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
Method

DATA SET 1, NCEPR-FINE:

NCEPR
\[2.5^\circ \times 2.5^\circ \Rightarrow p_{2.5}, T_{2.5}\]

ETOPO5 \(\Rightarrow H_5\)
\[
\sum_{i=1}^{n} H_{5,i} \over n = \bar{H}_{2.5} \Rightarrow z_{2.5}
\]

DATA SET 2, NCEPR-TOPO:

NCEPR-FINE
\[0.125^\circ \times 0.125^\circ\]
\[p_{0.125}, T_{0.125}, z_{0.125}\]

ETOPO5 \(\Rightarrow H_5\)
\[
\sum_{i=1}^{n} H_{5,i} \over n = \bar{H}_{0.125} \Rightarrow z_{1.0.125}
\]
\[\Delta z = z_{0.125} - z_{1.0.125}\]

NCEPR-FINE
each 2.5 x 2.5 from
NCEPR subdivided into
20 x 20, 0.125 deg units...
where
\[p_{0.125} = p_{2.5}\]
\[T_{0.125} = T_{2.5}\]
\[z_{0.125} = z_{2.5}\]

NCEPR-TOPO
where
\[T_0^{'}_{0.125} = T_{0.125} - \Gamma \Delta z\]
\[p_0^{'}_{0.125} = p_{0.125} \left[ \frac{T_{0.125} - \Gamma \Delta z}{T_{0.125}} \right] \frac{g}{\bar{H}_{0.125}}\]
• RMS of difference between the pressure data sets
• 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
surface displacement

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

$$\text{DIFF}^{\%} = \frac{2(NCEP_{\text{FINE}} - NCEP_{\text{TOPO}})}{NCEP_{\text{FINE}} - NCEP_{\text{TOPO}}} \times 100$$
RMS %DIFF

![Map of RMS %DIFF with color gradient representing different values across the globe.](Image)
Comparison with real data