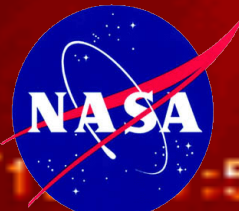


What Controls the Longitudinal Variability of Density Irregularity?

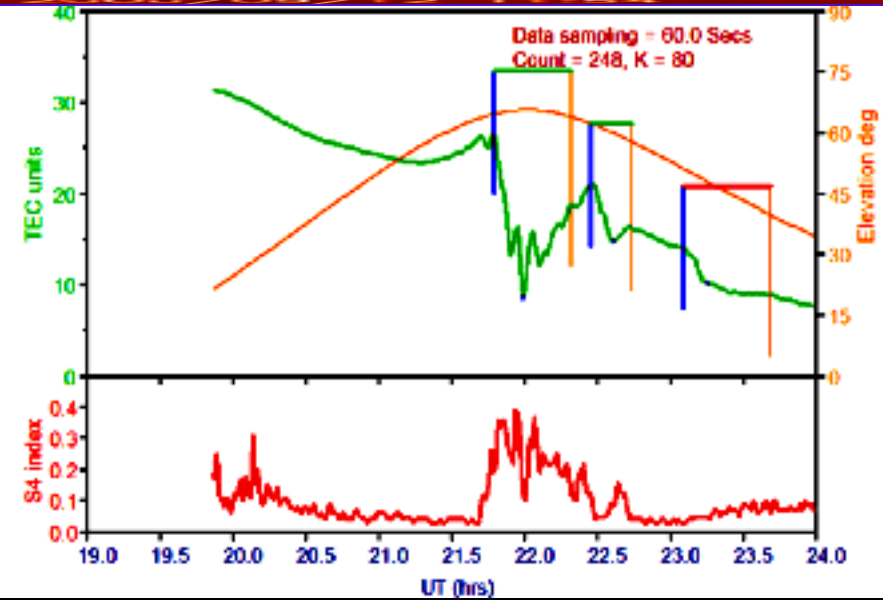
Endawoke Yizengaw

Institute for Scientific Research, Boston College, USA



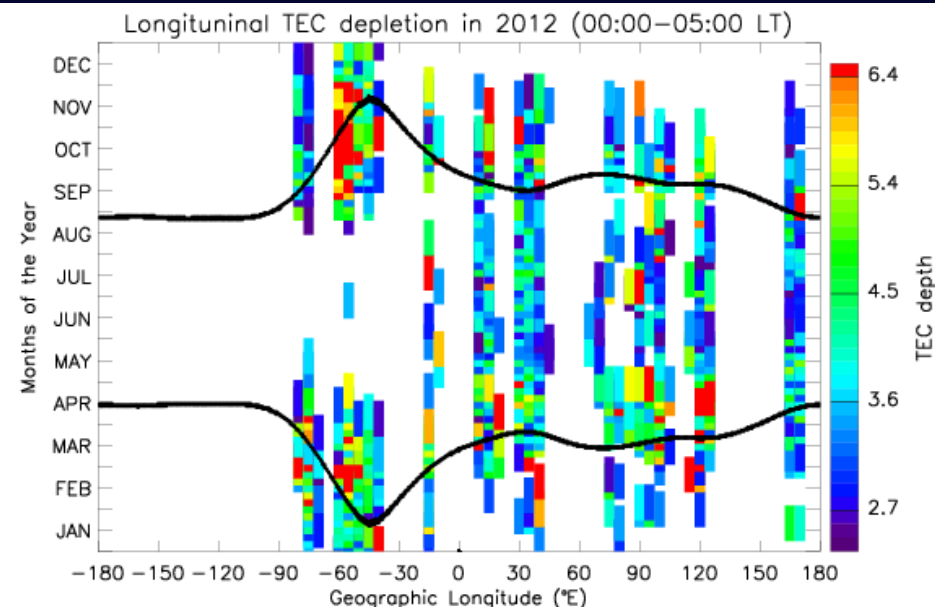
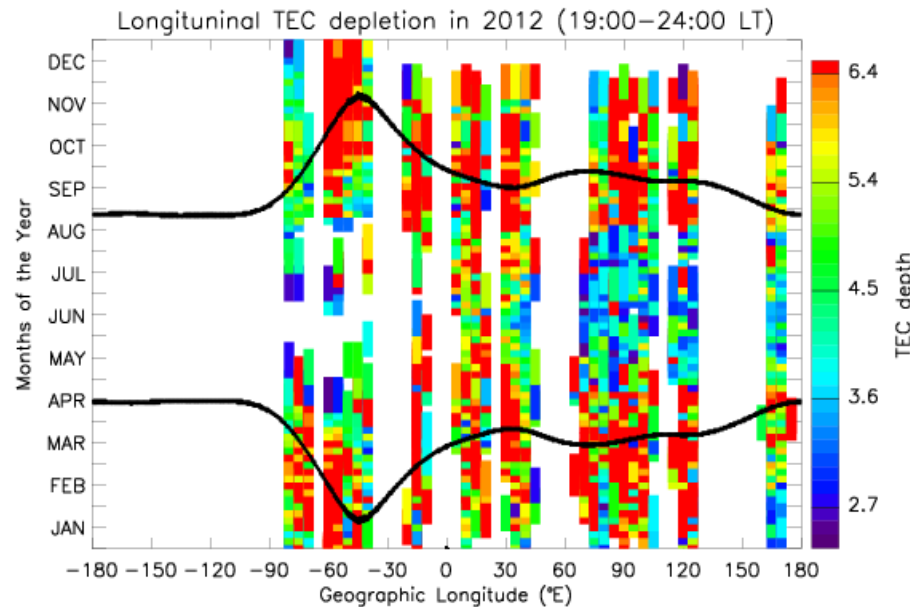
Longitudinal variability of bubbles

Bubble detection technique from the ground-based observations (Seemala et al., 2011)



Dusk sector (1900 – 2400 LT)

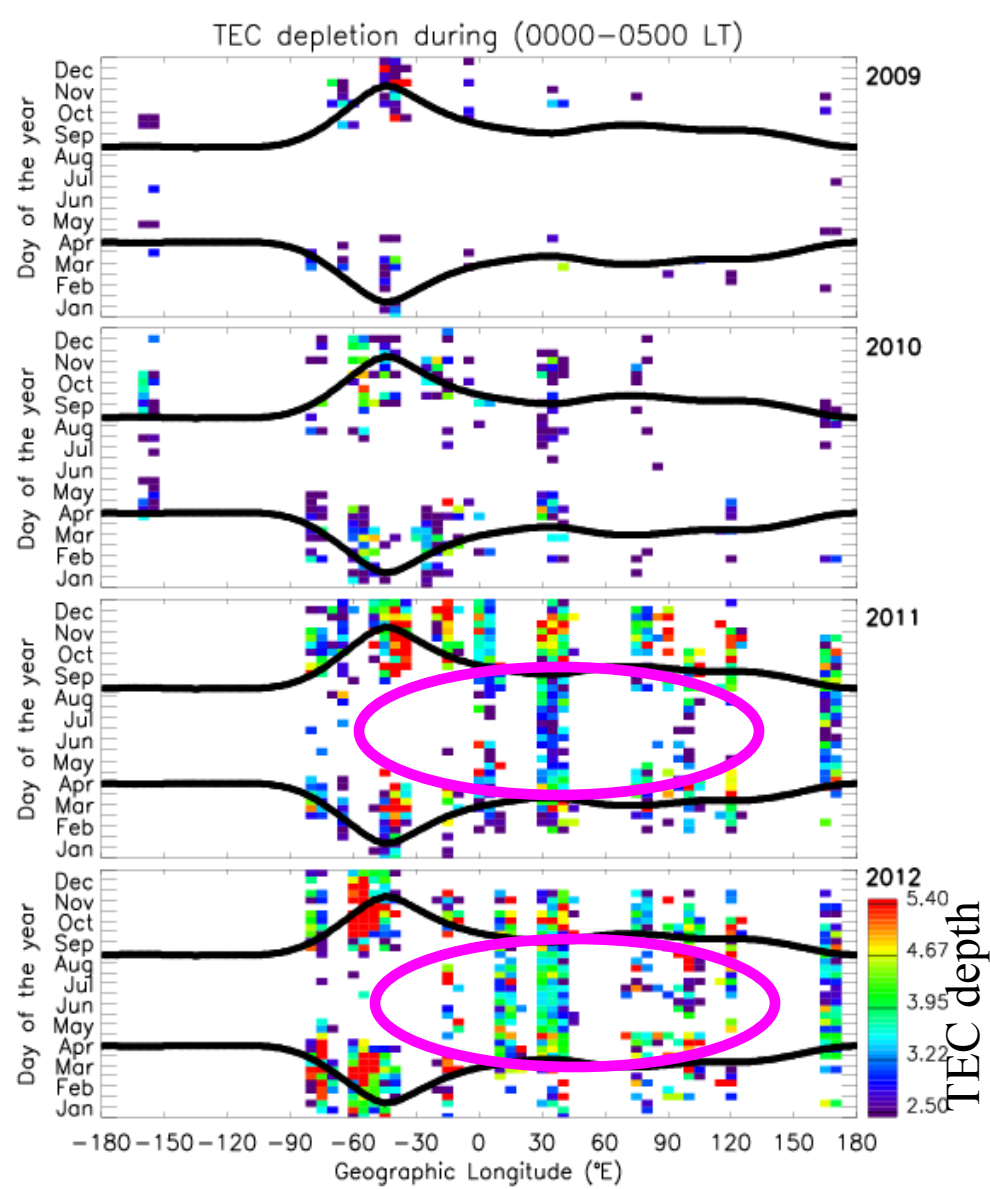
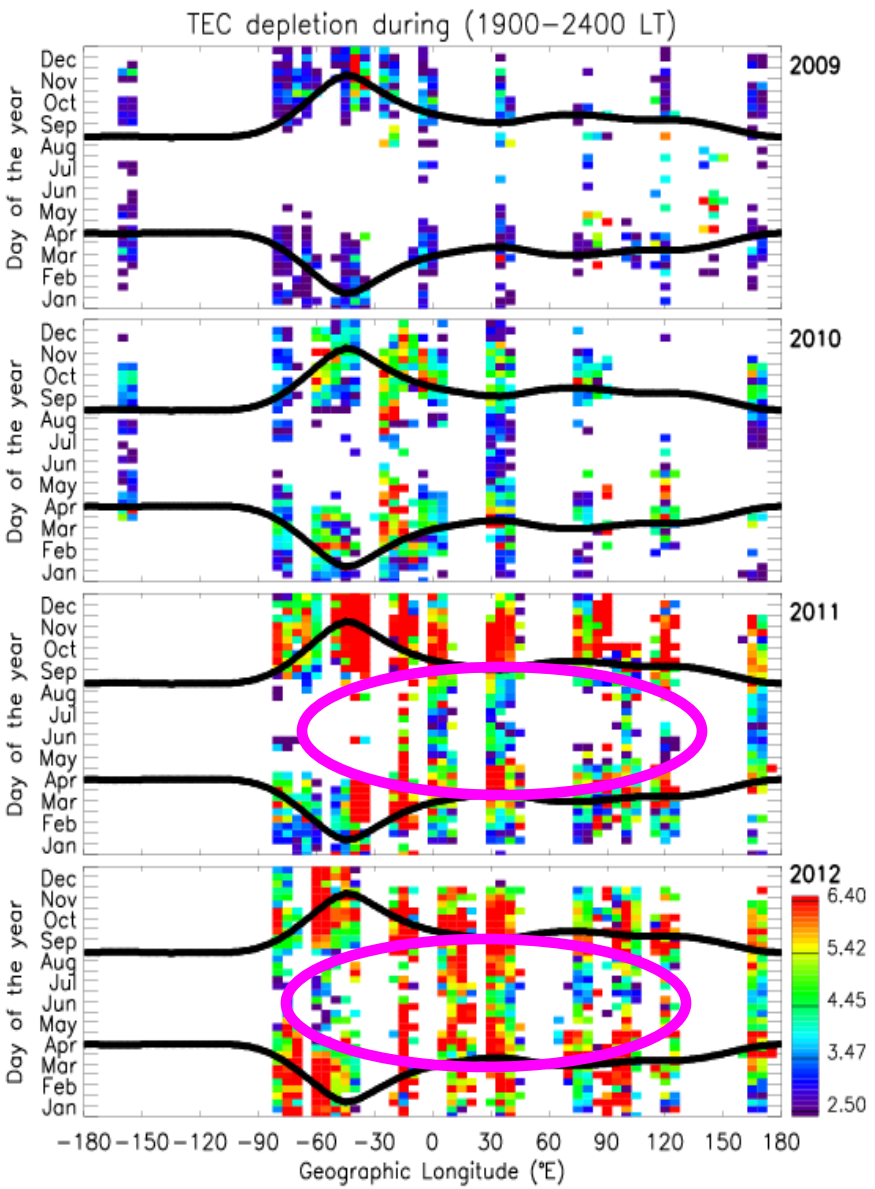
Dawn sector (0000 – 0500 LT)



Longitudinal variability of bubbles

Dusk sector (1900 – 2400 LT)

Dawn sector (0000 – 0500 LT)

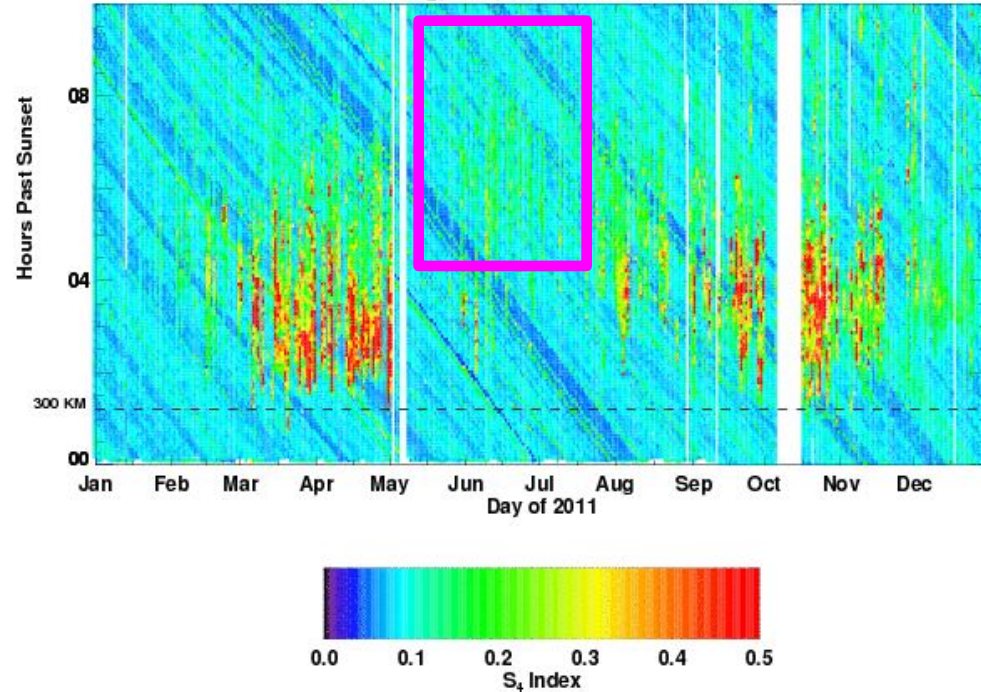


Sometimes GPS may not detect everything

250 MHz scintillation observations

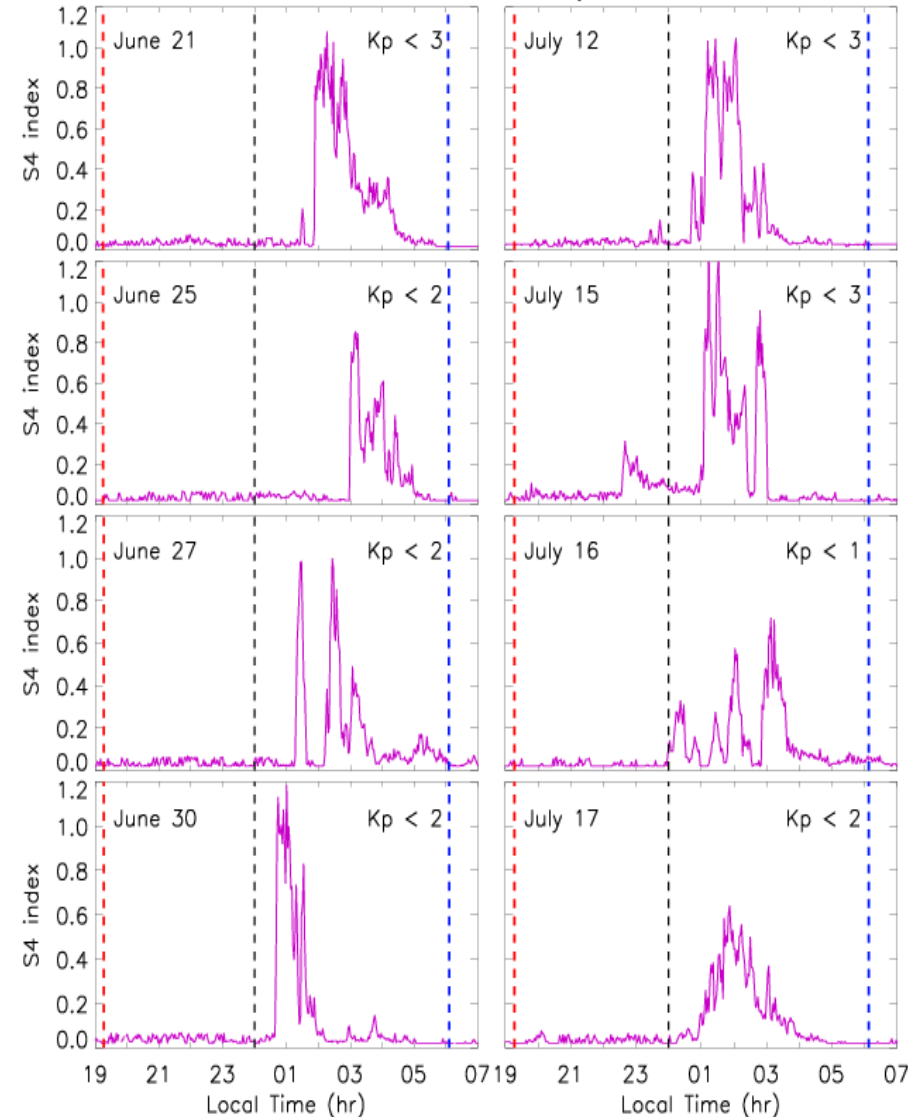
GPS scintillation observations

Hottest (> 30 deg) GPS Satellite from Nairobi : 2011



Courtesy to Keith Groves

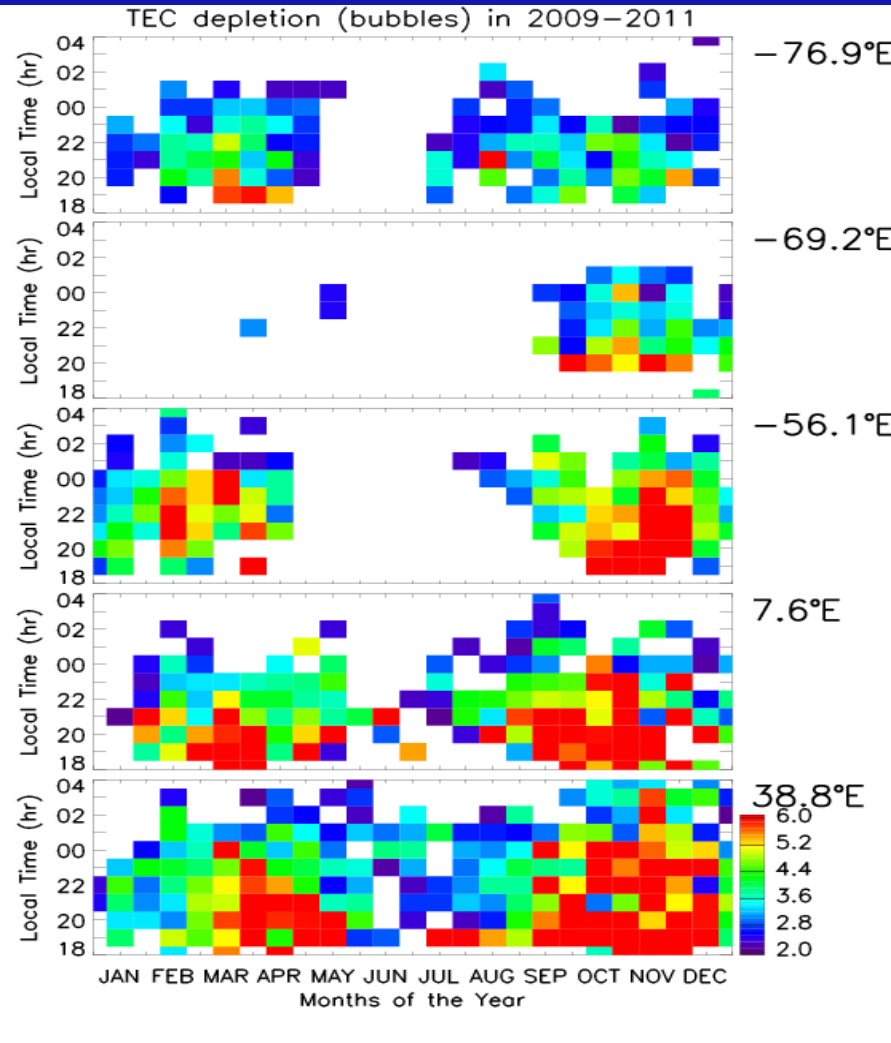
UHF Postmidnight Scintillation Observation in 2011 June Solstice from Nairobi, Kenya



Yizengaw et al., GRL, 2013

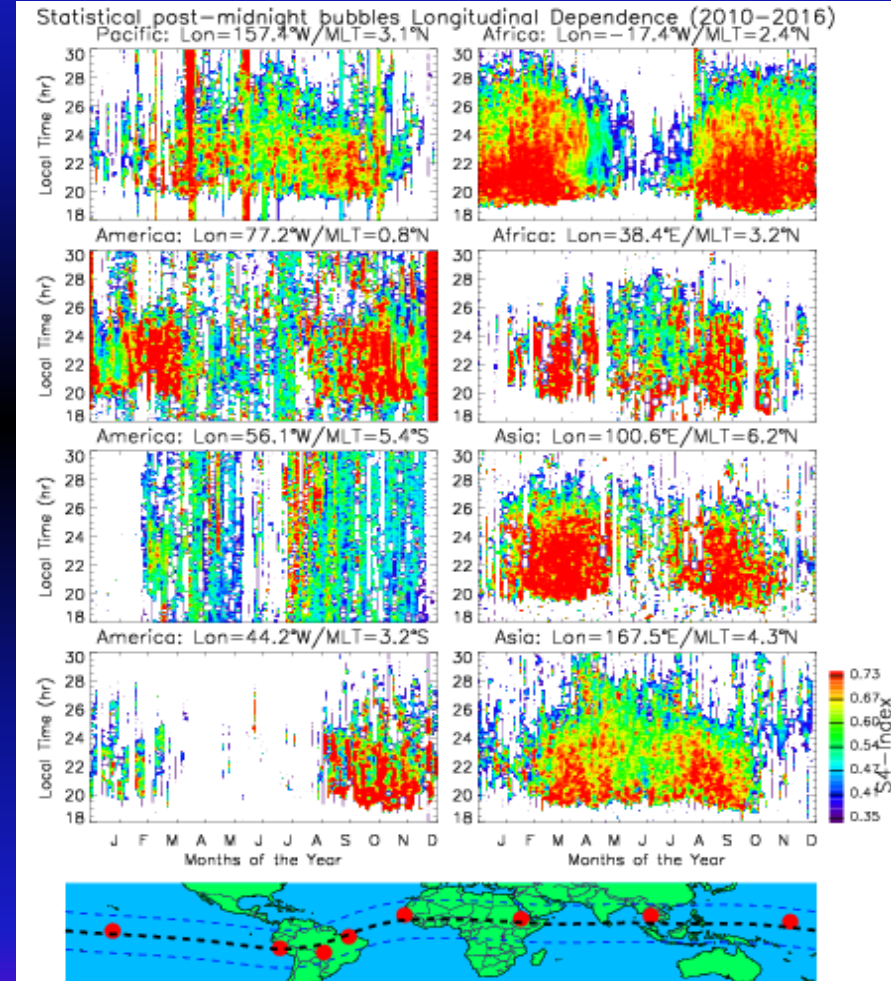
What controls the longitudinal and seasonal variability of ionospheric irregularities?

Bubbles extracted from TEC



Yizengaw et al., AG, 2014

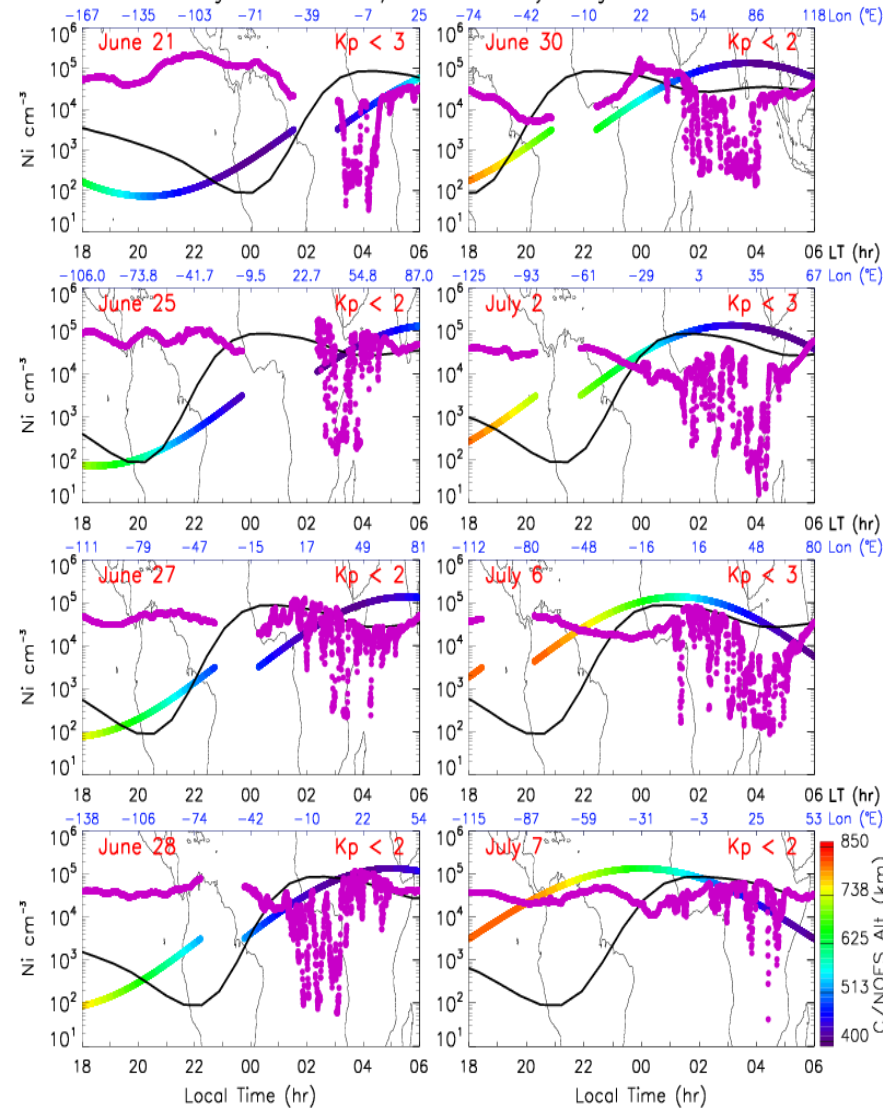
Scintillations from UHF receivers



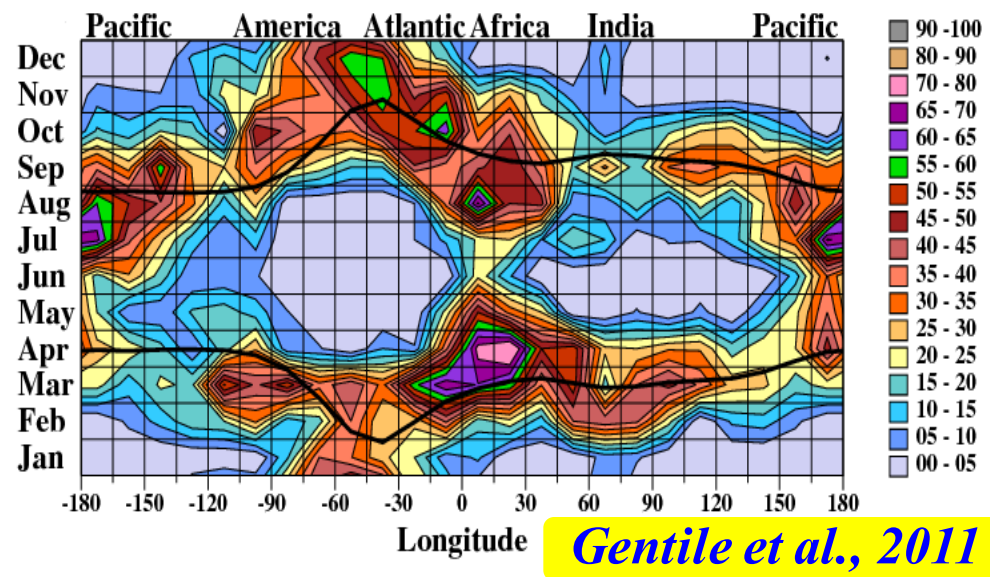
Yizengaw et al., 2017

Longitudinal variability of bubbles from space

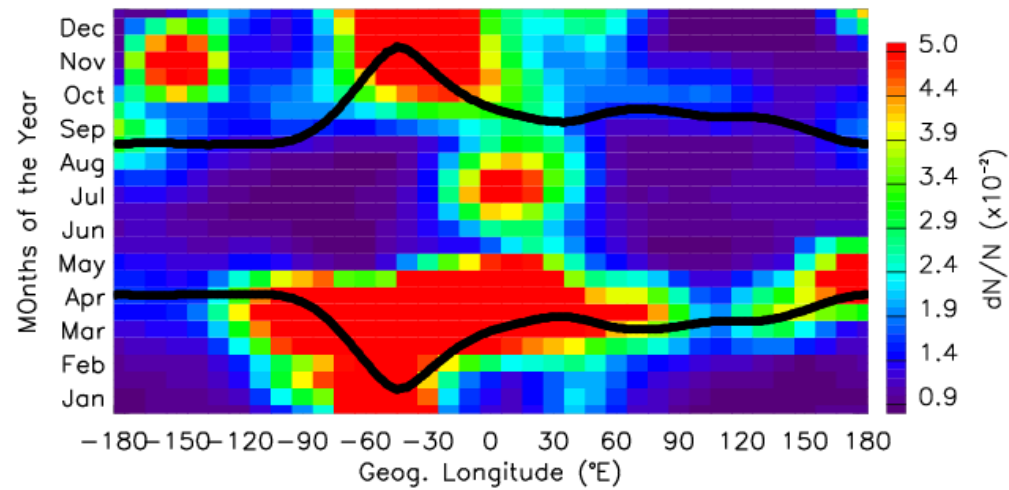
Postmidnight bubbles from C/NOFS PLP density during June Solstice in 2011



DMSF F15 Evening Sector EPBs 2000




19:00 – 24:00 Local Time



C/NOFS Observations

The question: Do the current models reproduce such distribution?

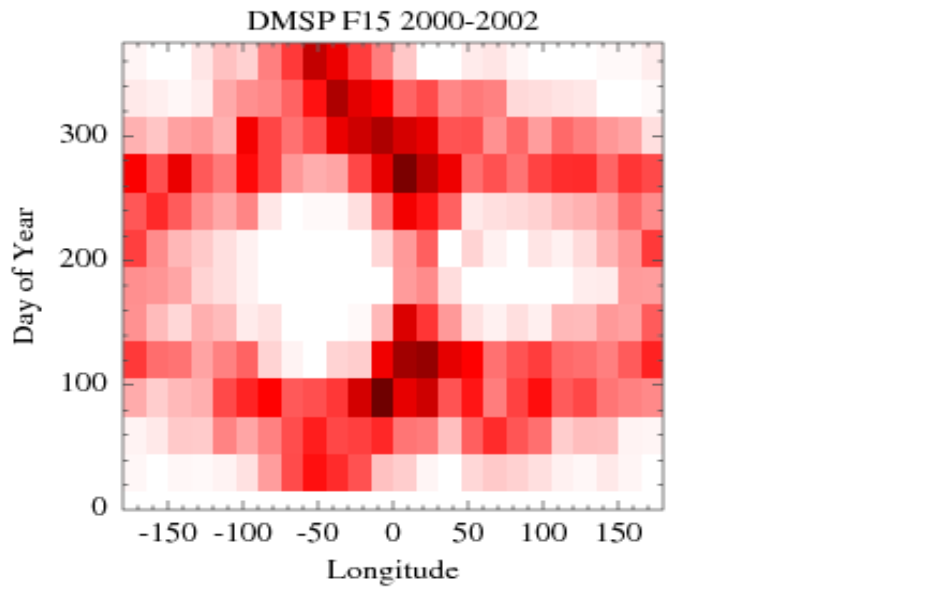
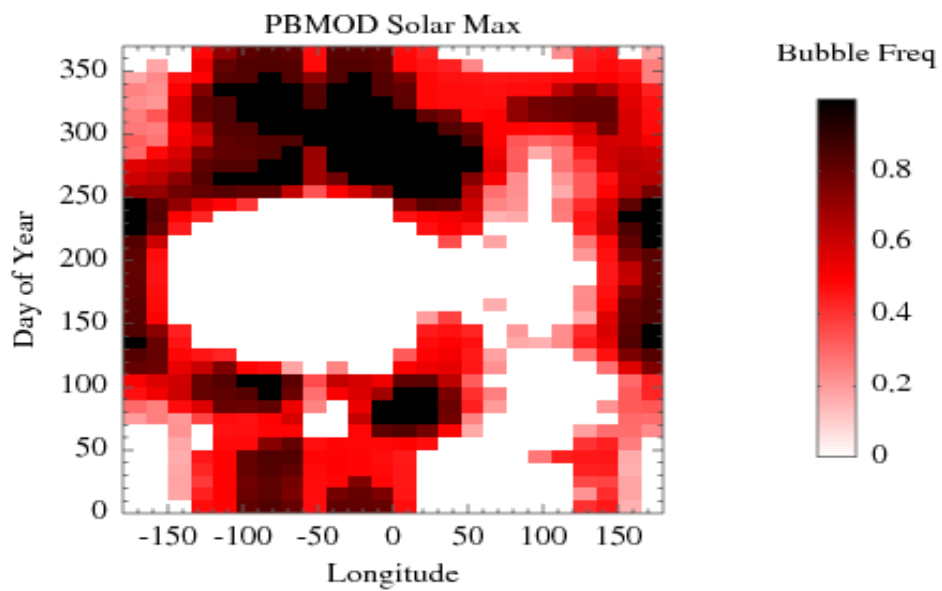


**Welcome to the CCMC's
Ionospheric Scintillation
Working Team!**

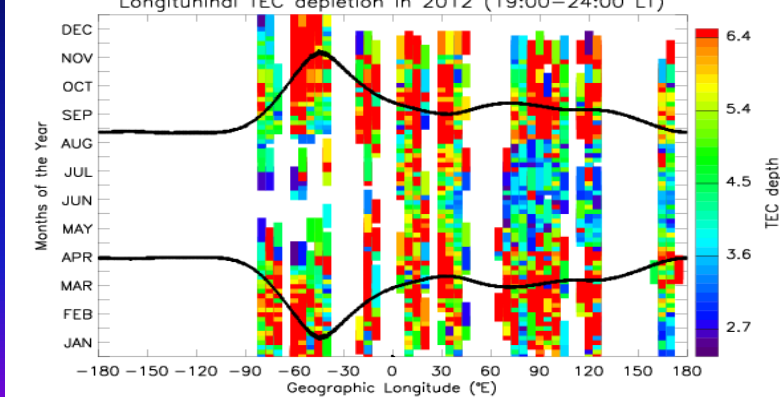
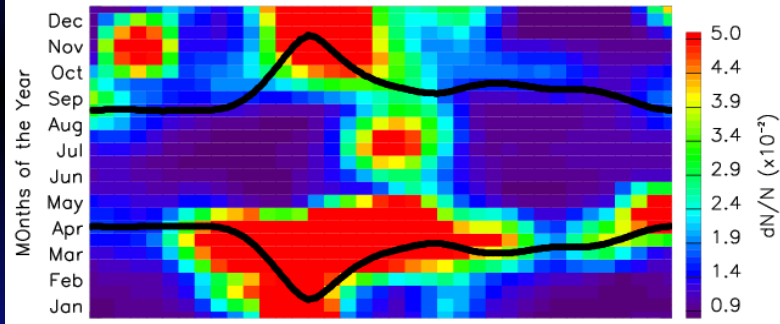
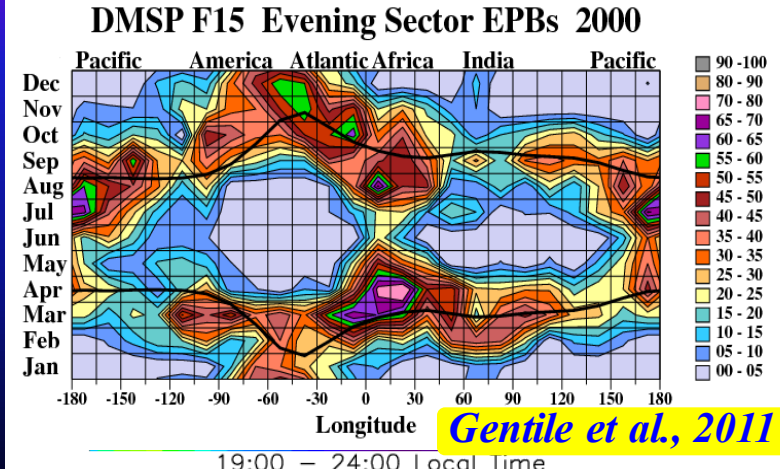
2000/09/12 11:54



Climatology Model Comparisons



Retterer et al.



Yizengaw et al., 2014

What do the modelers need to reproduce the day-to-day variability of Scintillation?

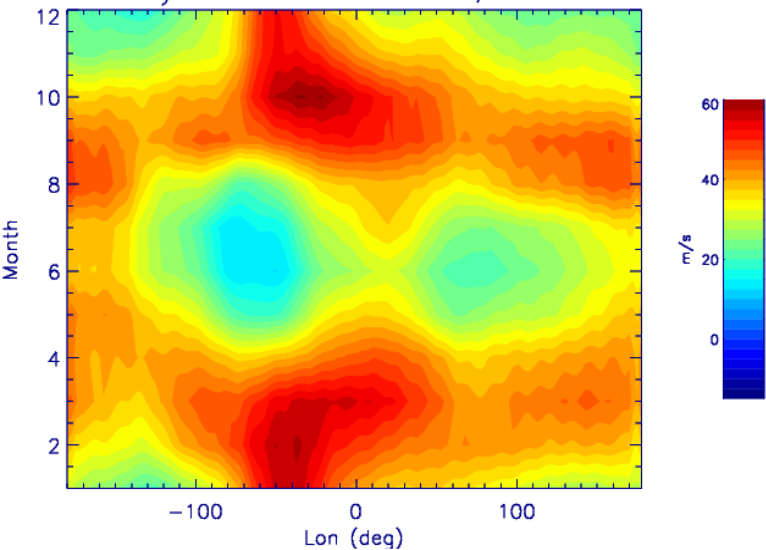
Day-to-day variability of

- ✈ Electric field**
- ✈ Neutral wind**
- ✈ Drivers from the lower atmosphere, e.g., gravity waves?**

Climatology Driver Models

Solar Maximum

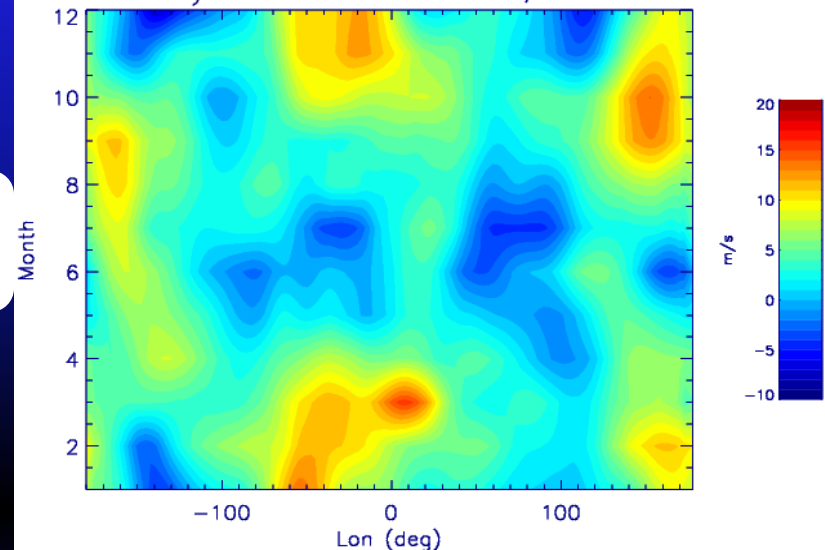
Monthly max PRE Wi 14S-14N, F107=200



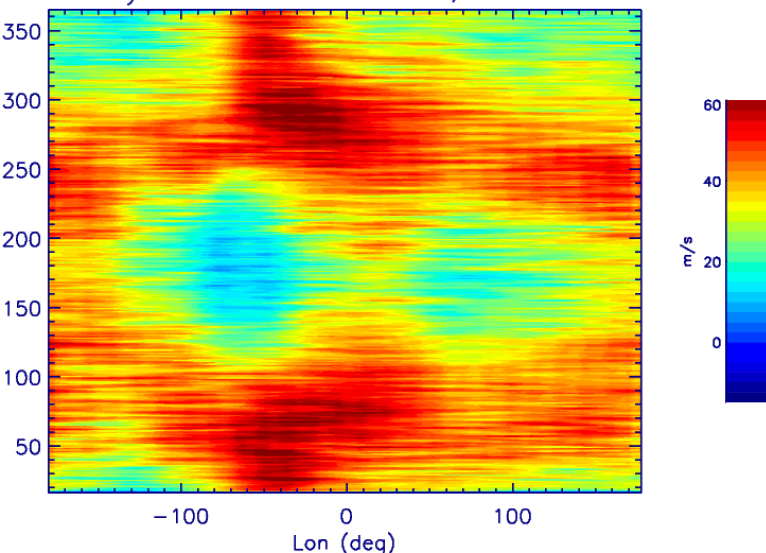
**Monthly PRE
maximum**

Solar Minimum

Monthly max PRE Wi 14S-14N, solar min

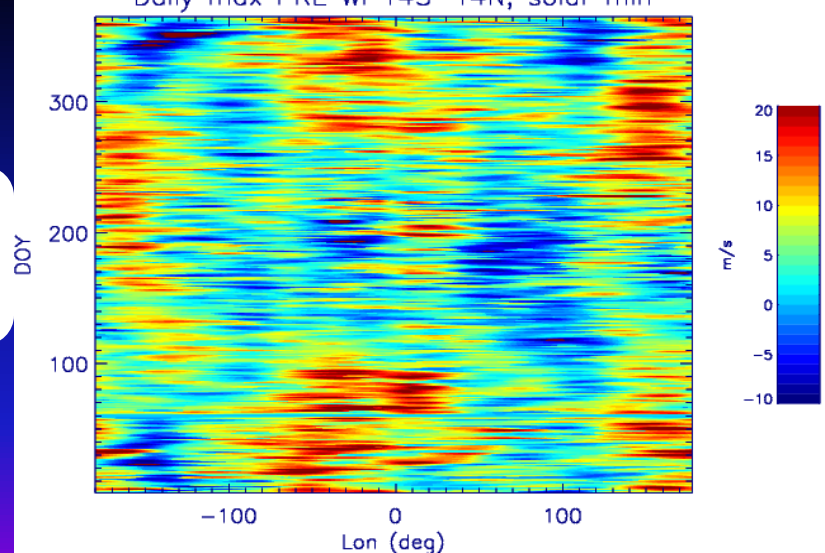


Daily max PRE Wi 14S-14N, F107=200



**Daily PRE
maximum**

Daily max PRE Wi 14S-14N, solar min



Metrics for Model Validation

- ✈ **What is the onset time of scintillation activity?**
- ✈ **What is the maximum/peak value of the scintillation index?,**
- ✈ **What is the duration of scintillation activity (above a certain S4-index level?**
- ✈ **What is the special (latitudinally and longitudinally) variability of scintillation activity?**