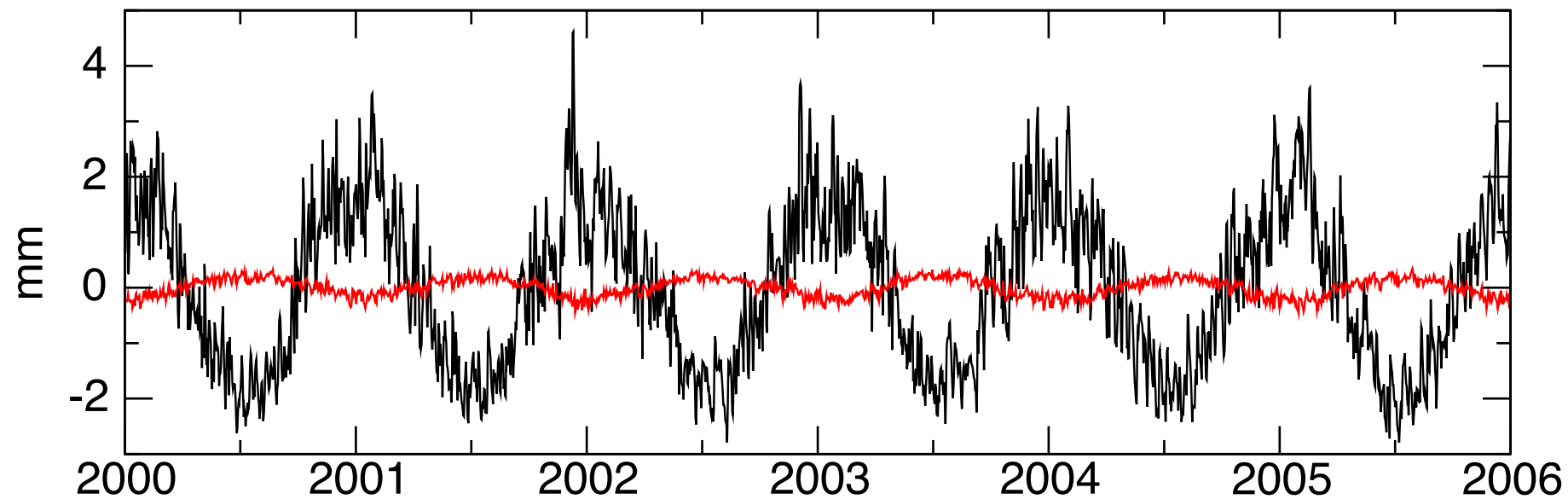
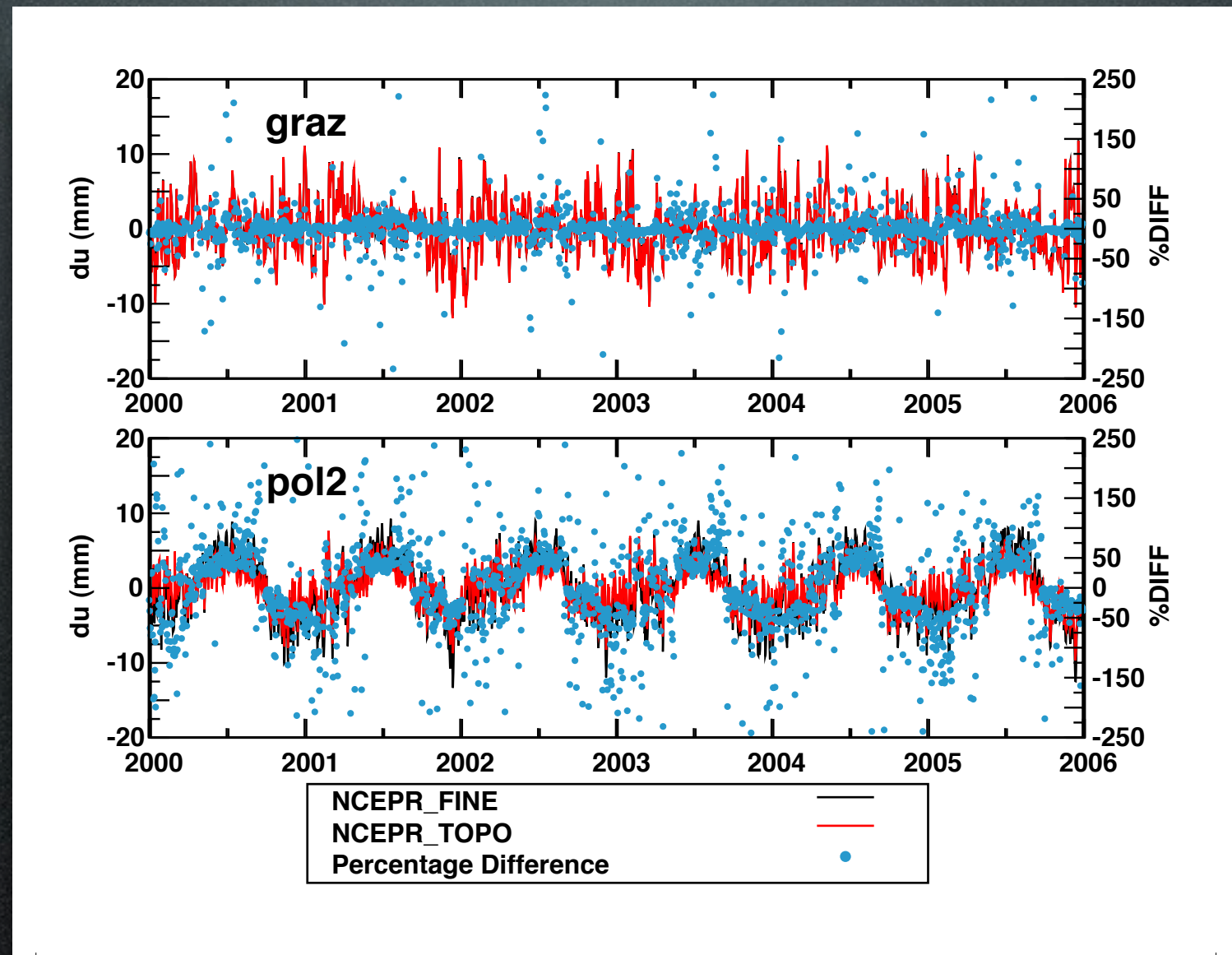


Figure 6

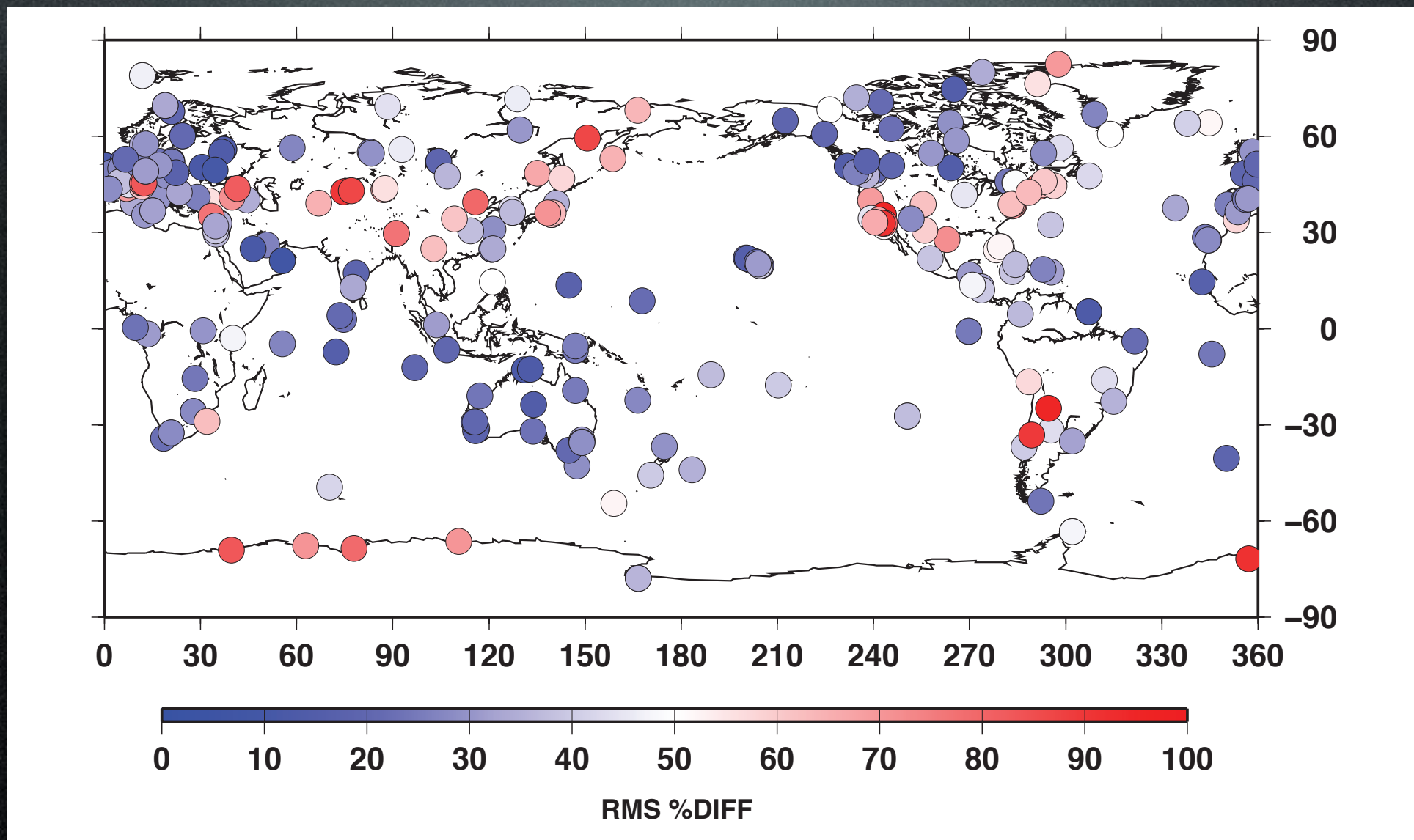
- displacement caused by pressure difference at two stations POL2 (black) and GRAZ (red)

Percent difference



$$\text{DIFF}\% = \frac{2(\text{NCEP}_{\text{FINE}} - \text{NCEP}_{\text{TOPO}})}{(\text{NCEP}_{\text{FINE}} + \text{NCEP}_{\text{TOPO}})} 100$$

RMS %DIFF



Comparison with real data

