On Correlations and Serial Correlations of AIRS T and q Profiles

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with help from Evan Manning
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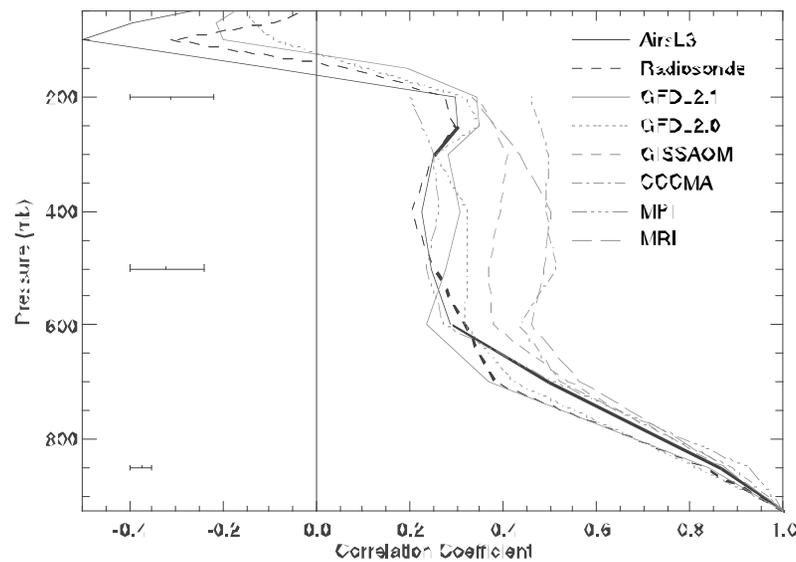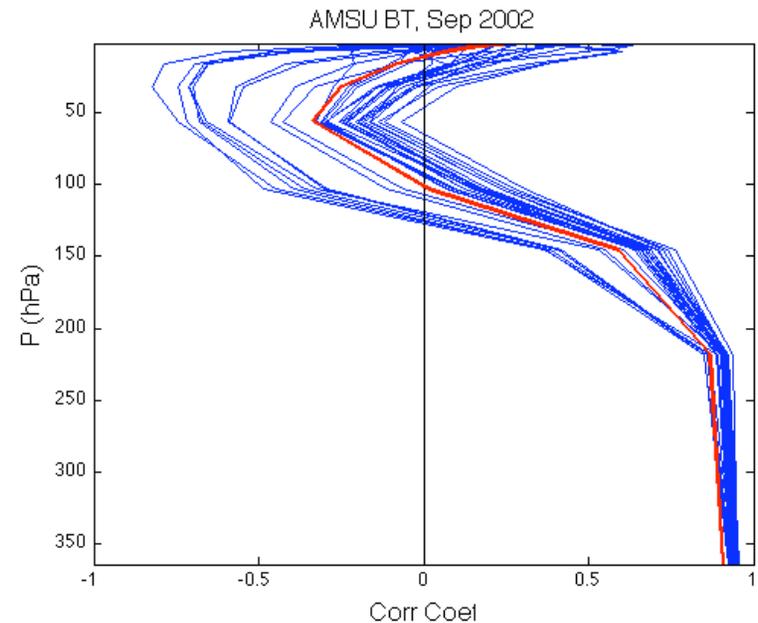
Basic Atmospheric Layers

cold top (CT)

free troposphere (FT)

boundary layer (BL)
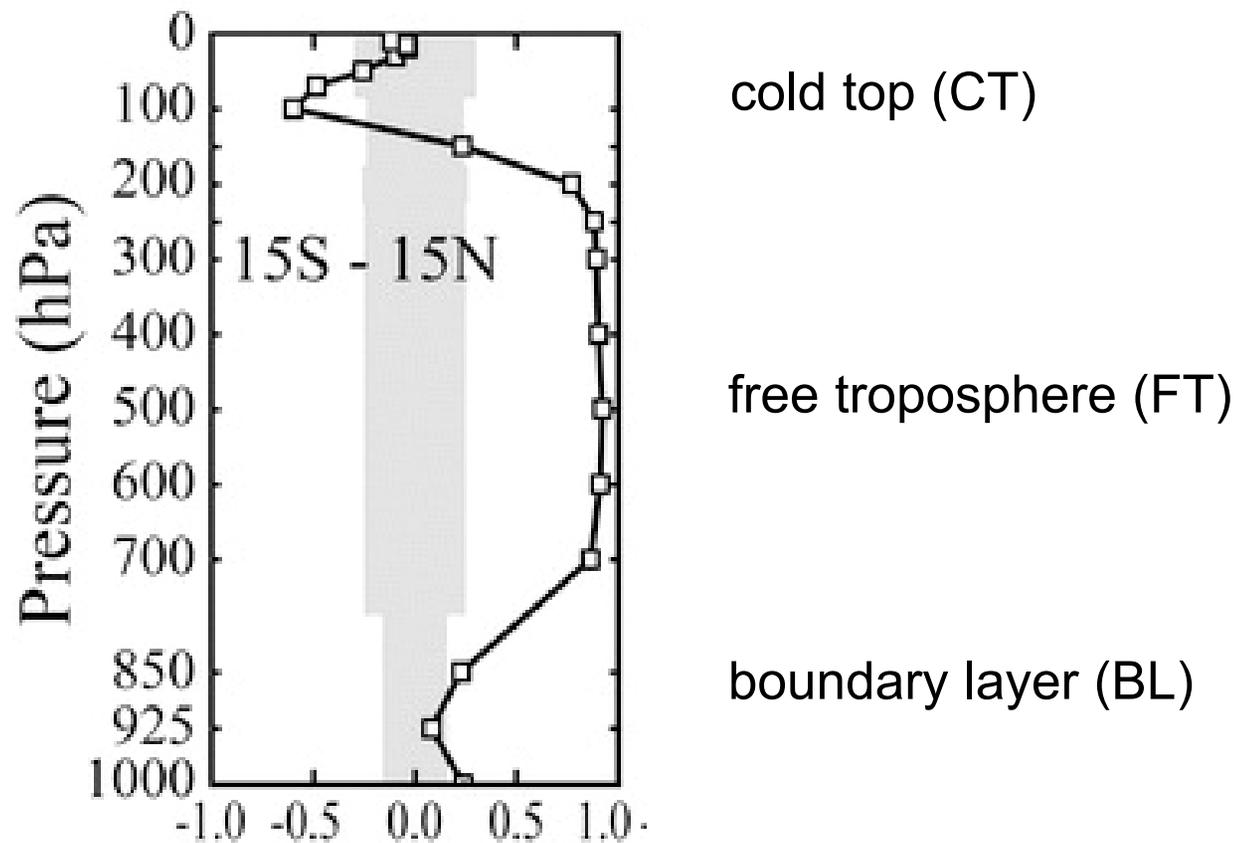
(Holloway & Neelin, 2007)
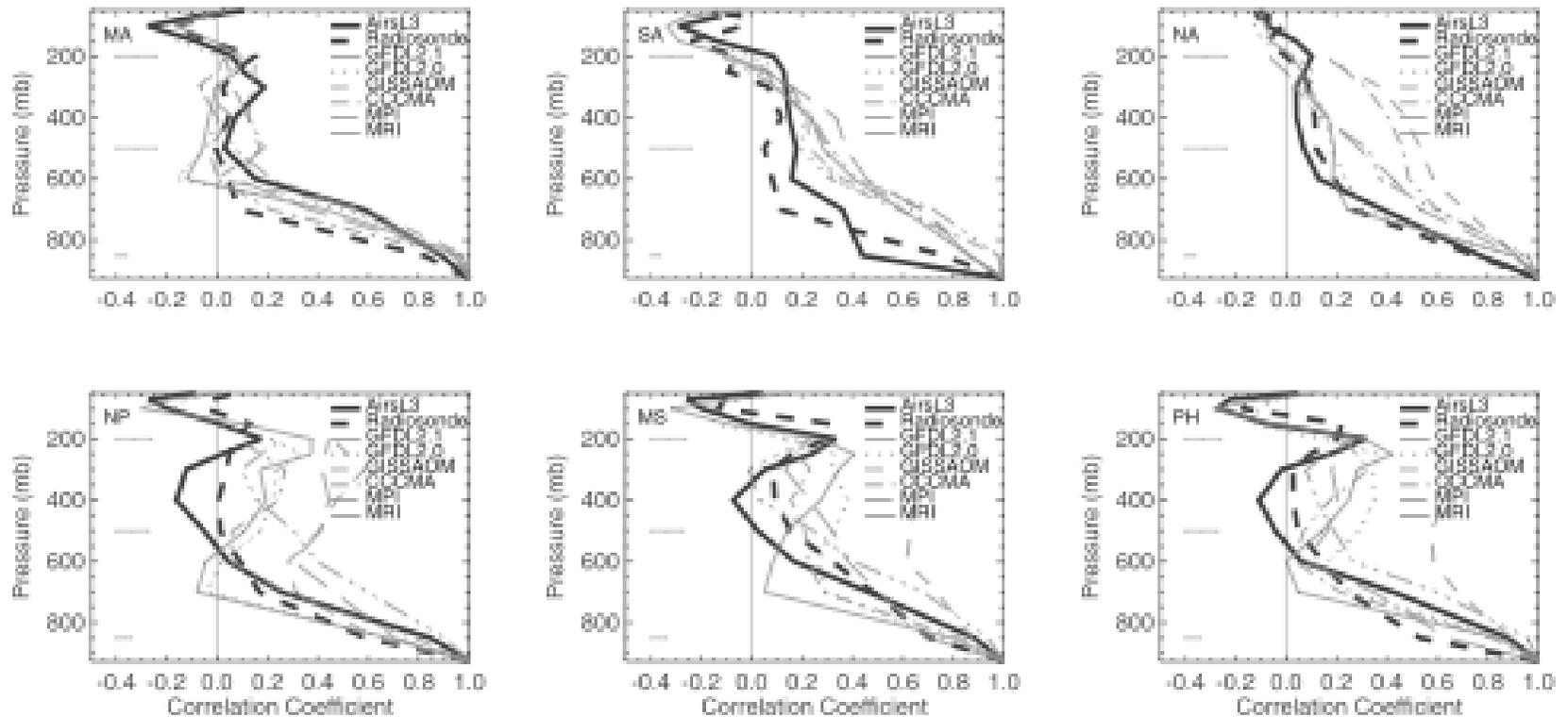
Correlations of BL with FT and LS

Tropics 20S-20N, monthly

BT Correlations with T0 (avn) agrees with radiosonde

Wu, Dessler & North, 2006
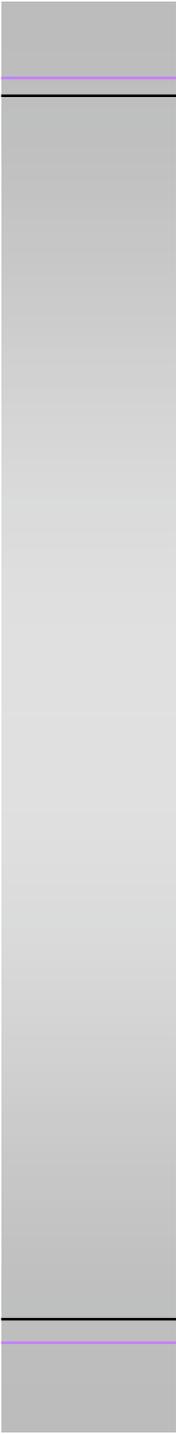
Regional Daily Correlations
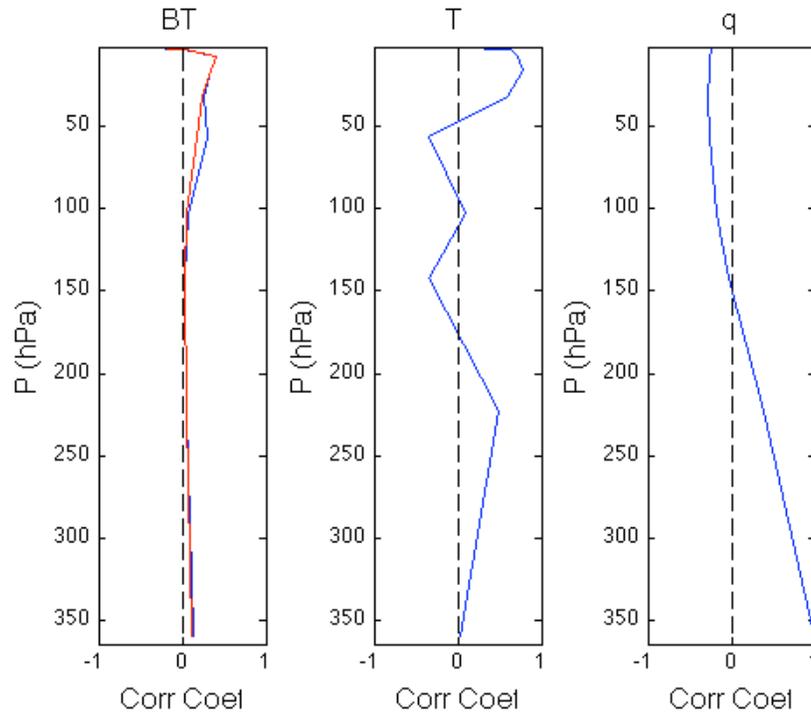

(upper panels) Mid Africa, S. Africa, N. America
(lower panels) N. Pacific, Sumatra, Philippines   (Wu et al., 2006)
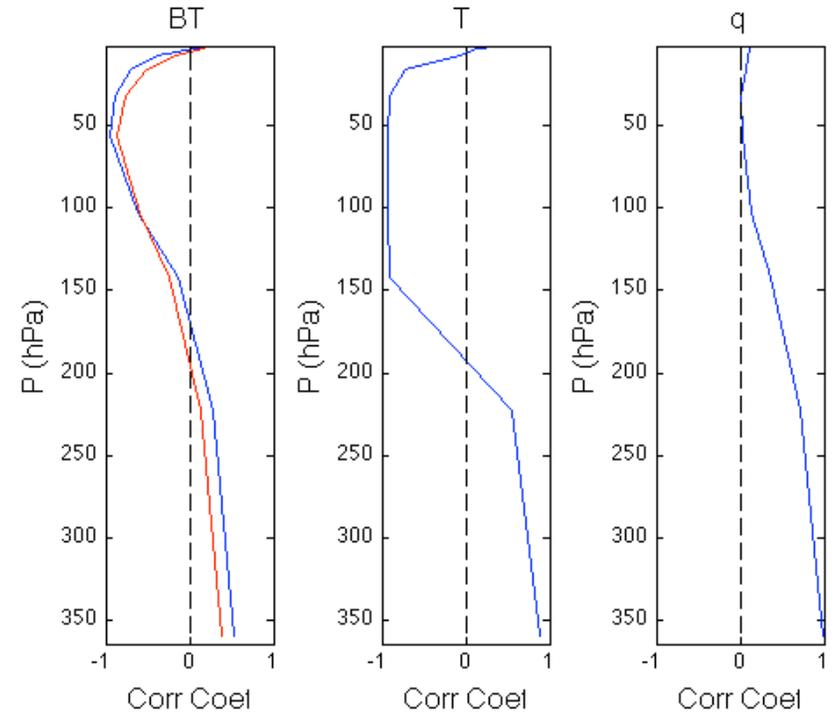
Correlations in selected granules
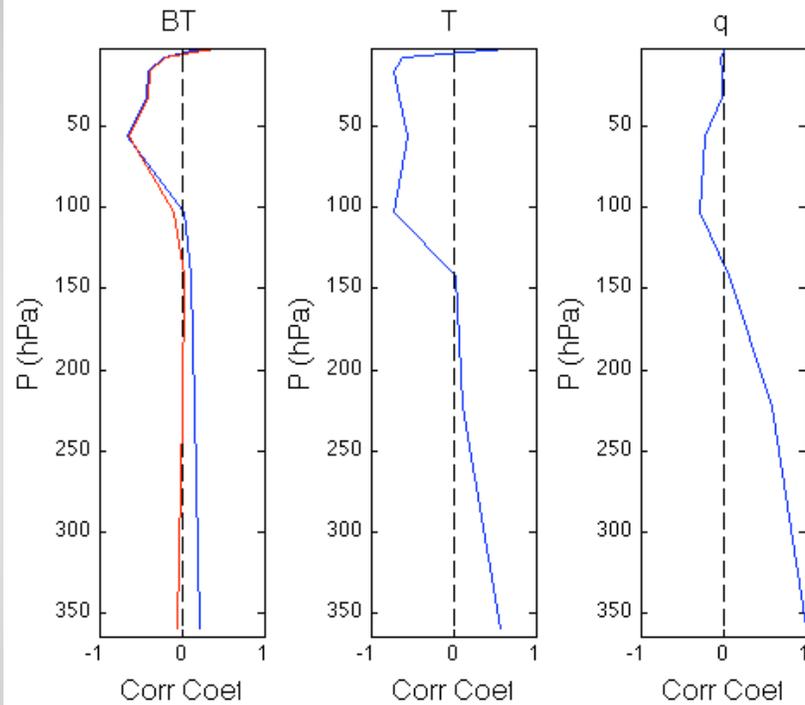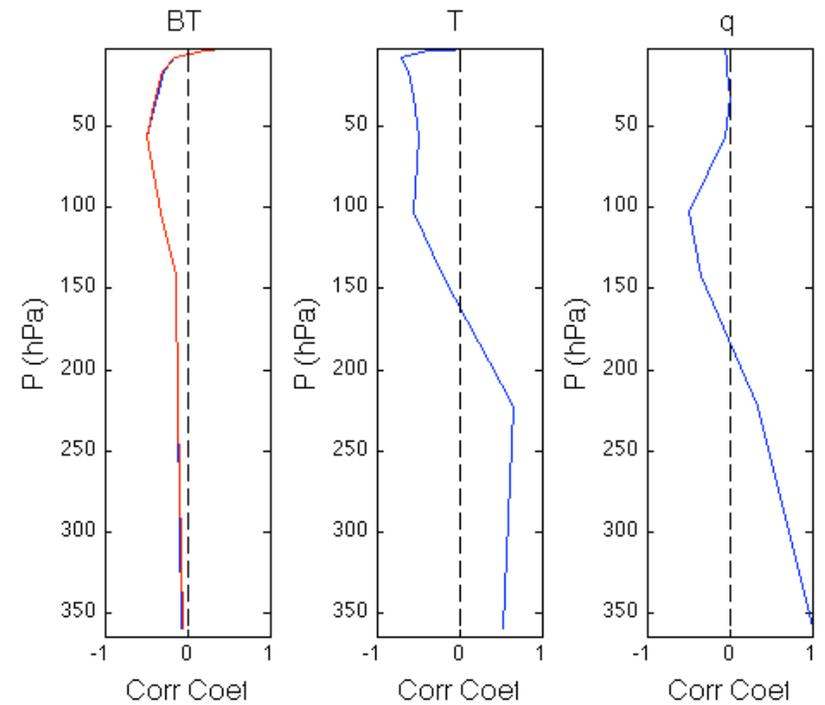# *(AMSU BT and T, q from L2cc 5a)*

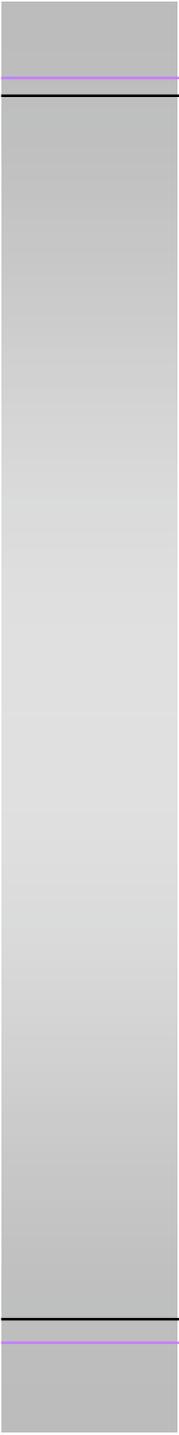# N. Africa

Egypt

Blue: QBOT = 0, red: all pixels
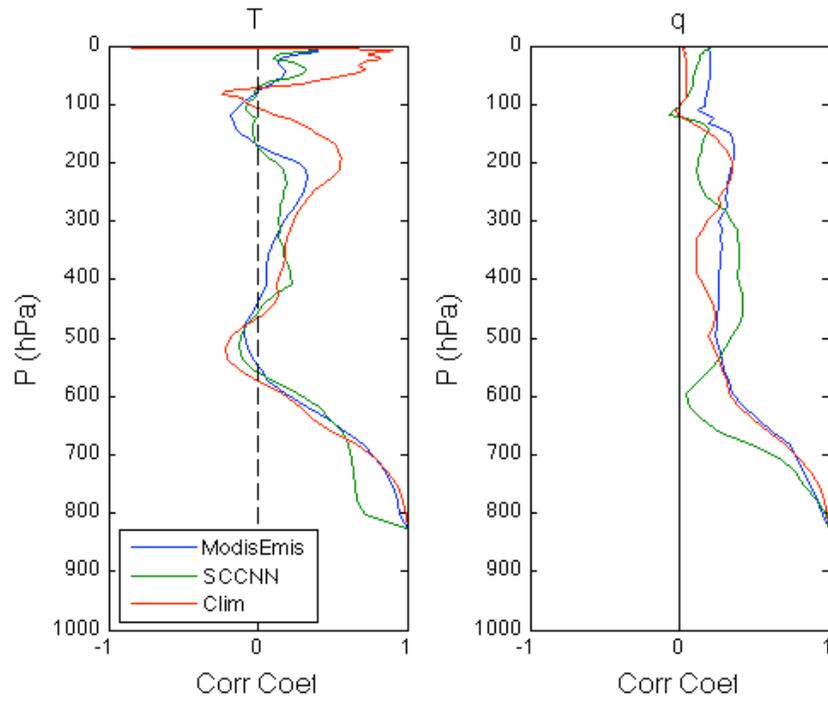
Tropic Pacific

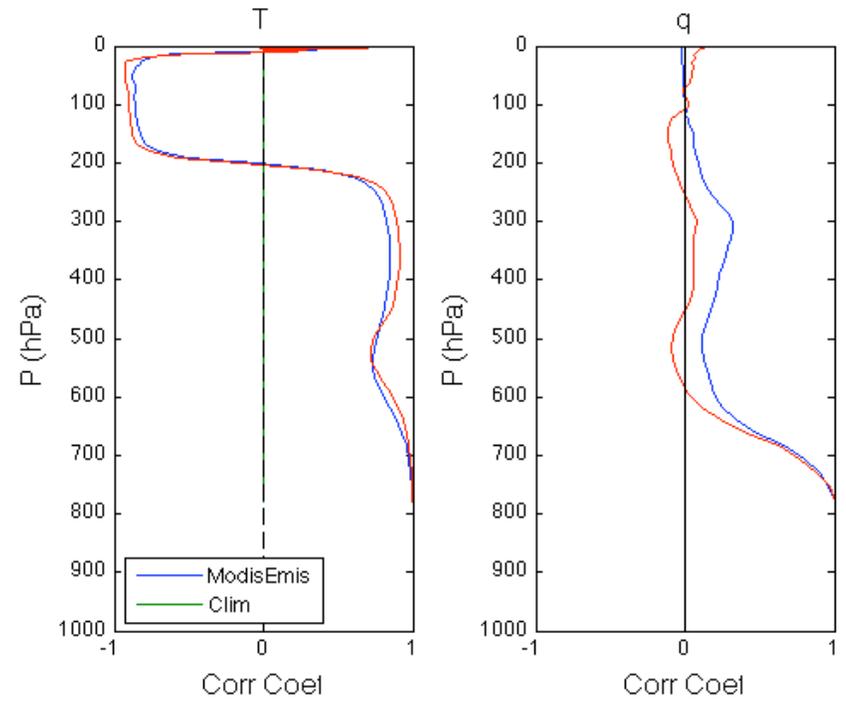# Tropic Atlantic

Blue: QBOT = 0, red: all pixels

Correlations in selected regions (AIRS L2, V6 versions)

Mid Africa

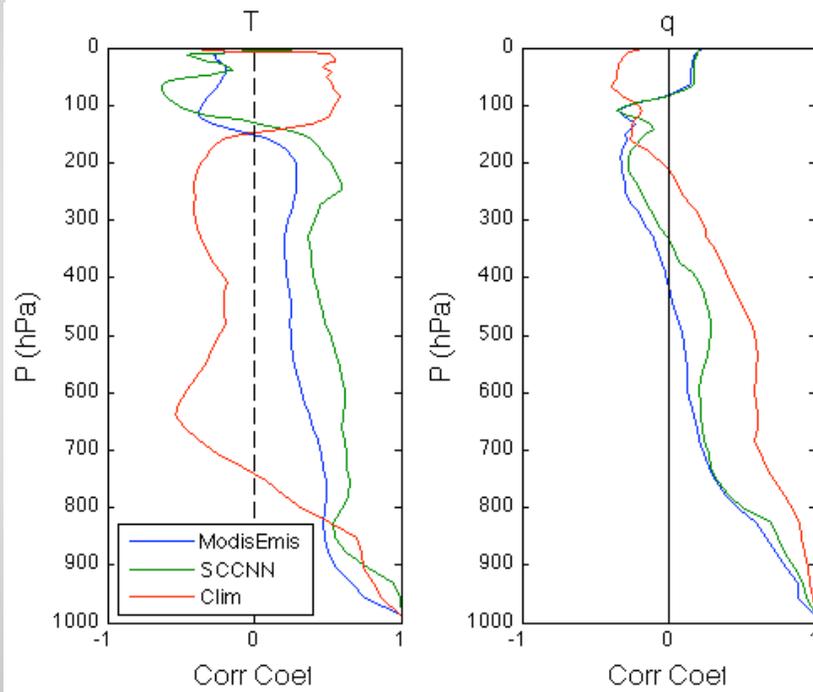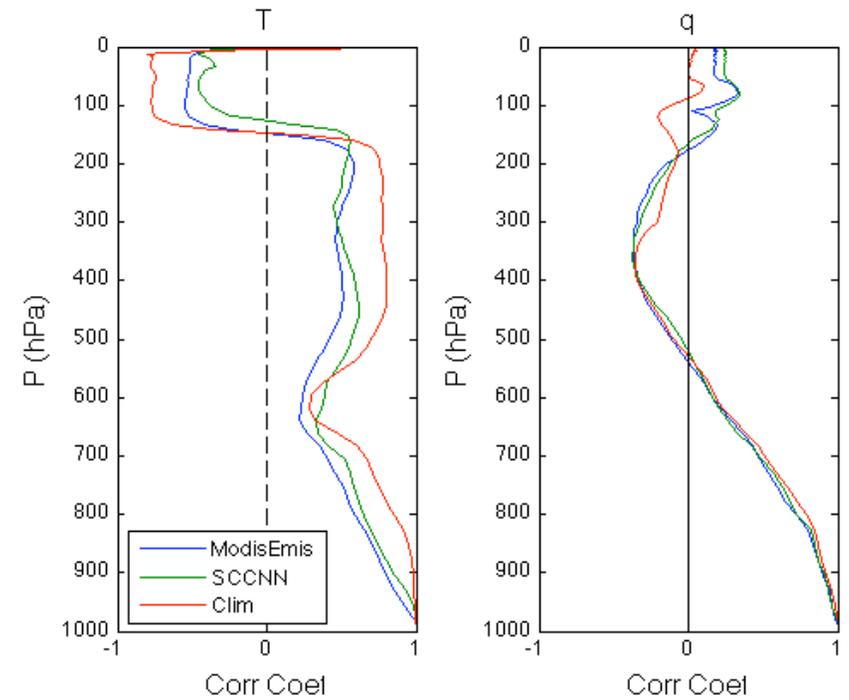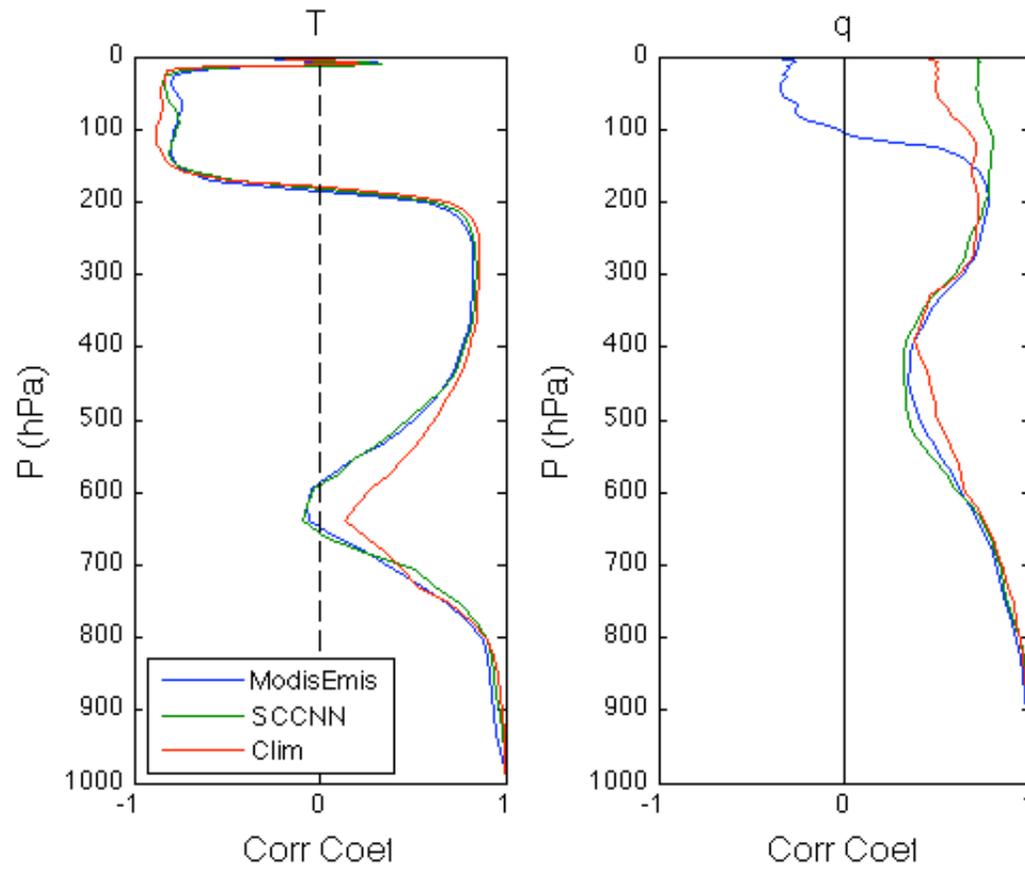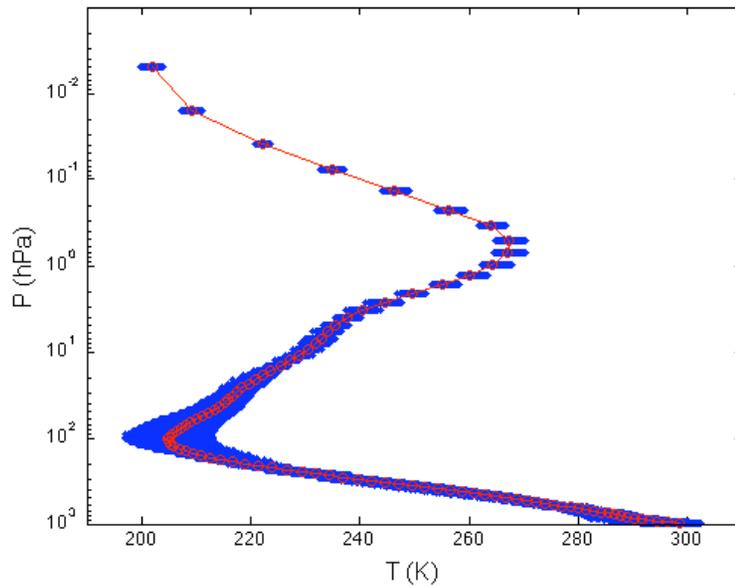# Egypt

W Pacific

Mid Atlantic

W Atlantic

Serial Correlations
(correlation of errors at adjacent levels)
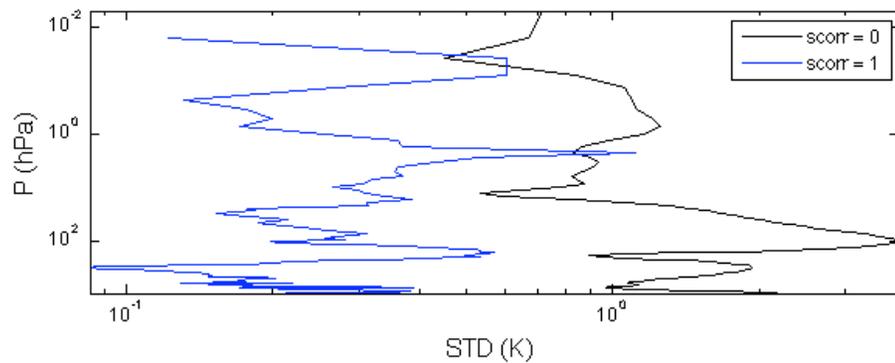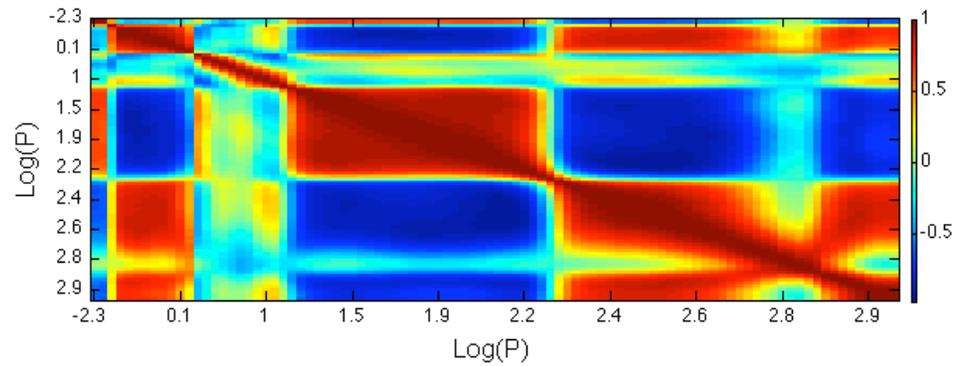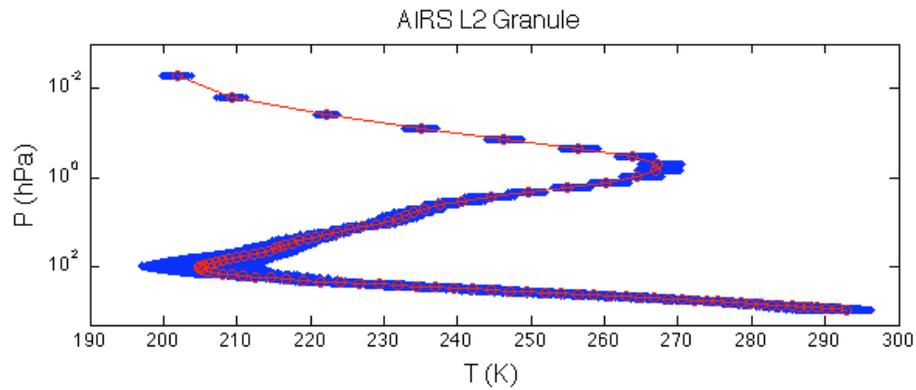

$$T_i = T0_i + e_i$$
$$T_{i-1} = T0_{i-1} + e_{i-1}$$

$$\rho = Cov(e_{i-1}, e_i) / \sigma^2 \neq 0$$

i.e. $e_i = \rho e_{i-1} + \mu_i$ $(-1 < \rho < 1)$

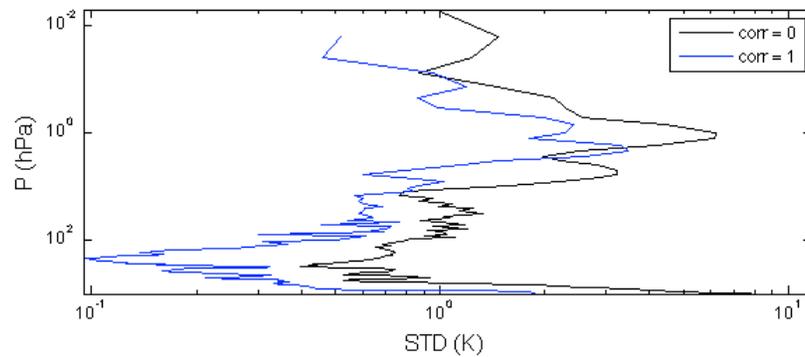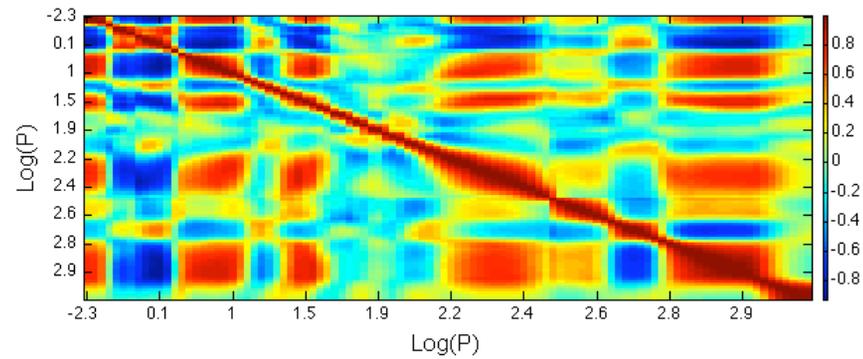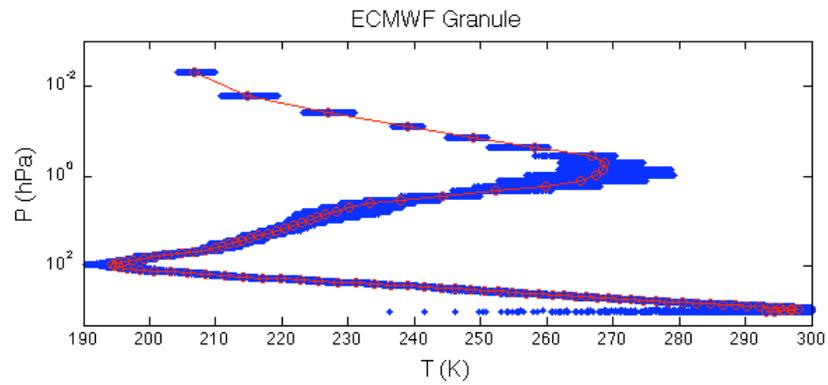$$T_i - T0_i = \rho (T_{i-1} - T0_{i-1}) + \mu_i$$
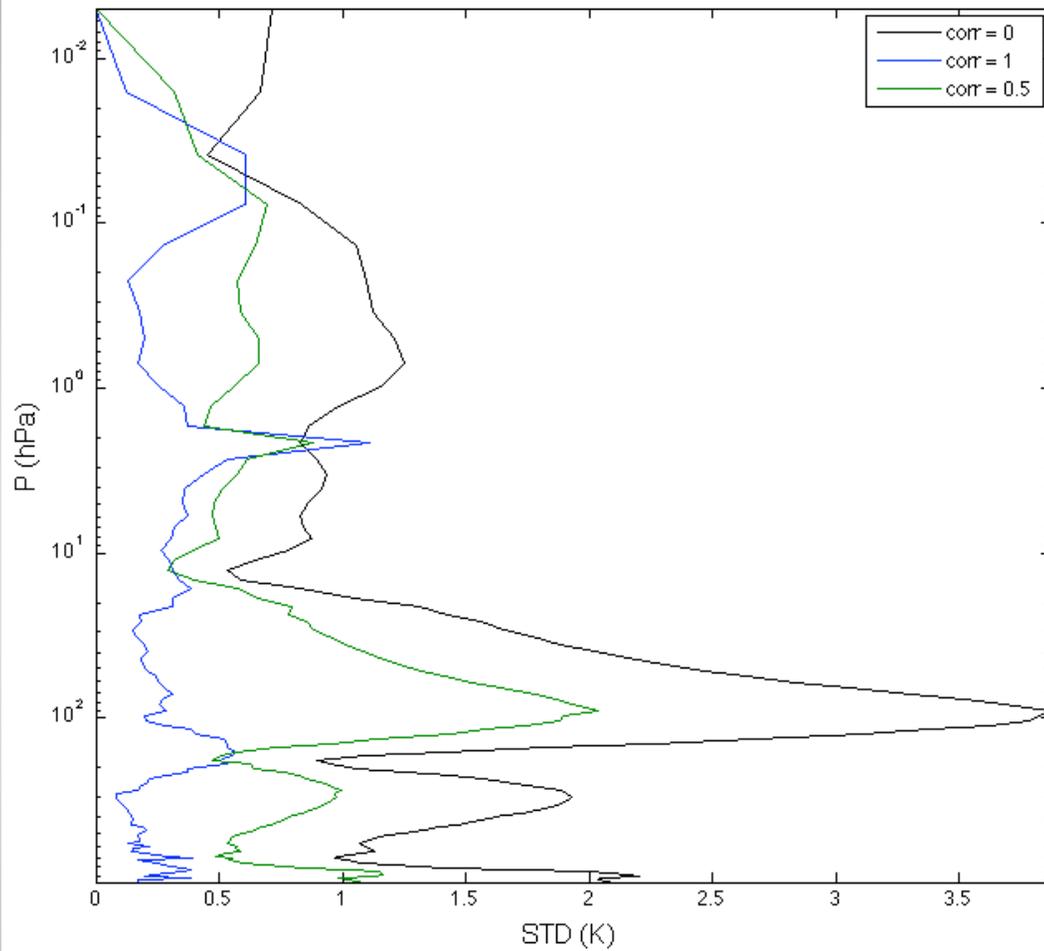
σ_μ is a true sigma

AIRS example

Tropical Atlantic granule

*Same
with ECMWF*

Effect of serial correlations on accuracy of the profile

Conclusions

◆ BT correlations from AMSU agrees with radiosonde and in selected L2cc 5a granules and can serve as a 'truth'

◆ Diff V6 versions show diverse T, q profiles of correlations between BL and upper atmosphere

◆ Taking into account serial correlations in the profiles allows decreasing their STDs