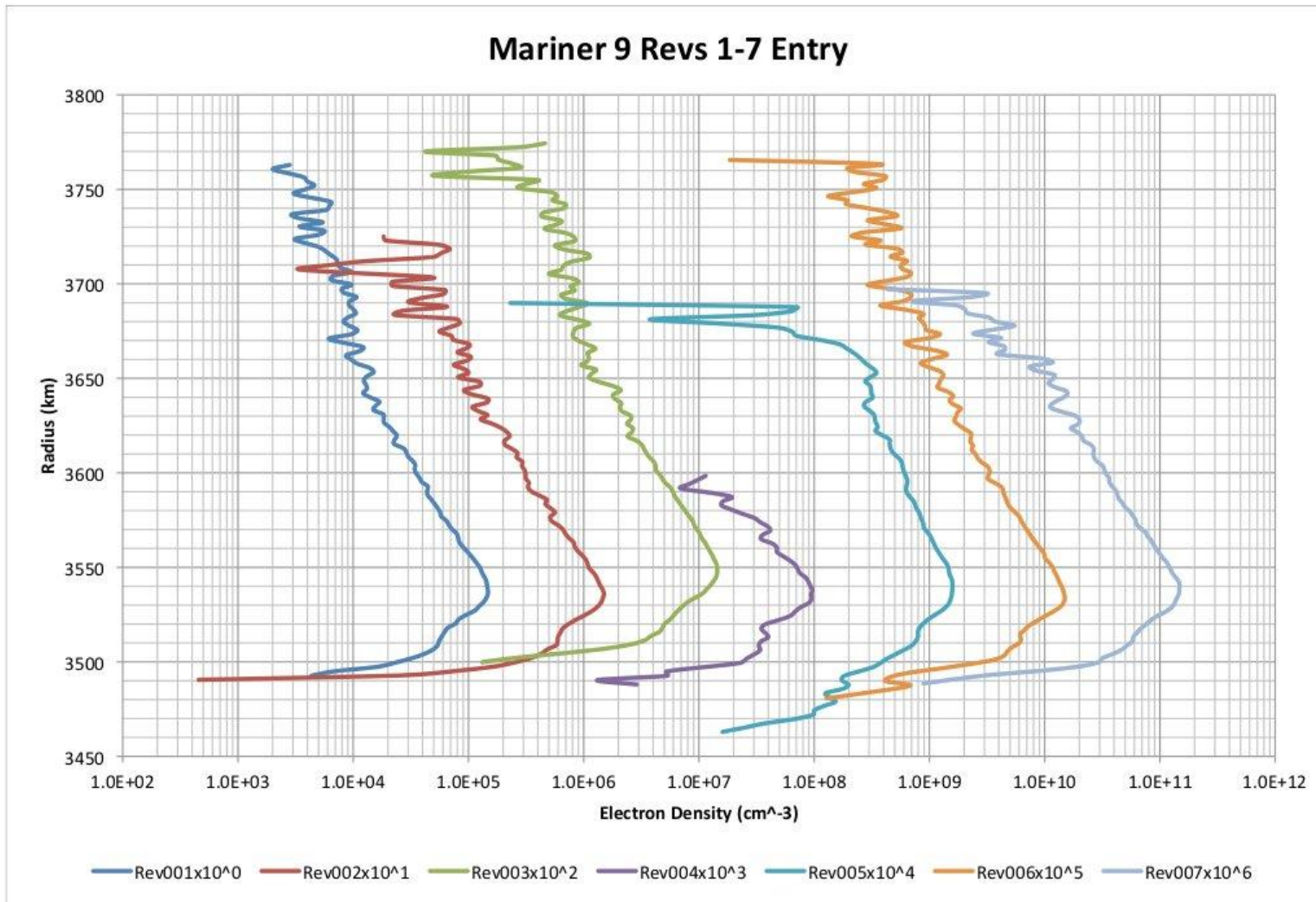


# Ionosphere of Mars: Miscellaneous stuff

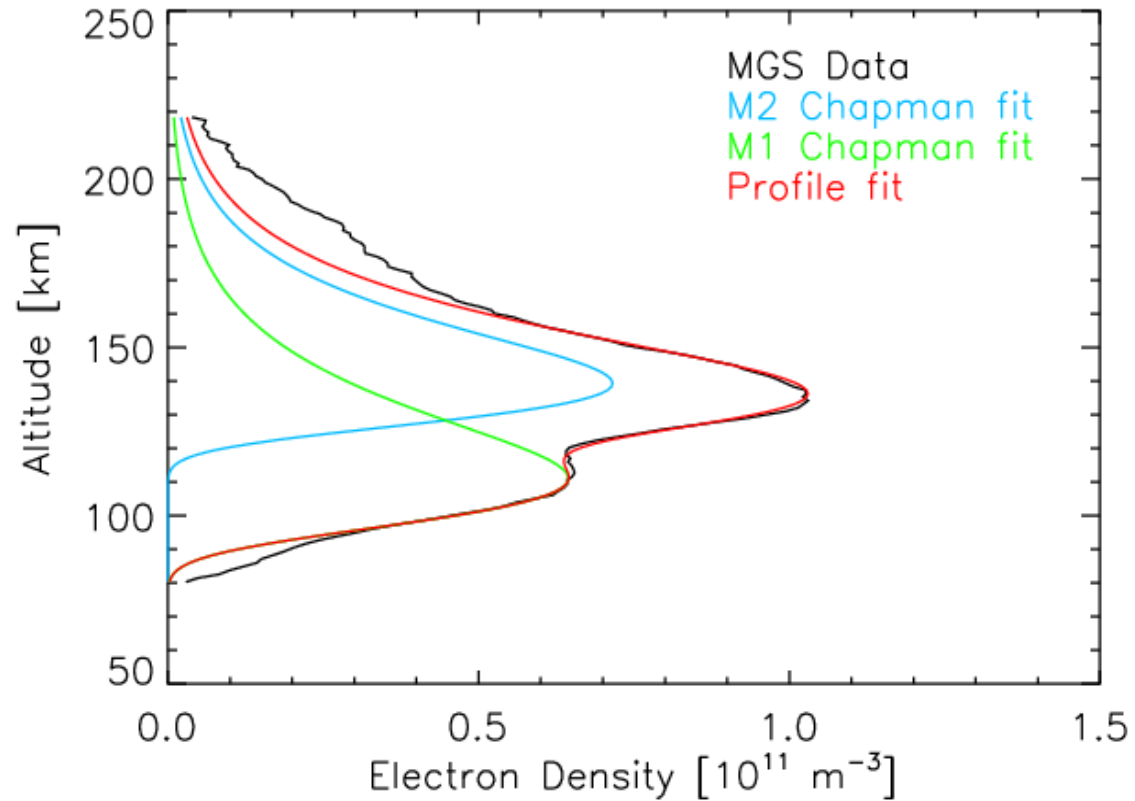
Paul Withers  
withers@bu.edu

MEX/VEX RS team meeting  
Cologne, Germany  
2012.01.11-13

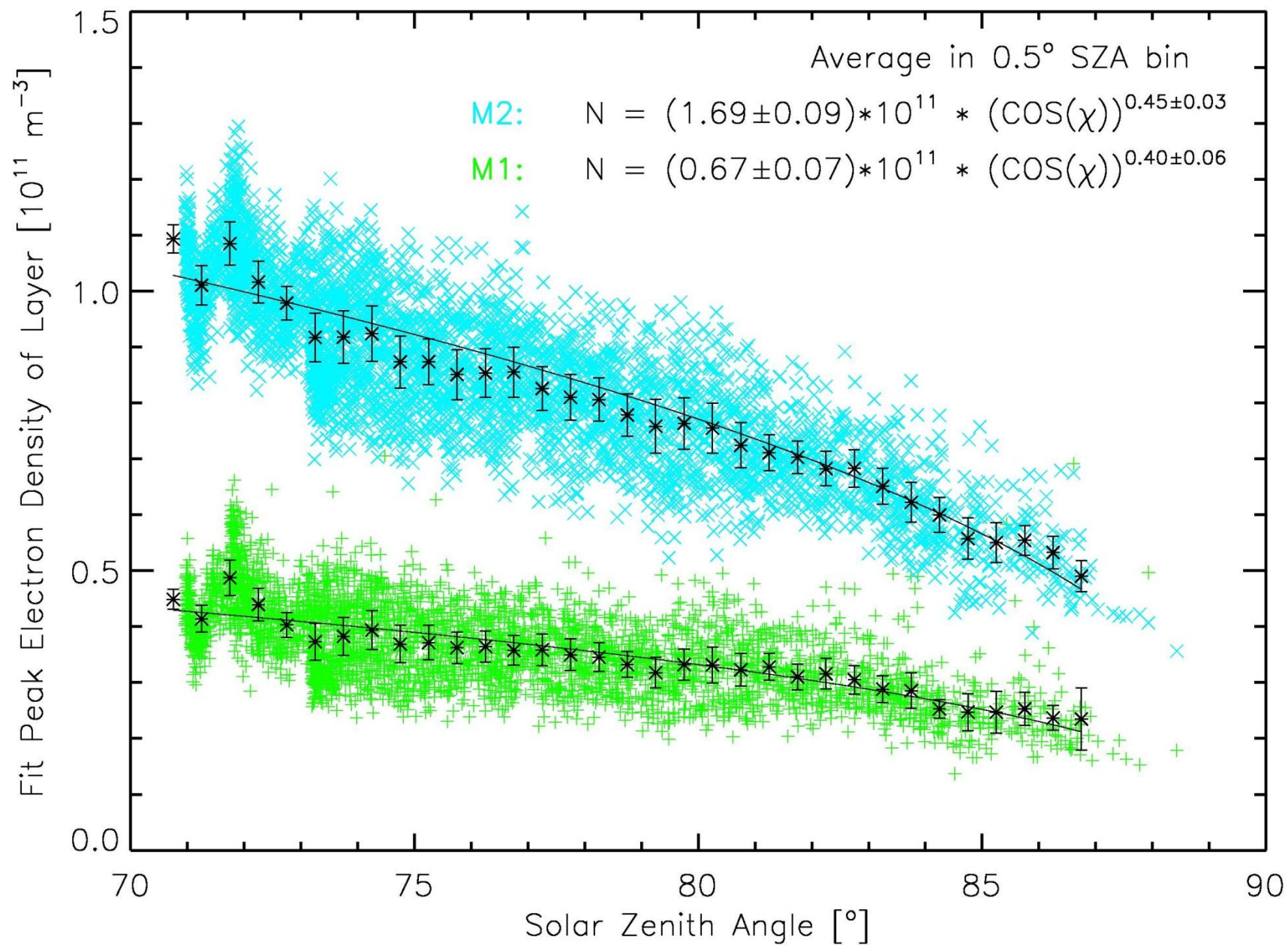
# Mariner 9 profiles recovered!

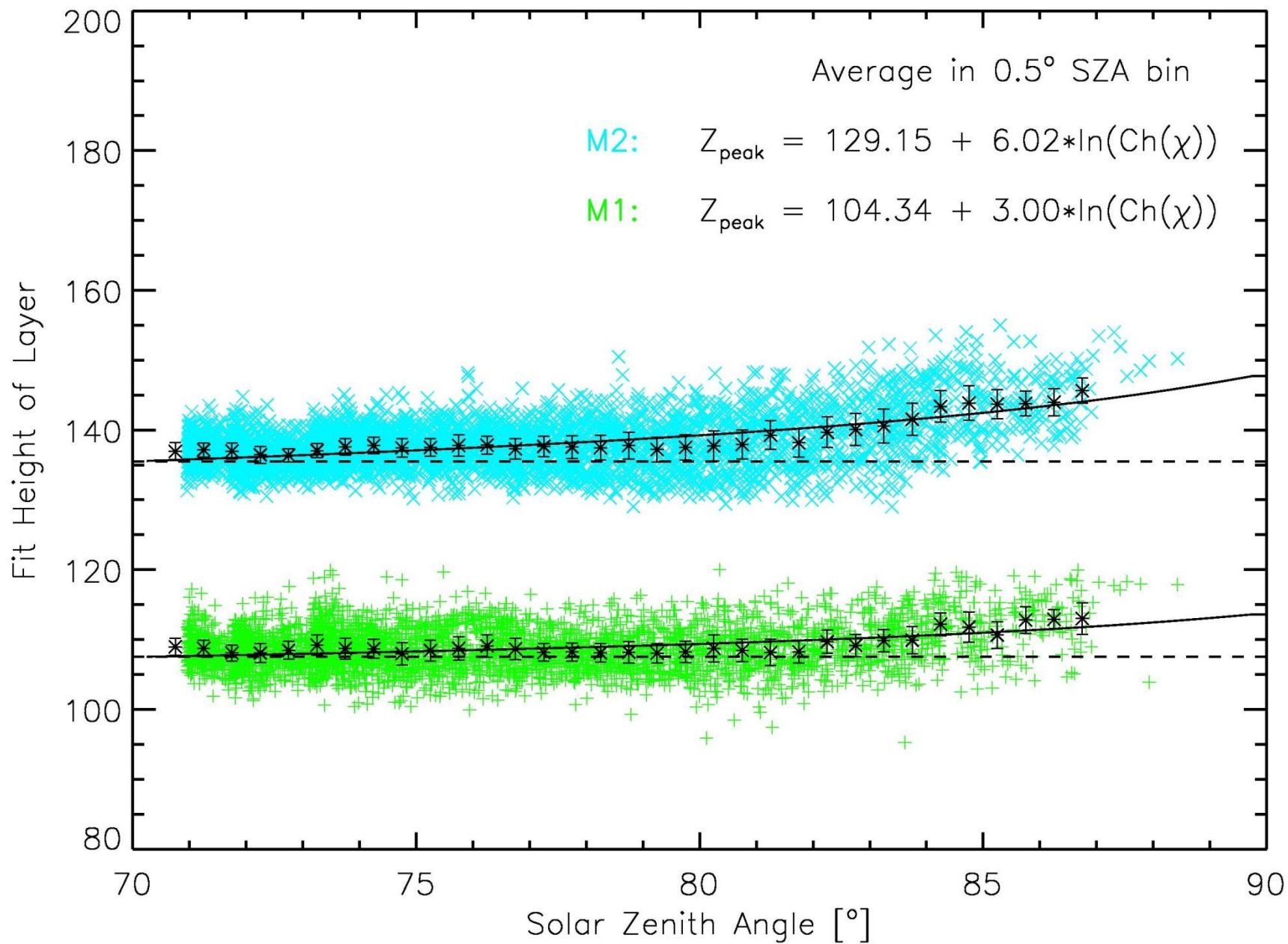


# Comparing M1 and M2 layers (Katy Fallows)

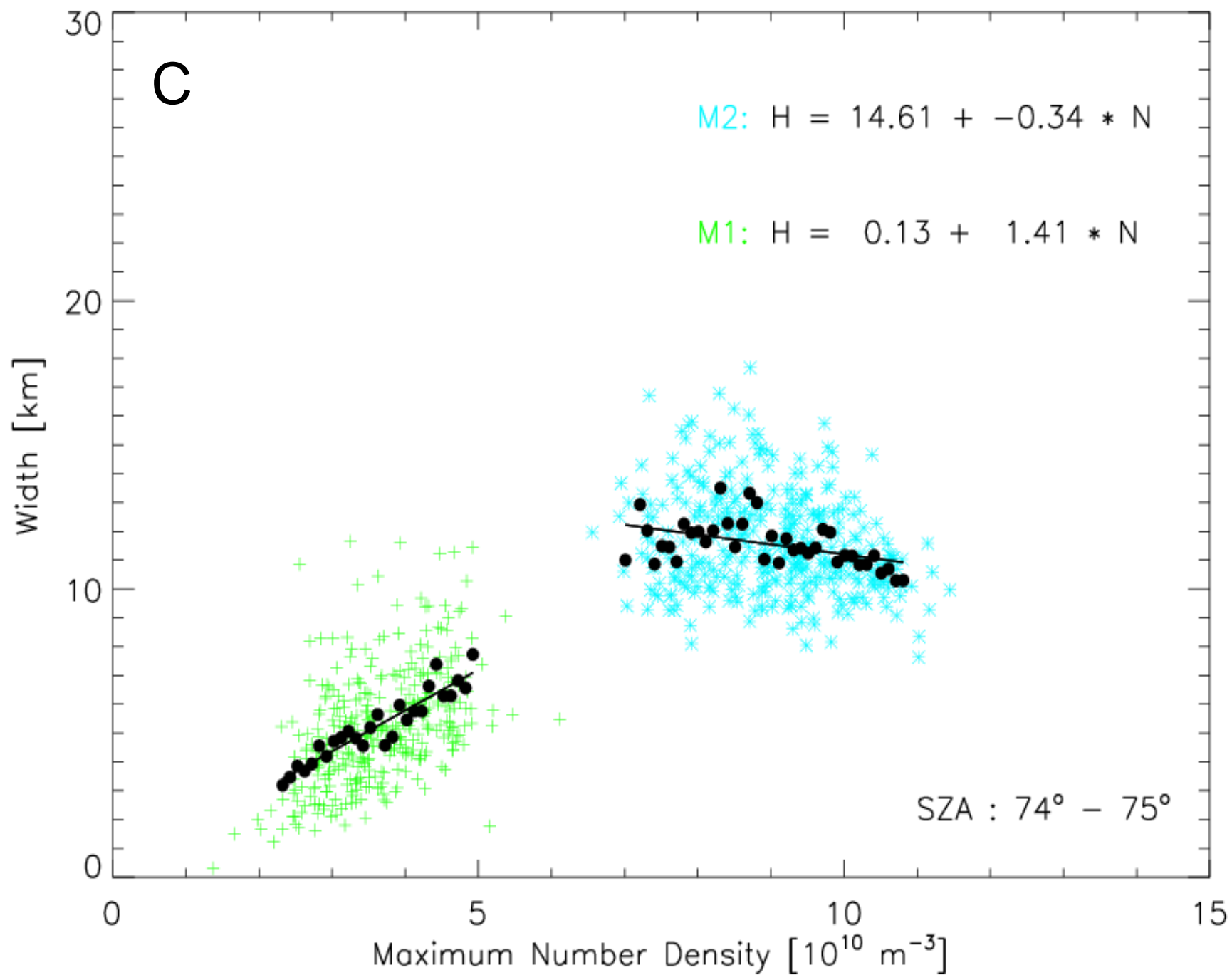


$$\begin{array}{c} \text{---} \\ \text{---} \end{array} \left( \text{---} \right) + \left( \text{---} \right)$$

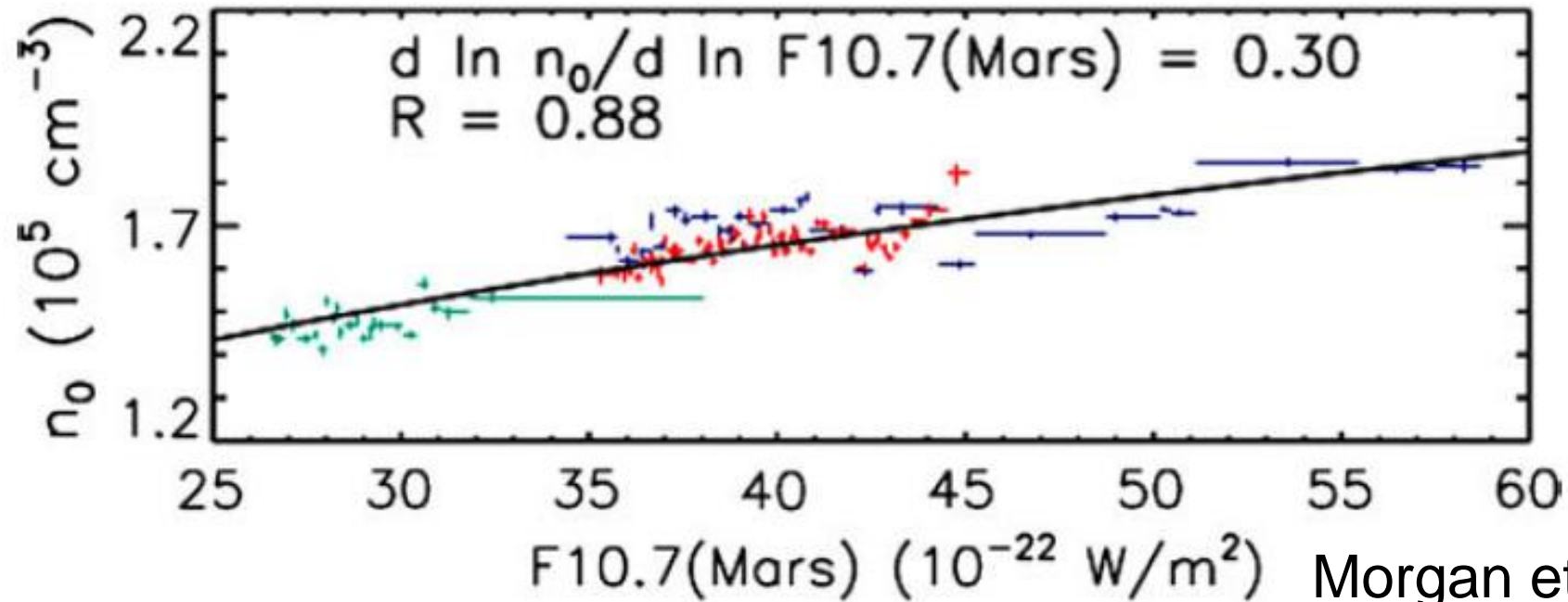








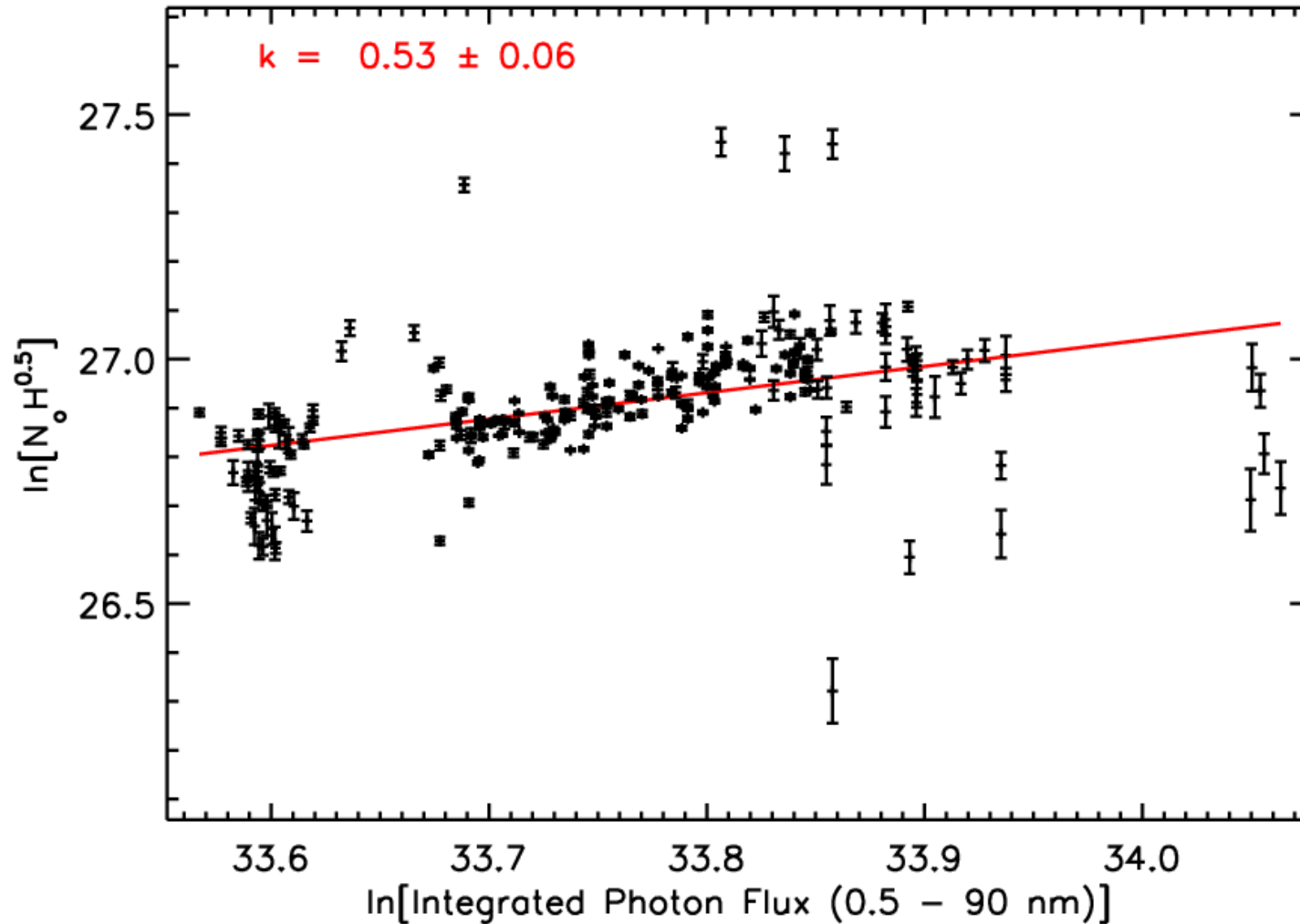
# How Chapmanlike? (Zachary Girazian)



Morgan et al.  
(2008) MARSIS

$$N_o = \sqrt{\frac{F}{\alpha e H}} \quad N_o H^{0.5} \propto F^k \quad \text{k should be 0.5}$$

# What is best proxy for F?



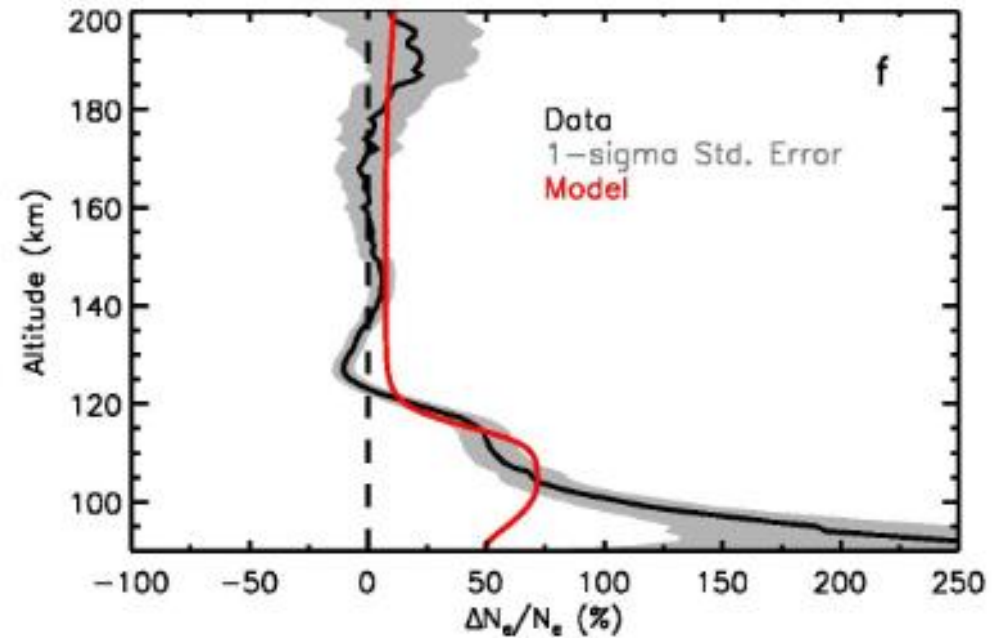
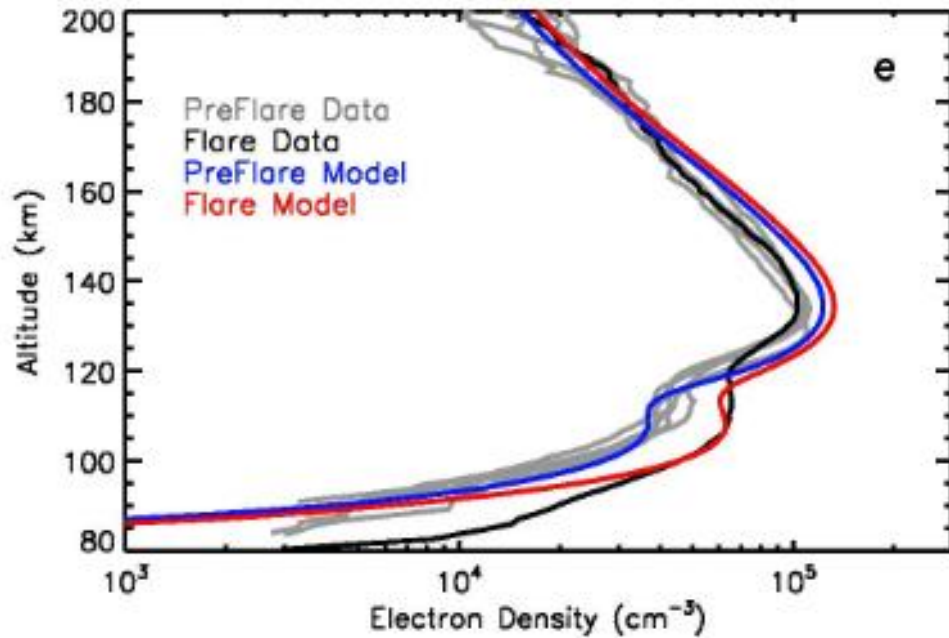
MEX data for  
SZA < 80

Caution!  
Best fit value for  
k keeps changing  
whenever we  
modify anything

Preliminary at best



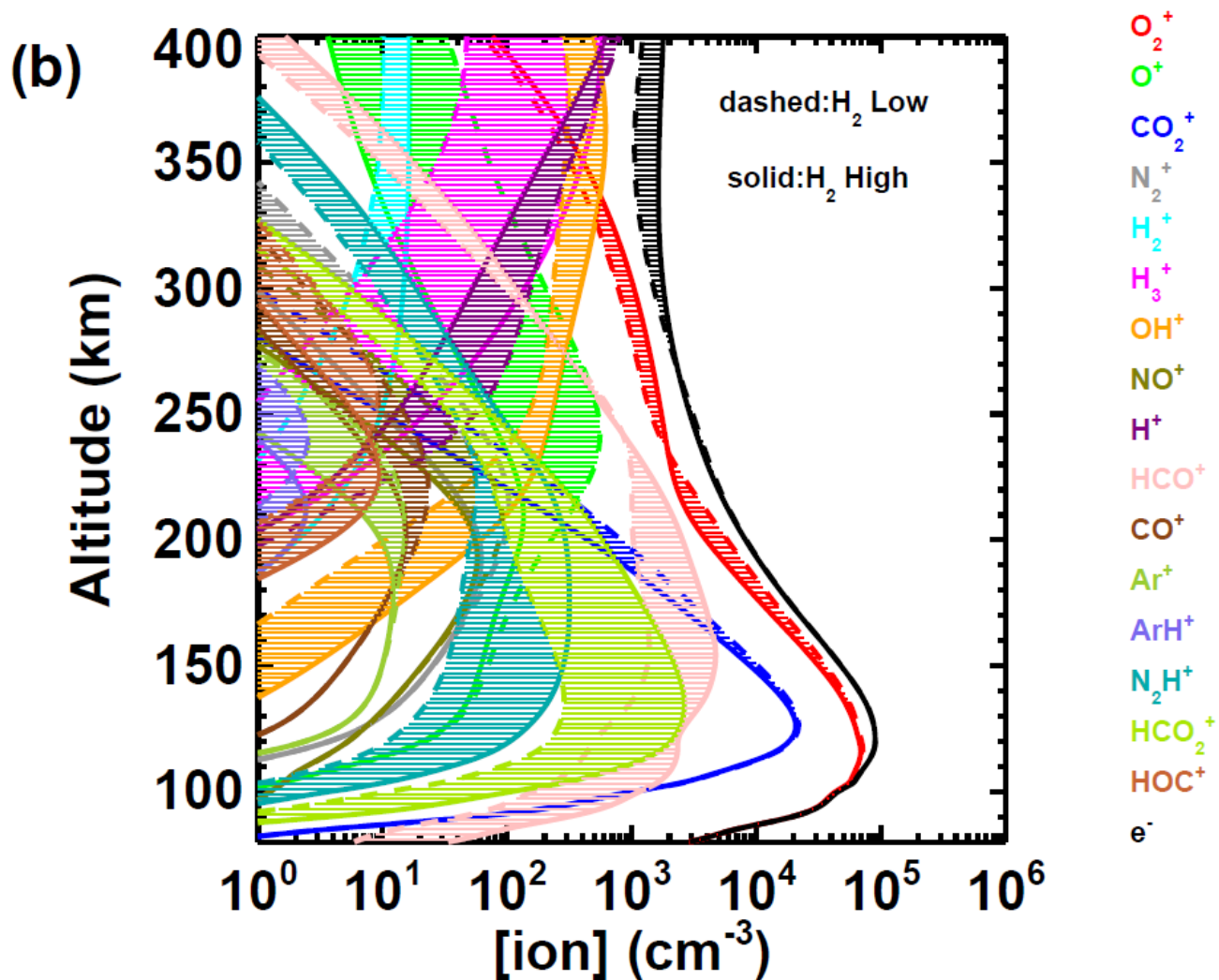
# Response to solar flares



Lollo et al. manuscript submitted to  
JGR-Space Physics on 22 November



# Chemical composition (Majd Matta)



$\text{O}_2^+$   
 $\text{O}^+$   
 $\text{CO}_2^+$   
 $\text{N}_2^+$   
 $\text{H}_2^+$   
 $\text{H}_3^+$   
 $\text{OH}^+$   
 $\text{NO}^+$   
 $\text{H}^+$   
 $\text{HCO}^+$   
 $\text{CO}^+$   
 $\text{Ar}^+$   
 $\text{ArH}^+$   
 $\text{N}_2\text{H}^+$   
 $\text{HCO}_2^+$   
 $\text{HOC}^+$   
 $e^-$

What happens if we add H-species into our model?

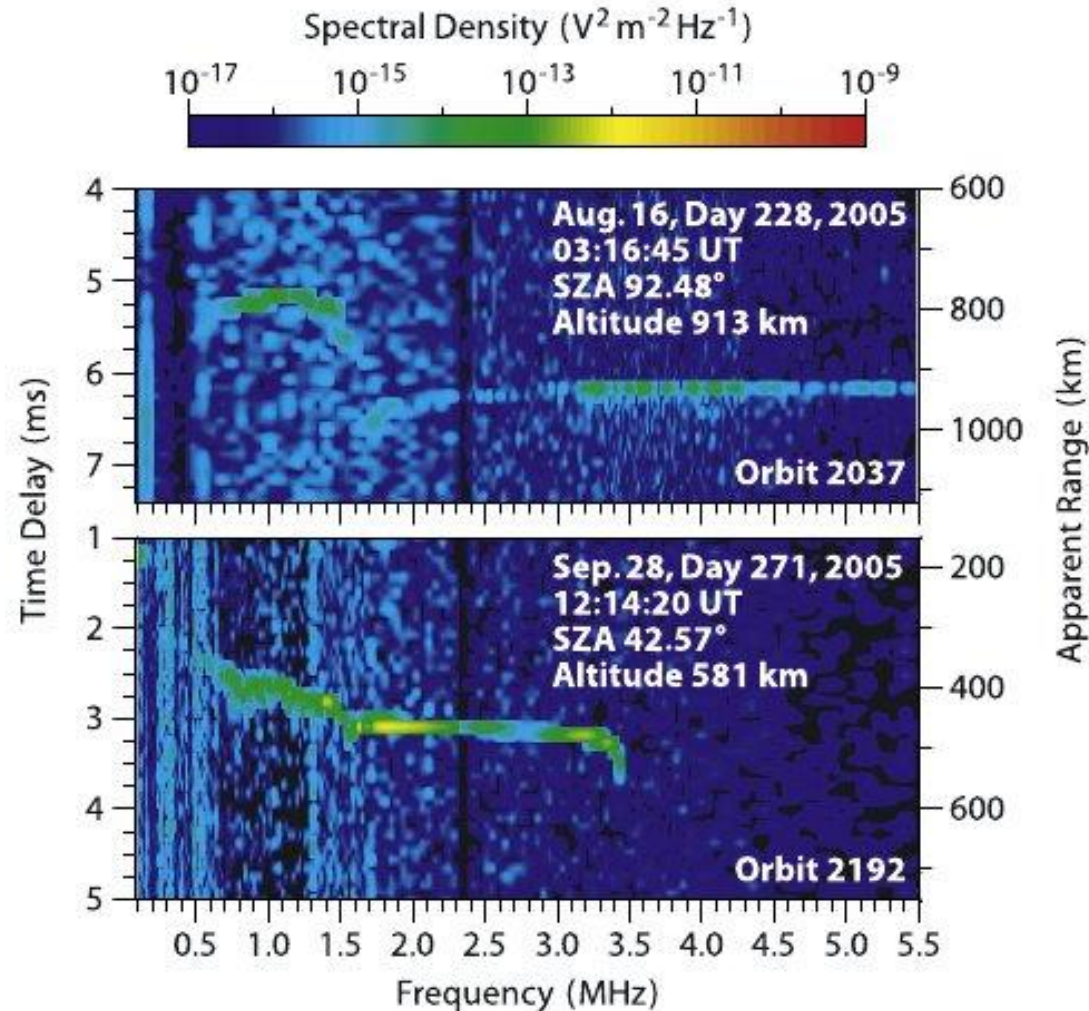
Uncertainties in  $\text{H}_2$  content and in a key reaction rate ( $\text{H}^+ + \text{H}_2 \rightarrow \text{H}_2^+ + \text{H}$ )

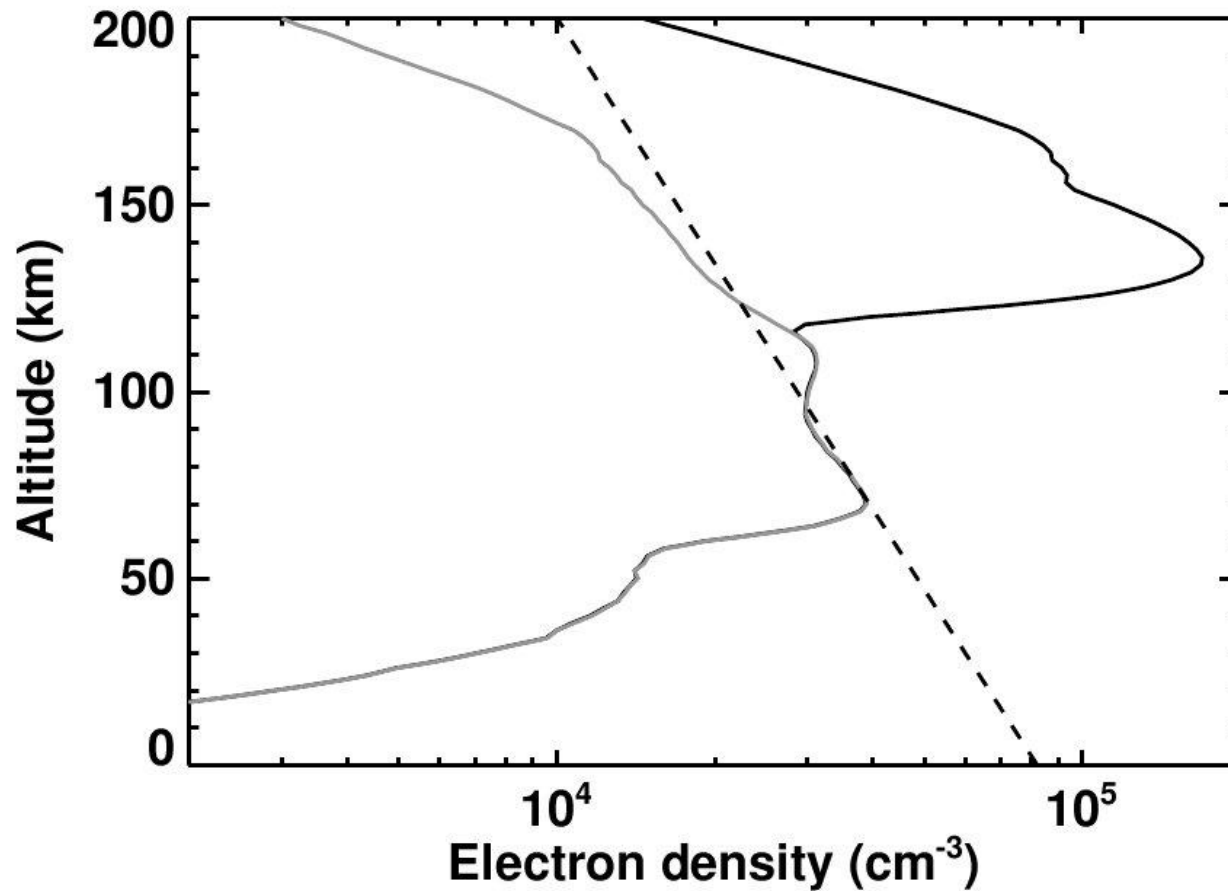
For some regions of parameter space, we find  $\text{OH}^+$  and related species dominant at high altitudes

Differs from the usual  $\text{O}_2^+$  and  $\text{O}^+$  dominance

Preliminary!

# MARSIS gets blacked out during solar energetic particle (SEP) events





Simulations for an SEP event with and without photoionization  
Dashed line is simple approximation (I think it does very well!)

Enhanced plasma at 70-100 km

Enhanced TEC

Massive radio wave absorption for MARSIS

Sheel et al. manuscript submitted to JGR-Space Physics on 15 Dec.  
(Needed some complicated simulations from Haider's group)