

SAMI3/RCM SIMULATION STUDY OF THE MARCH 31, 2001 STORM

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THE POTENTIAL EQUATION

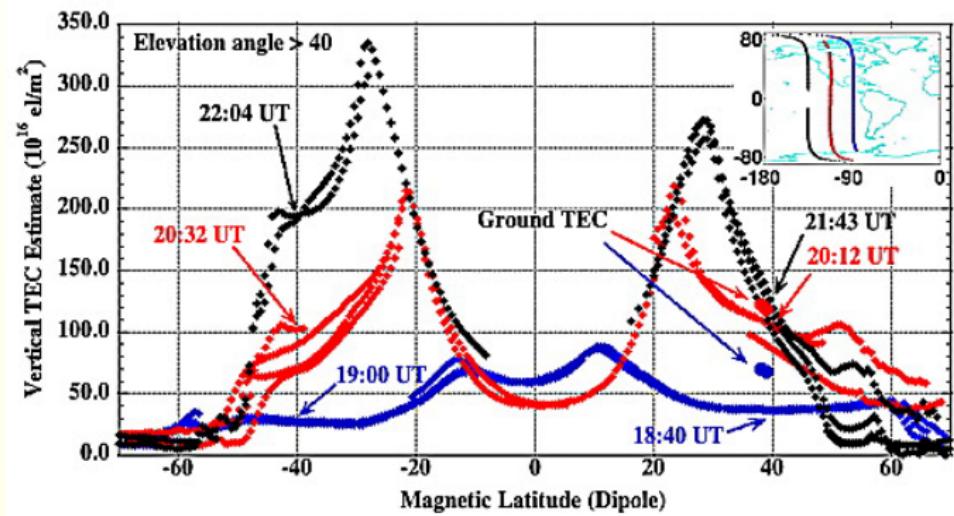
primary influence of storm-time dynamics on the ionosphere/plasmasphere system

$$\nabla \cdot \Sigma \nabla \Phi = S(V_n, J_{\parallel})$$

- penetration electric field
 - $S(V_n, J_{\parallel}(t))$
 - time scale: mins
- stormtime dynamo electric field
 - $S(V_n(t), J_{\parallel})$
 - time scale: hrs

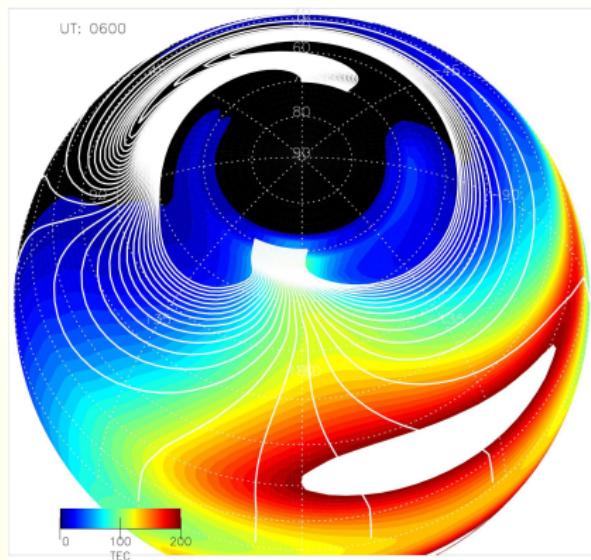
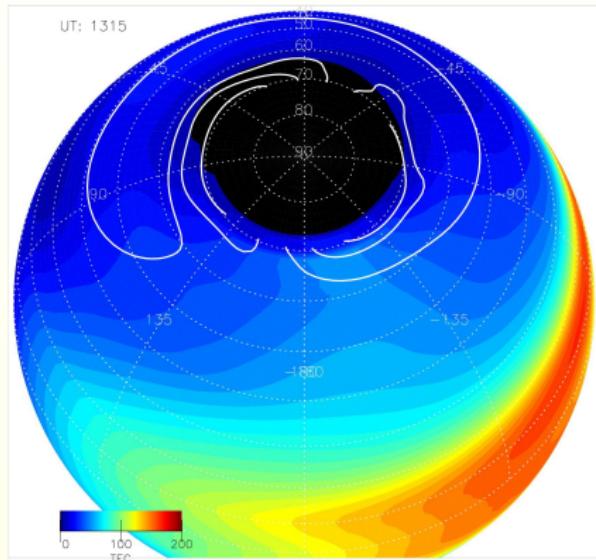
PENETRATION ELECTRIC FIELD

stormtime impact on ionosphere (Mannucci et al., GRL, 2005)



PENETRATION ELECTRIC FIELD

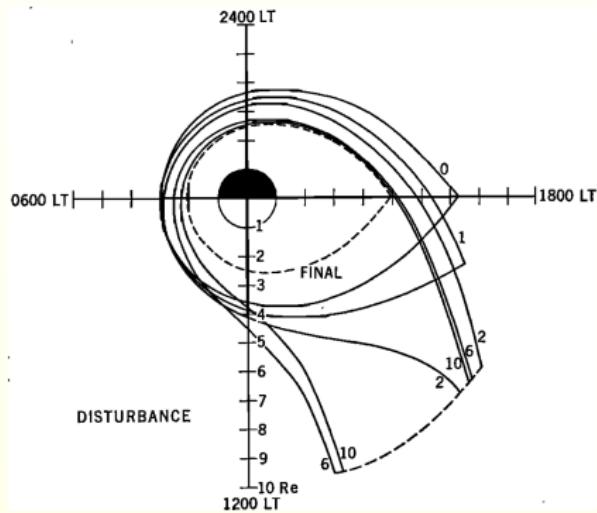
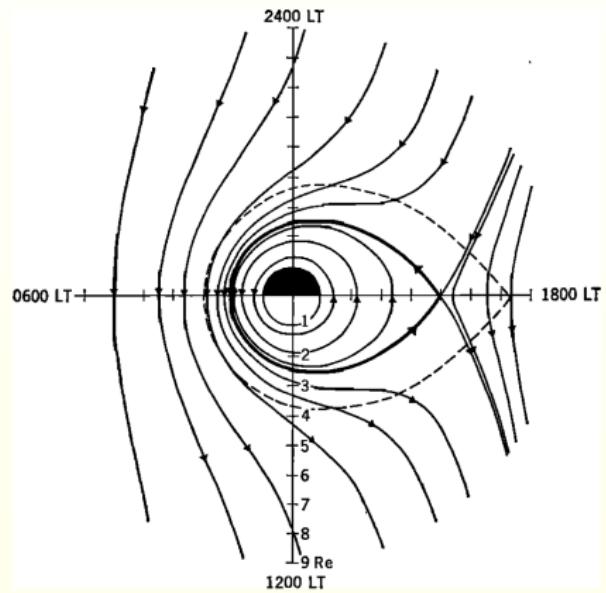
SAMI3/RCM: quiet time vs stormtime



$$\nabla \cdot \underbrace{\sum_{\text{SAMI3}} \nabla \Phi}_{\text{HWM}} = S(\underbrace{V_n}_{\text{HWM}}, \underbrace{J_{||}}_{\text{RCM}})$$

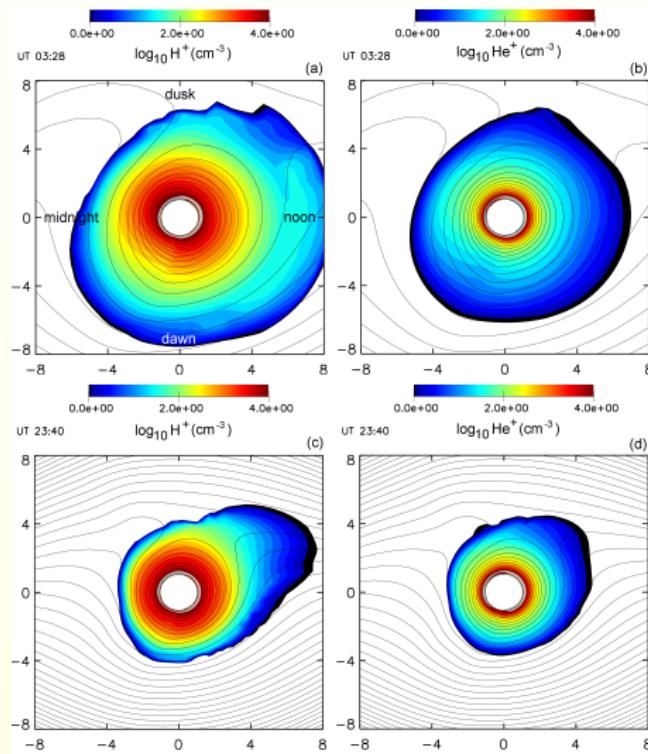
PLASMAPAUSE DYNAMICS

stormtime response (Grebowsky, JGR, 1970)

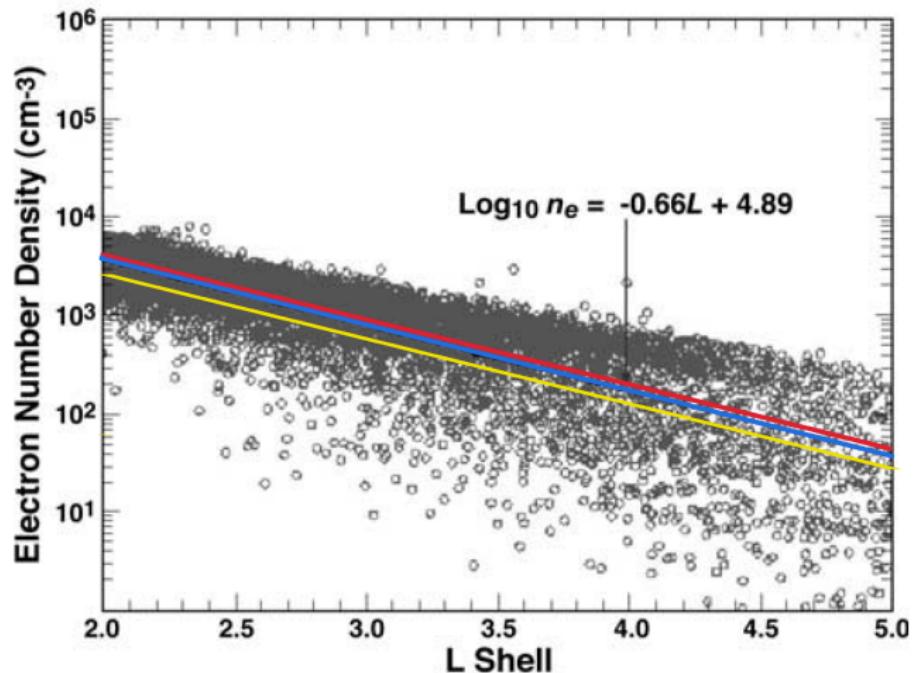


H^+/He^+ CONTOURS

(Huba and Krall, GRL, 2013)

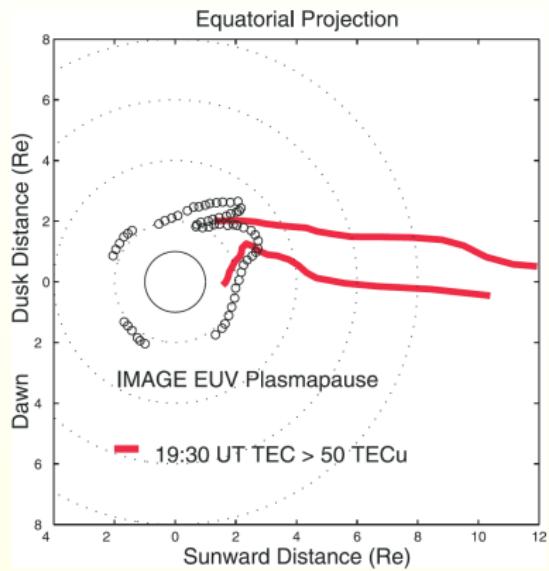
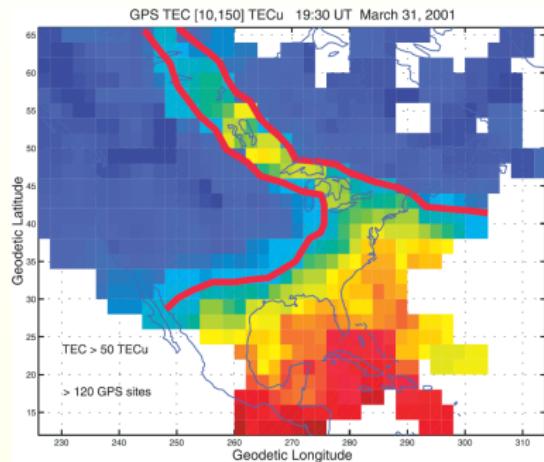


ELECTRON DENSITY AND SAMI3 DATA



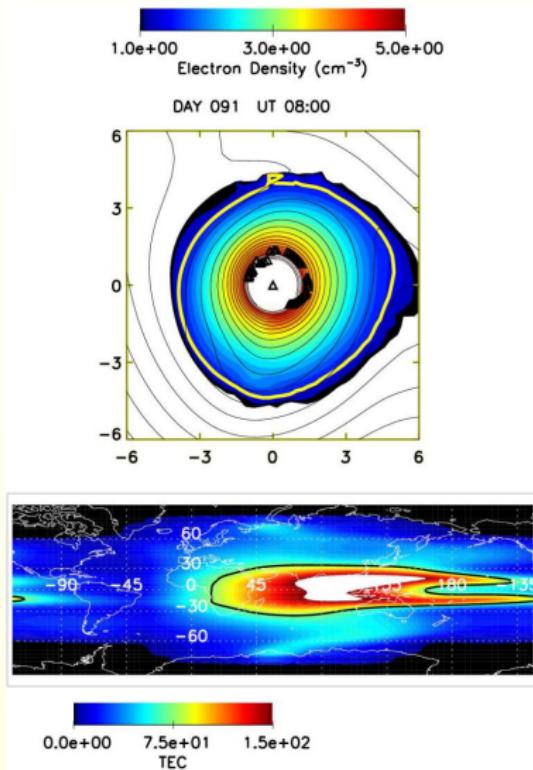
IONOSPHERE/PLASMAPAUSE SIGNATURES

march 31, 2001 storm: Foster et al., *Geophys. Res. Lett.*, 2002



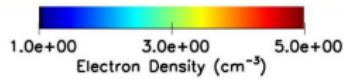
SAMI3/RCM

march 29, 2001 storm

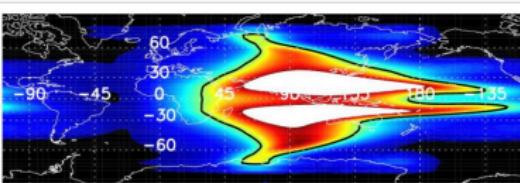
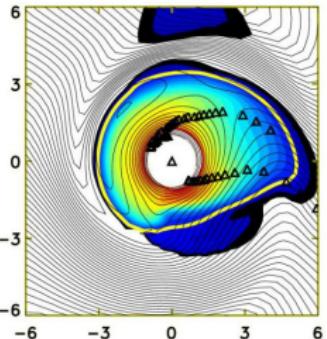


SAMI3/RCM

march 29, 2001 storm



DAY 090 UT 07:00



0.0e+00 7.5e+01 1.5e+02

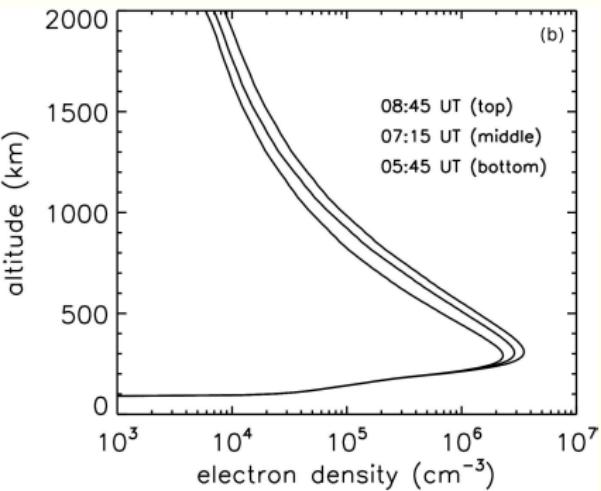
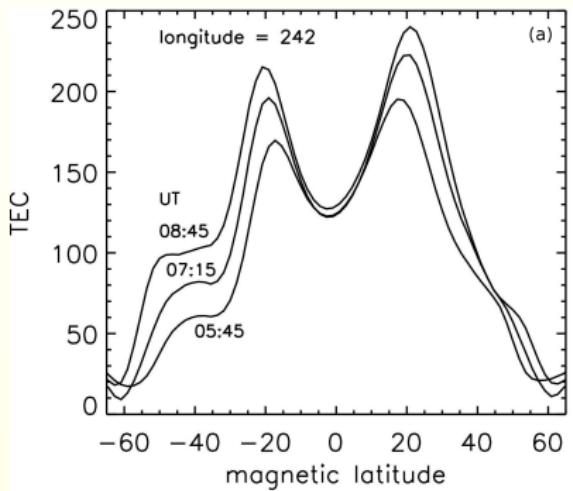
TEC

SAMI3/RCM

march 29, 2001 storm

SAMI3/RCM

march 29, 2001 storm - impact on TEC and electron density profile



SUMMARY

ionosphere/plasmasphere system

- quiet time: plasmasphere just an extension of ionosphere
(reasonably well-modeled by SAMI3/Weimer)
- stormtime: high latitude dynamics become important
 - penetration electric field
 - disturbance dynamo electric field
- effects
 - erosion of plasmasphere/plume development
 - stormtime enhanced density (SED) in mid- to high-latitude ionosphere
- some fundamental stormtime dynamics confirmed using SAMI3/RCM: relationship of SED and plume