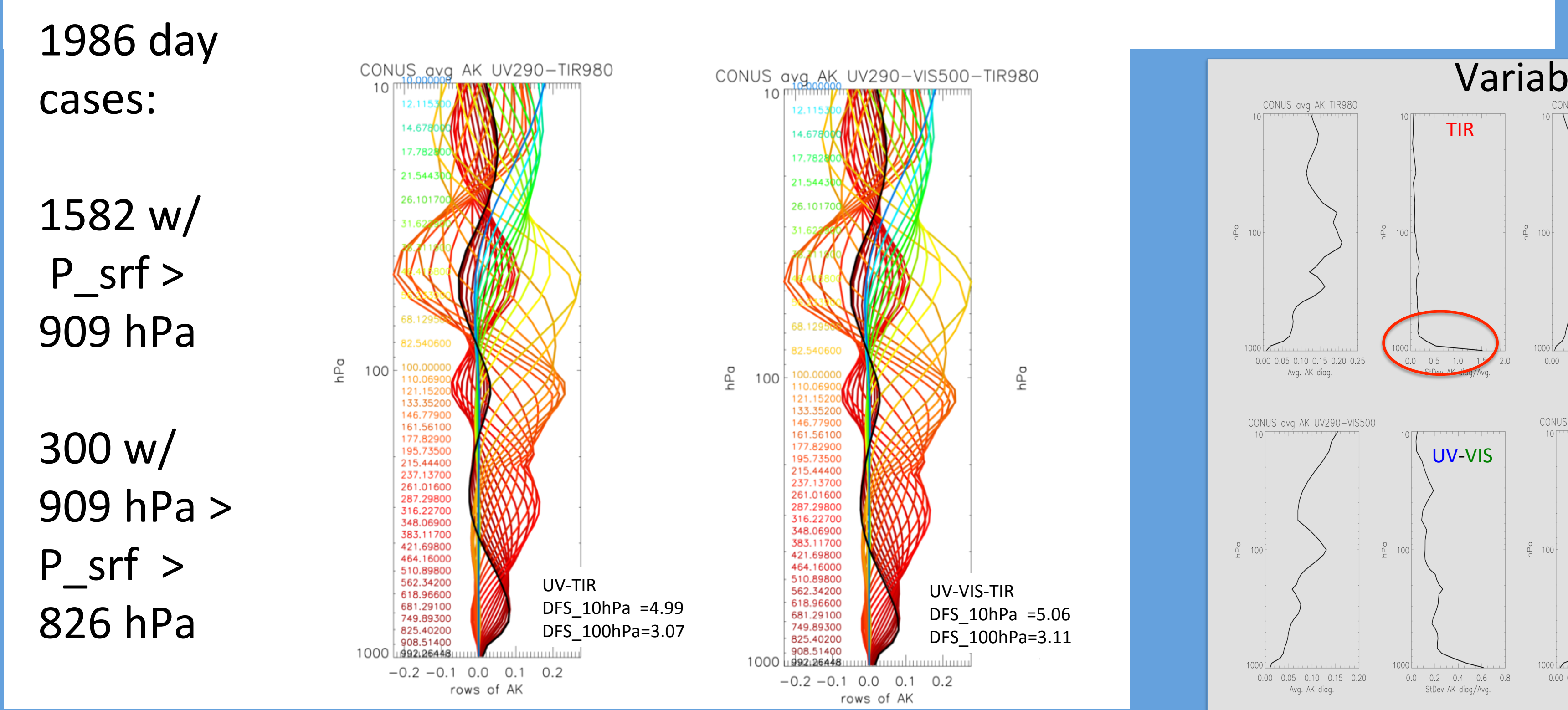
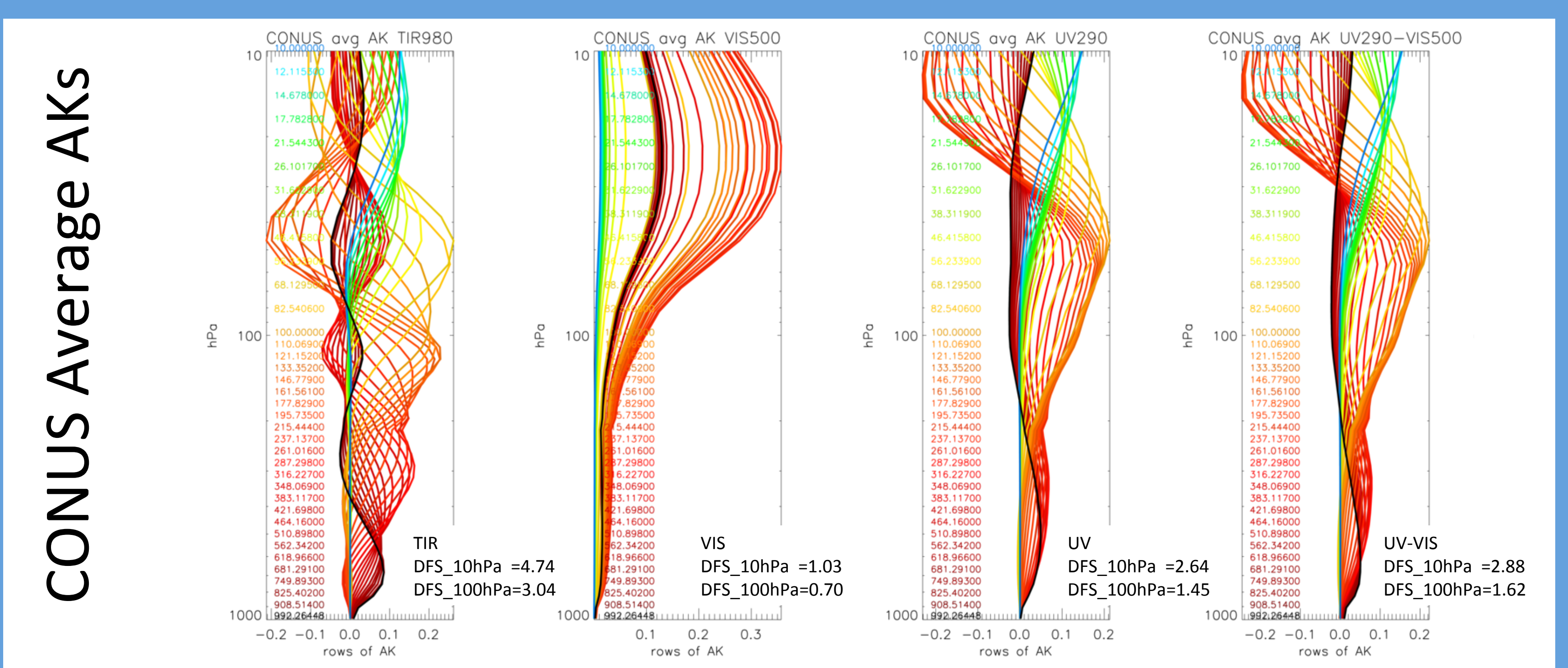


Averaging kernel variability and dependence on physical state parameters for O₃ and CH₄

H. M. Worden, D. P. Edwards, G. Francis, (NCAR), S. S. Kulawik (BAER/NASA Ames), V. Natraj (JPL/CalTech), B. Pierce, (NOAA)

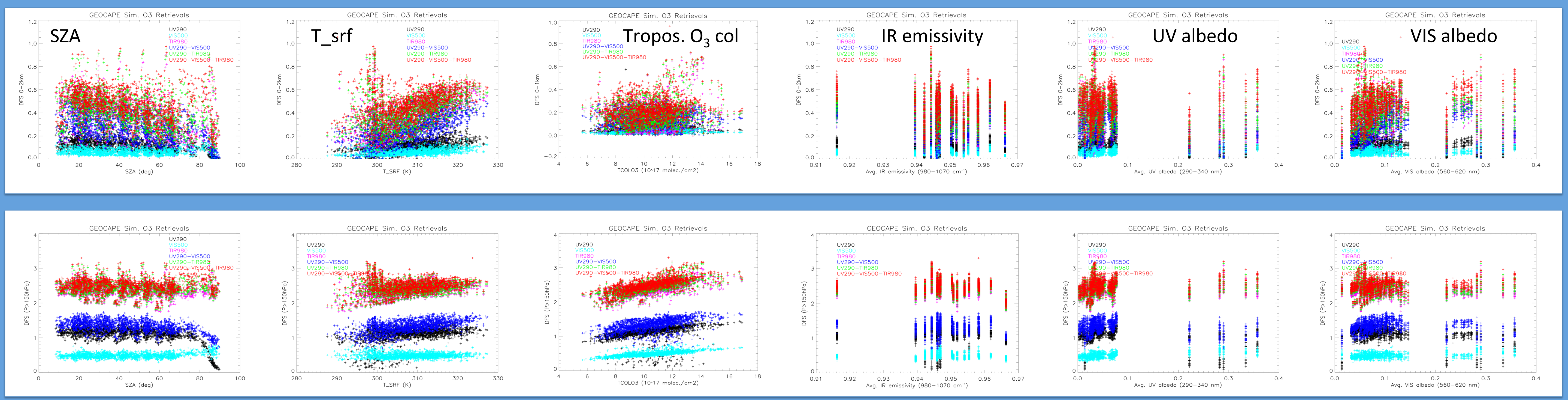


O₃ Simulated Retrievals



DFS Dependence

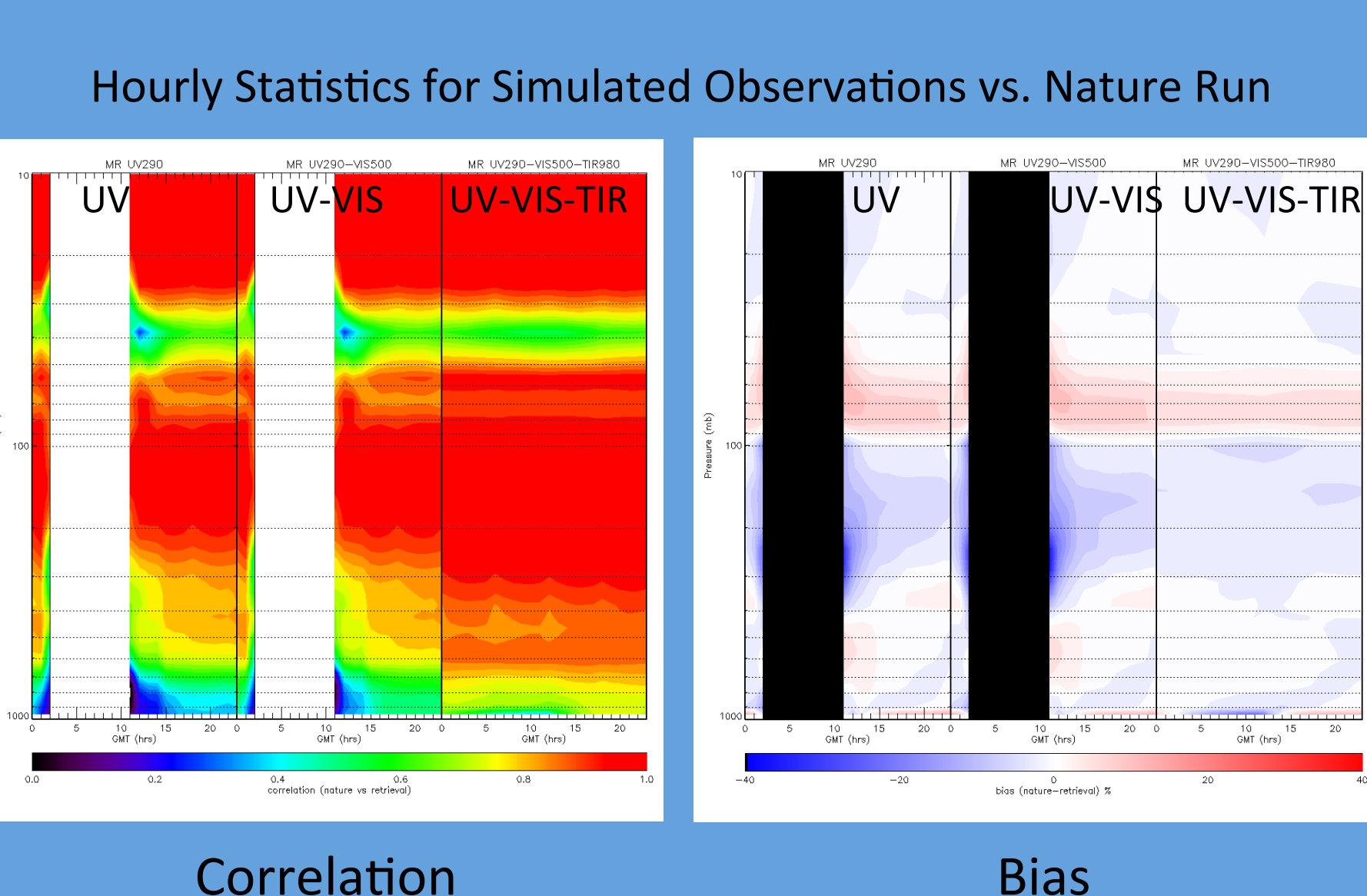
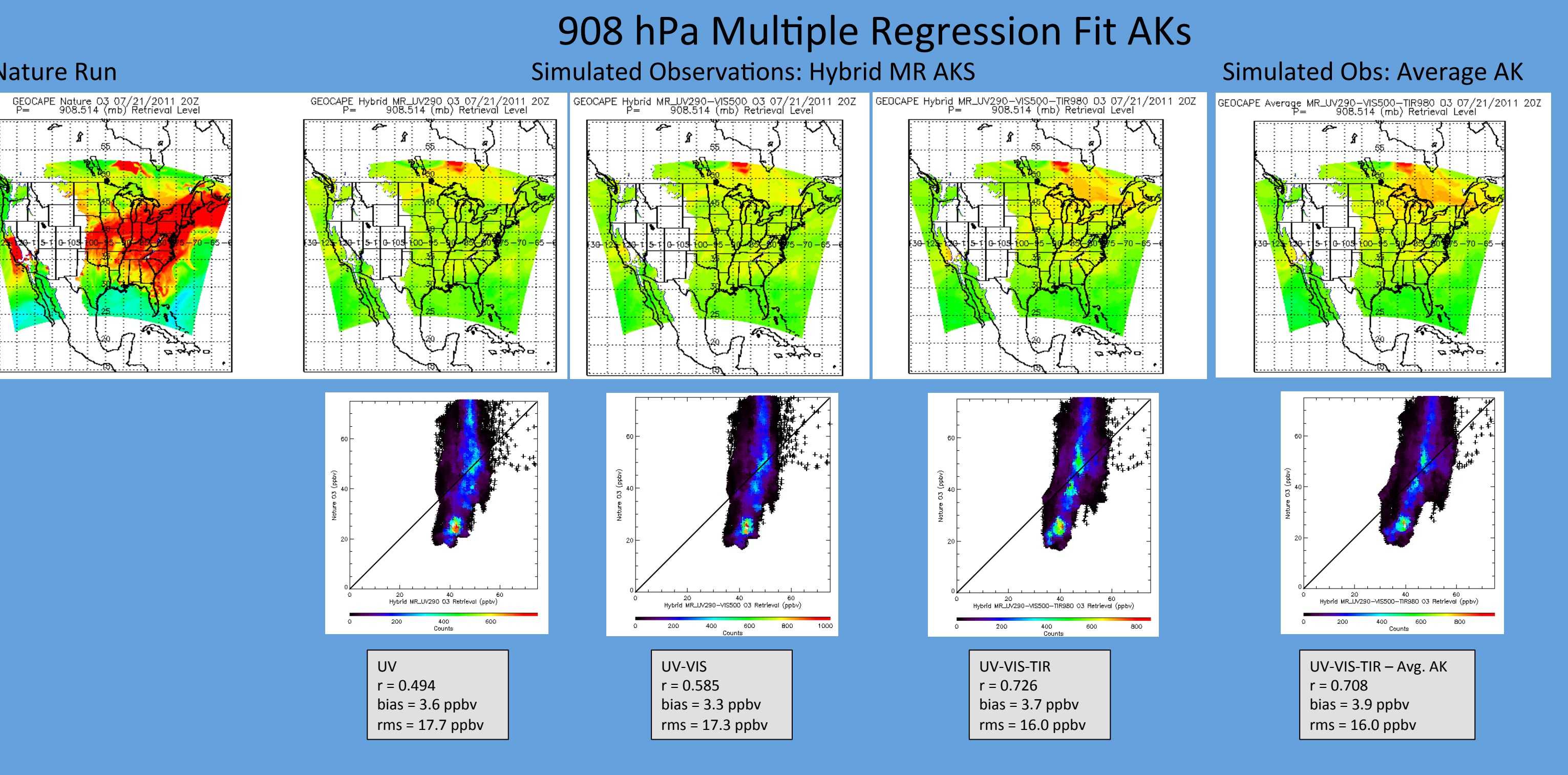
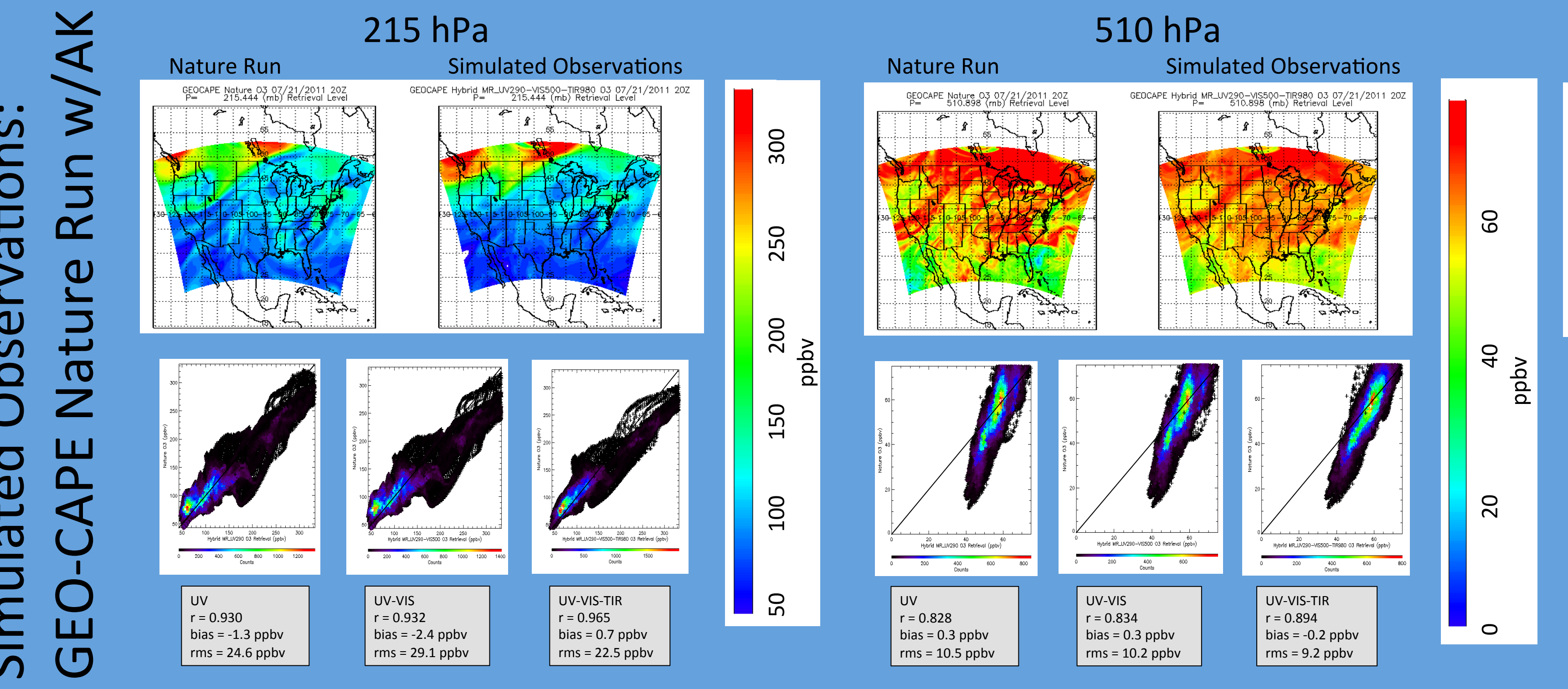
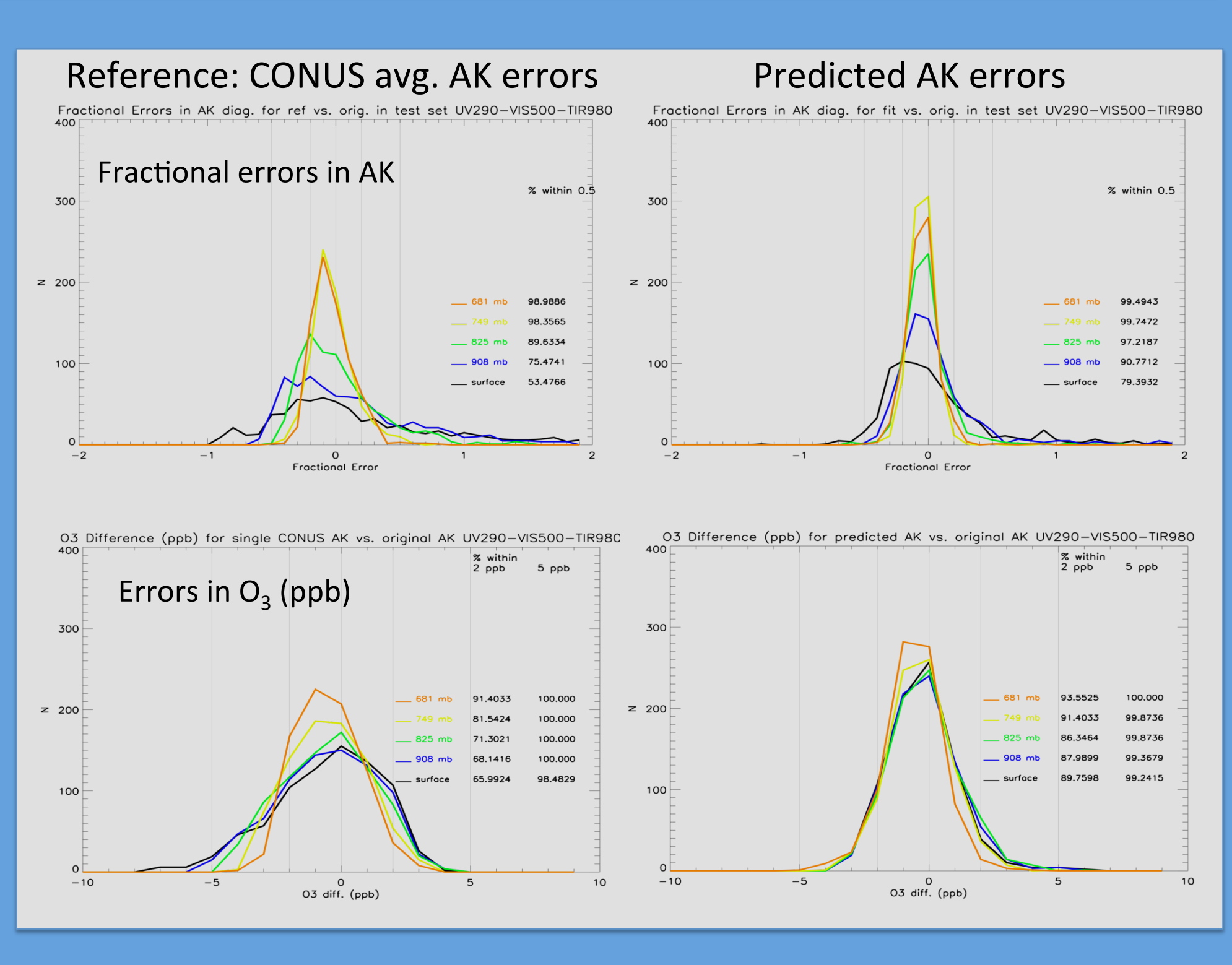
0-2 km
Prs > 150 hPa



SVD and Multiple Regression (MR) Tests

- Focused first on UV-VIS-TIR
- SVD up to 100 mb, 5 SVs
 - Poor reconstruction of AK (worse result than avg. AK)
 - 4SVs – still bad
- SVD up to 421 mb, 3 SVs
 - Good reconstruction up to 681 mb, (Avg. AK better for lower pressures)
 - 2SVs – not as good.
- SVD up to 681 mb, 2 SVs
 - Good results for surface & lowermost troposphere
 - 3SVs – about the same
- Removing each MR param. (one at a time). Always reduced the % within 2ppb at the surface, indicating that each parameter adds something to the MR fit.

Param.	Mean	Std. Dev.	Min	Max
SZA (°)	44.4	21.3	10.3	89.8
Albedo	0.094	0.075	0.014	0.357
IR emiss.	0.95	0.006	0.94	0.96
P _{surface} (mb)	118.0	11.7	83.2	316.2
T _{surface} (K)	992.3	21.2	940.9	1018.2
O ₃ total column (10 ¹⁸ molecules/cm ²)	8.37	0.31	7.56	9.63
O ₃ tropos. column (10 ¹⁸ molecules/cm ²)	1.08	0.17	0.57	1.69



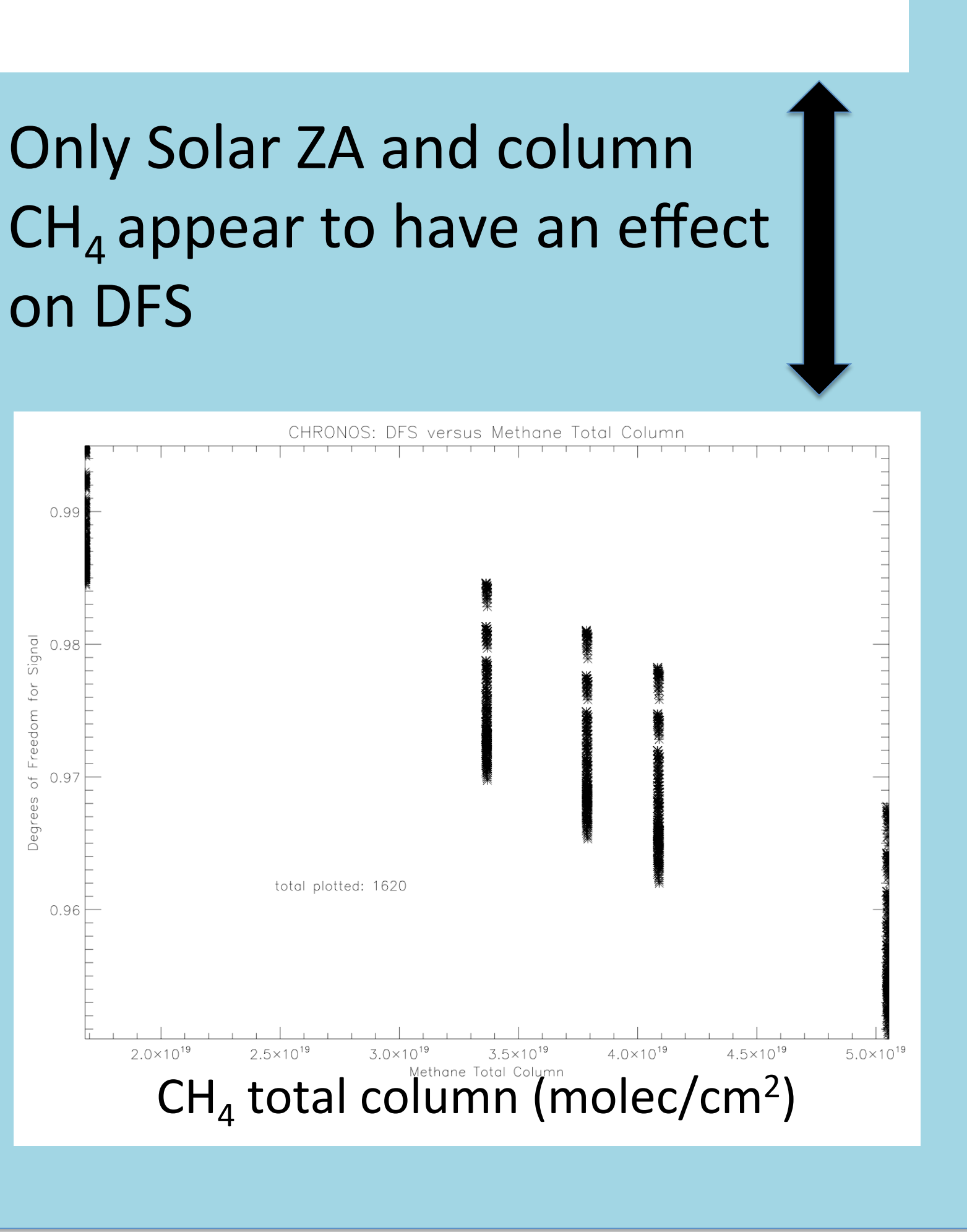
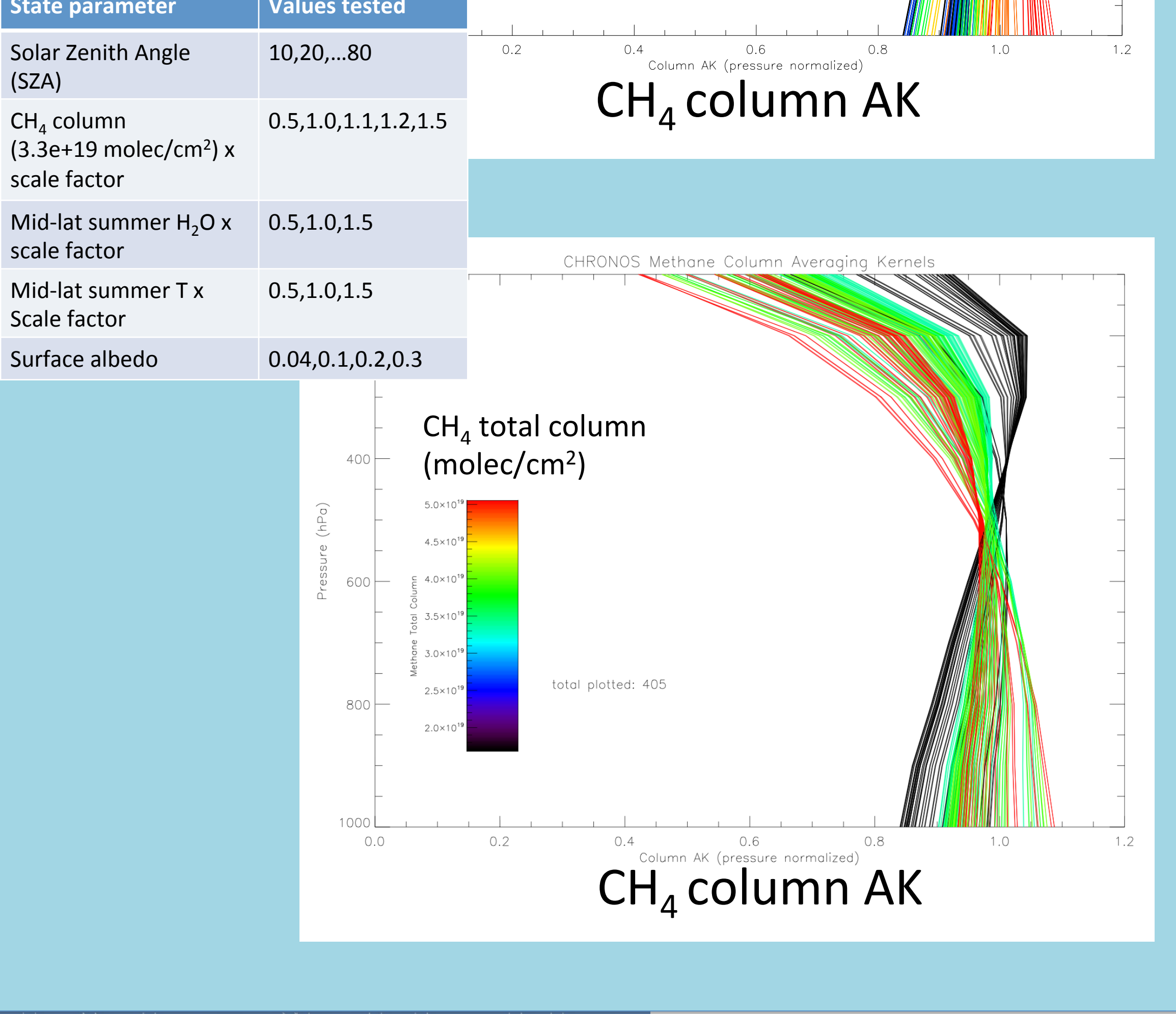
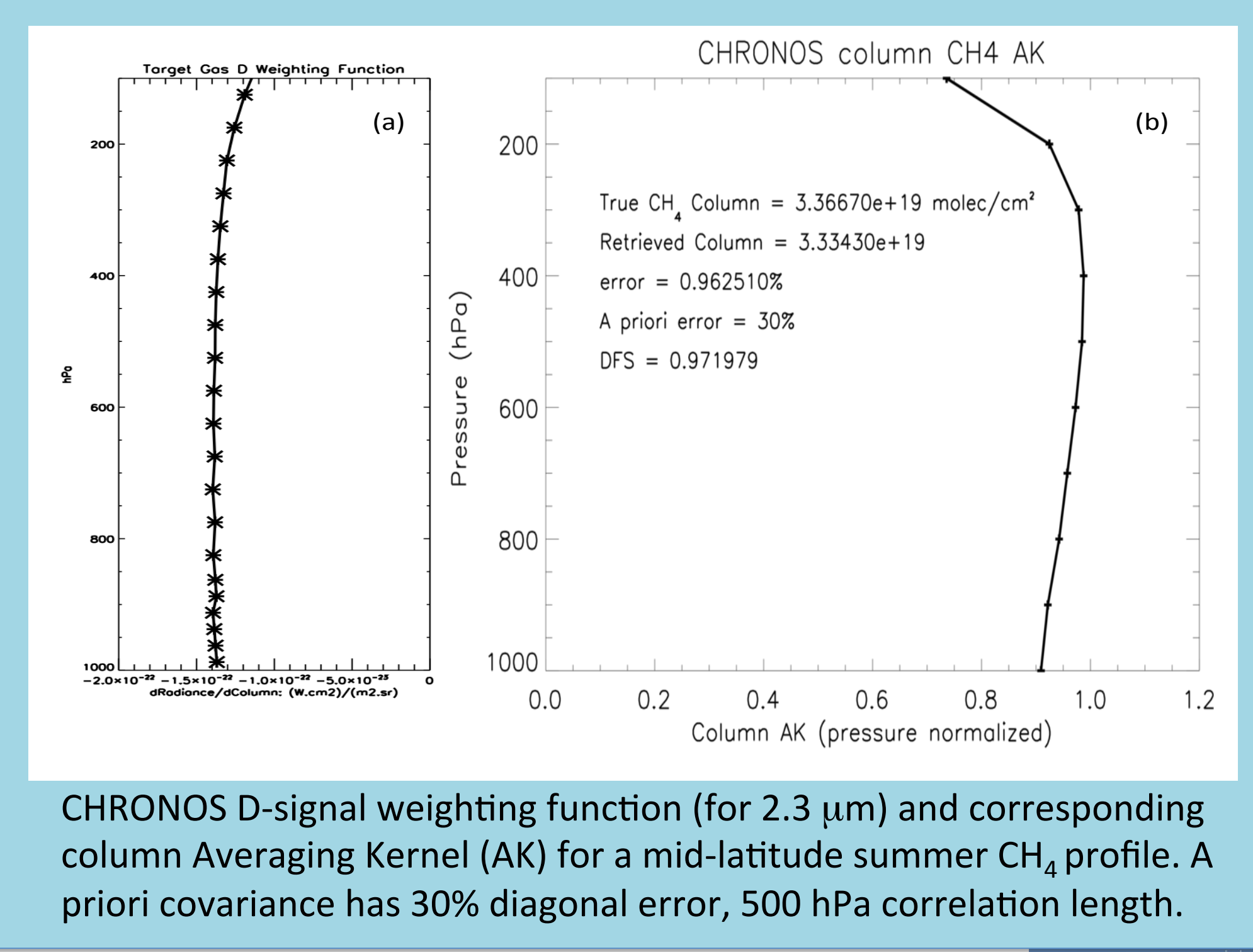
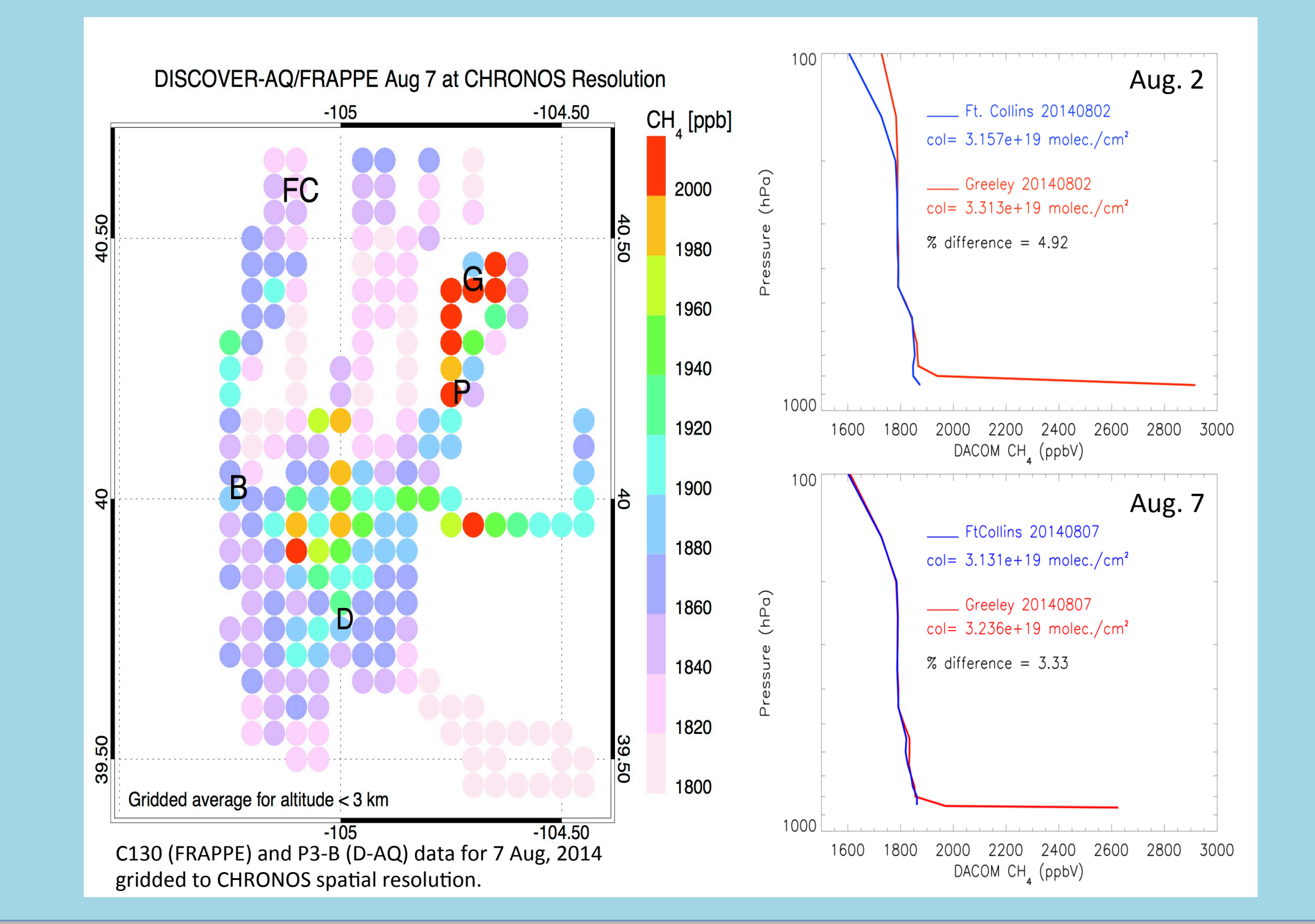
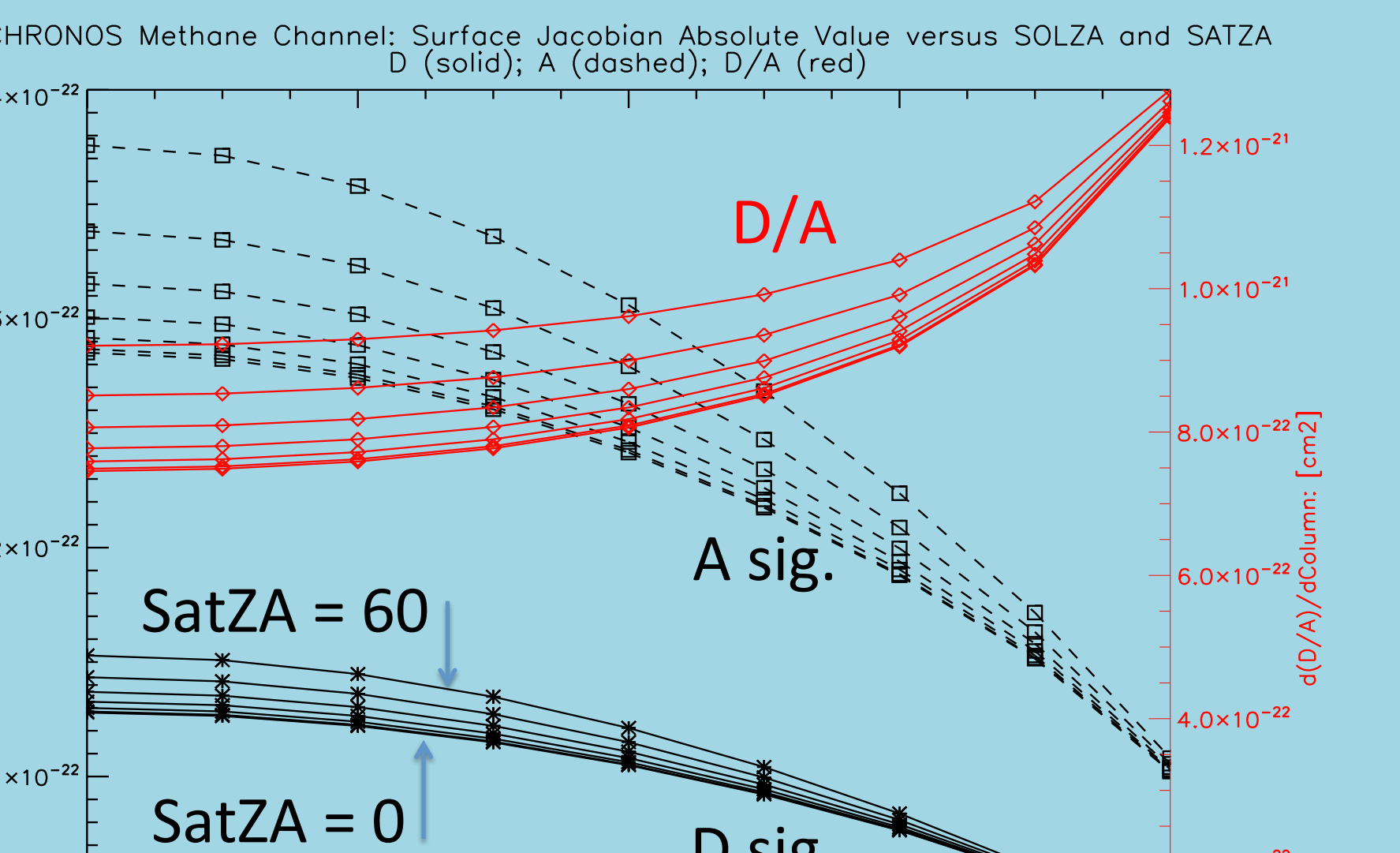
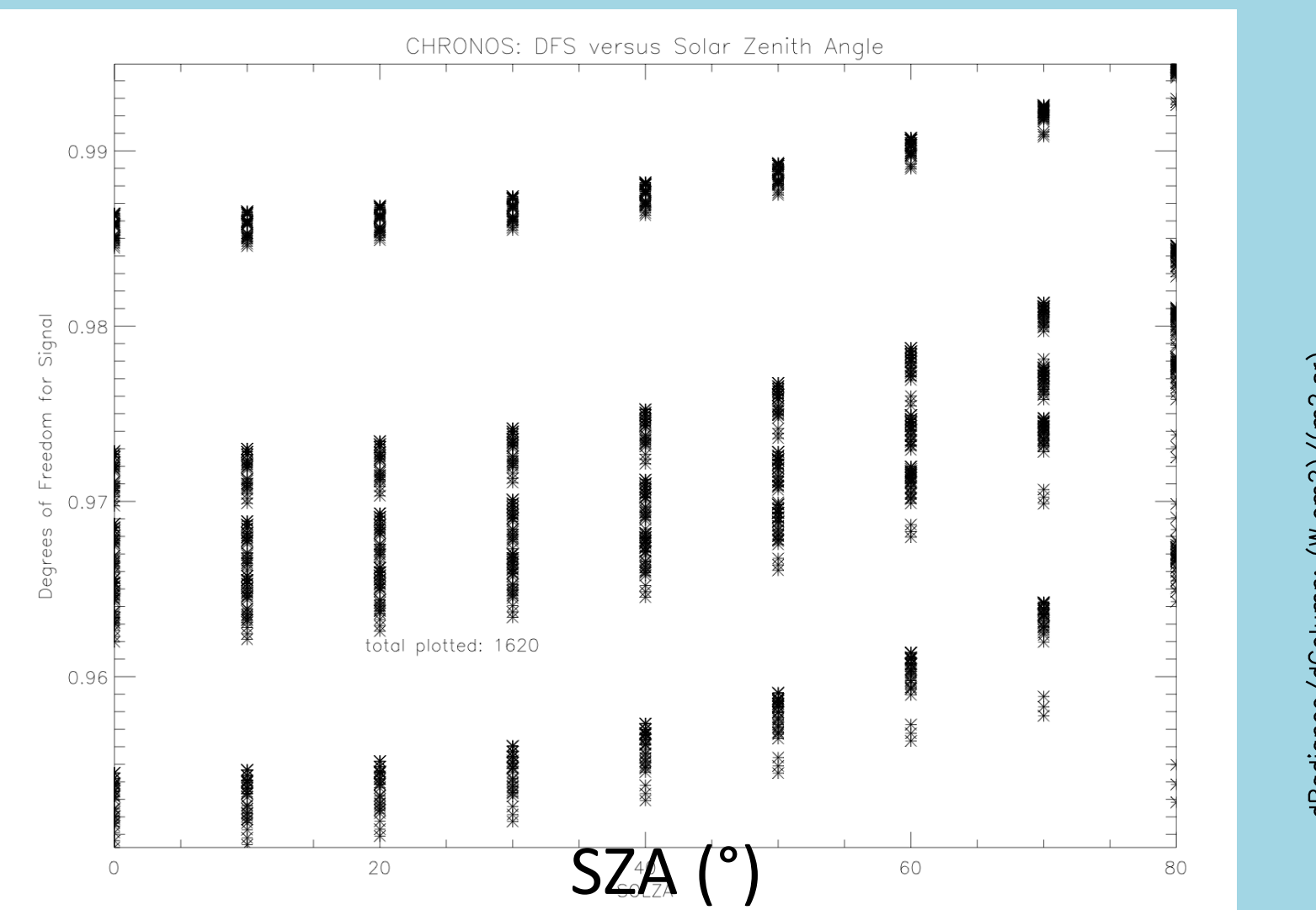
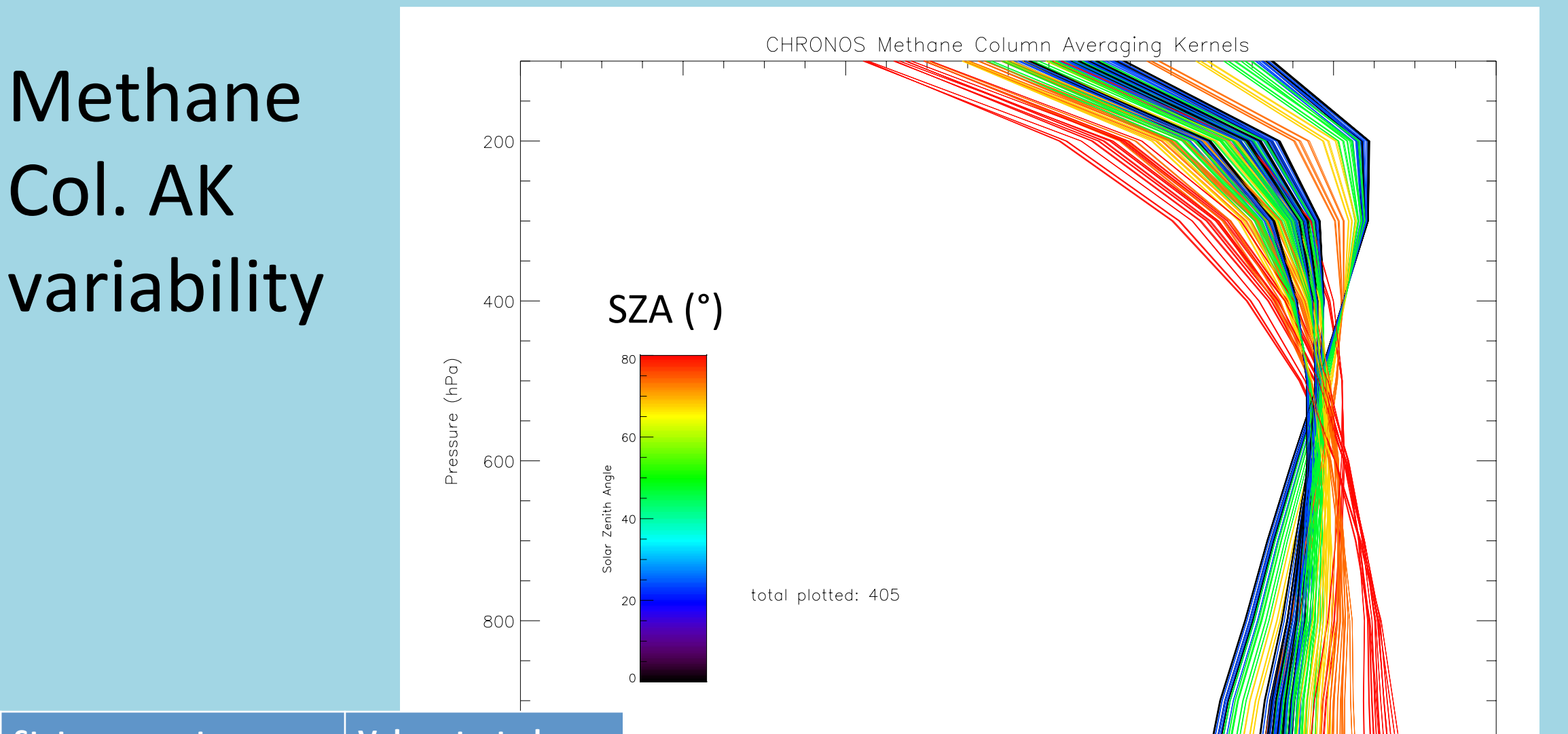
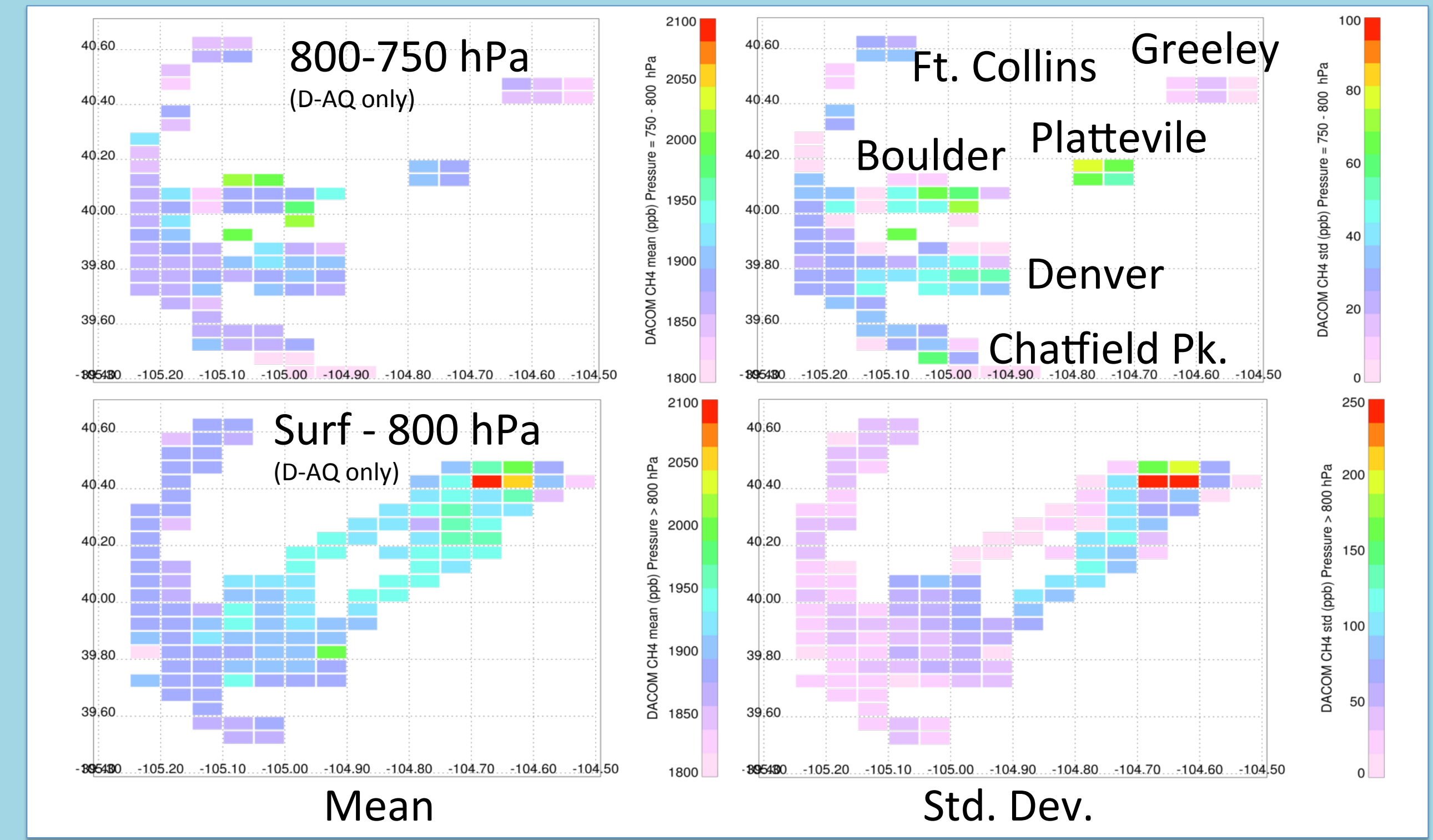
Conclusions for Ozone

- Multiple regression works best for surface – 681 hPa AK rows
- Combinations of fit AK in lower troposphere and average AK above allow simulated observations for different wavelength combinations
- UV-VIS-TIR provides highest correlation for simulated obs. vs. Nature run.

CH₄ Simulated Retrievals

Methane distributions and variability in Colorado Front Range

FRAPPE/DISCOVER-AQ
July & August, 2014



Conclusions for Methane

- Variations in DFS and AK shape are mostly driven by more extreme values of SZA and col. CH₄
- Average column AK could be used under most conditions for simulated observations