

# Introduction of LISN

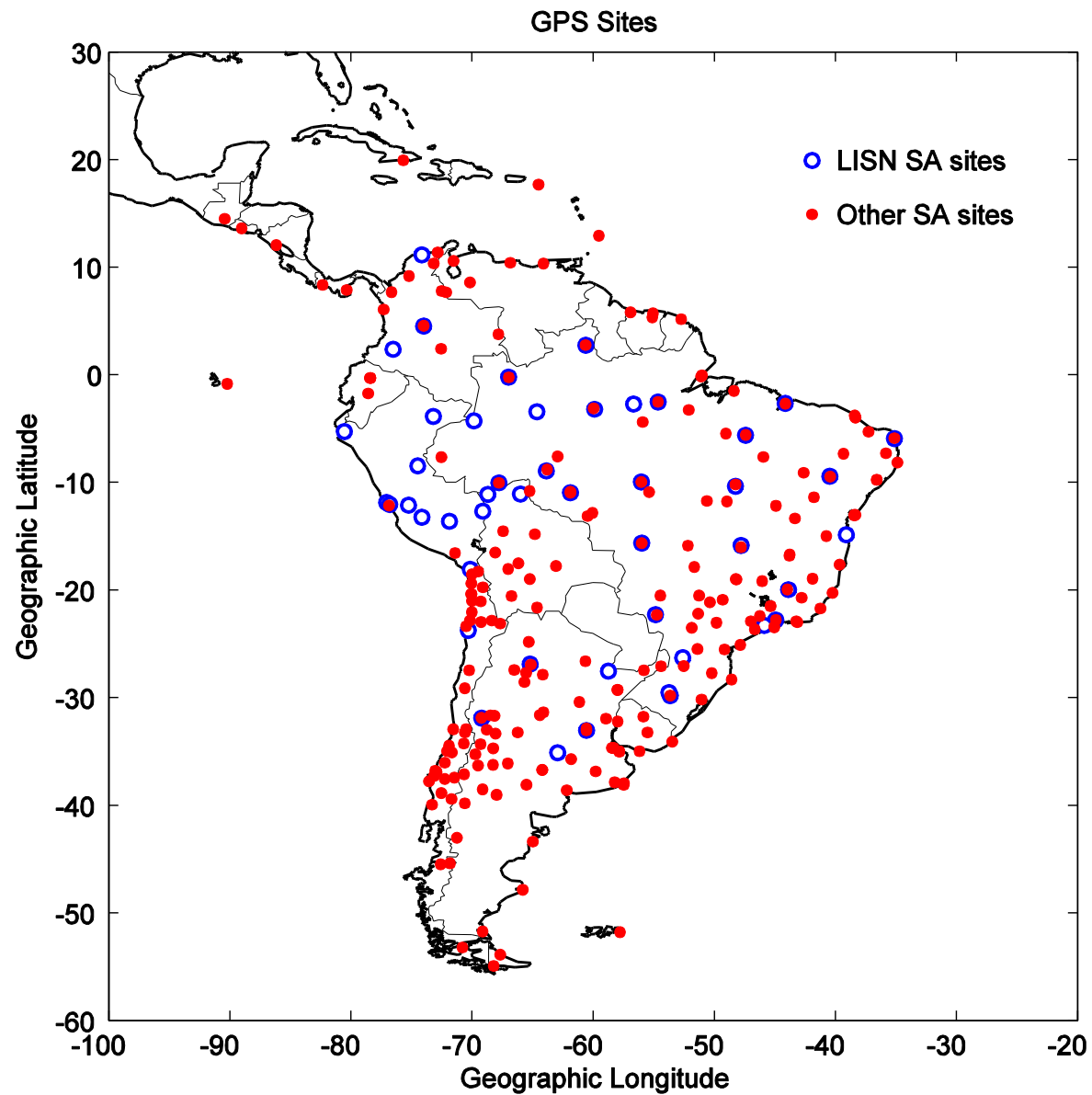
**Cesar E. Valladares**



# Low-latitude Ionospheric Sensor Network (LISN)

- The LISN network is a distributed observatory designed to provide nearly real-time observables (**nowcast**) to the Aeronomy community. LISN aims to develop a short term (60 minutes) predictive model of the ionosphere (**forecast**) based on real-time data-ingestion and assimilation techniques.
- The main goal of LISN is to establish a permanent array of instruments to investigate the complex day-to-day variability and the extreme state of disturbance that occurs in the equatorial ionosphere in a regional context.
- LISN consists of (June 2012): 47 GPS receivers, 5 magnetometers, and 1 VIPIR ionosonde.

# Locations of GPS Receivers over South America (>200)

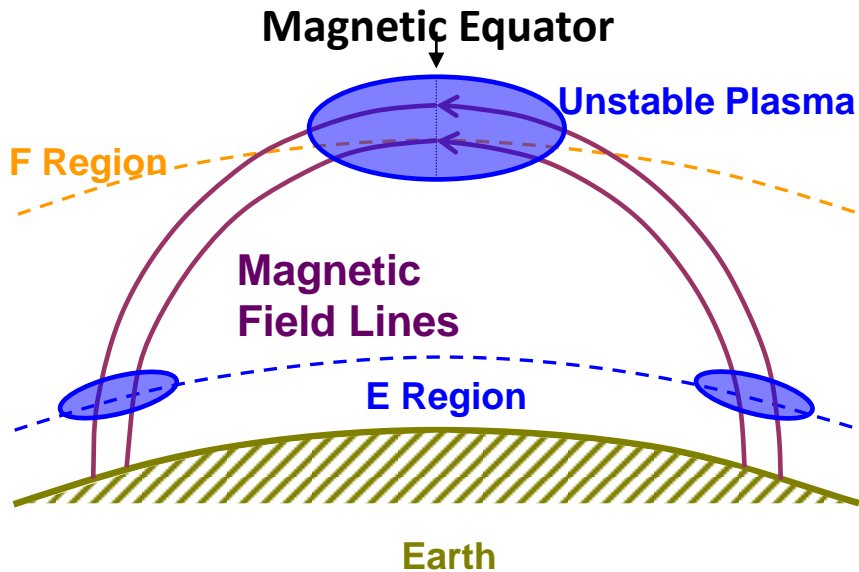


# 4 Magnetometer Baselines in SA; LISN (Green) and Others (blue)





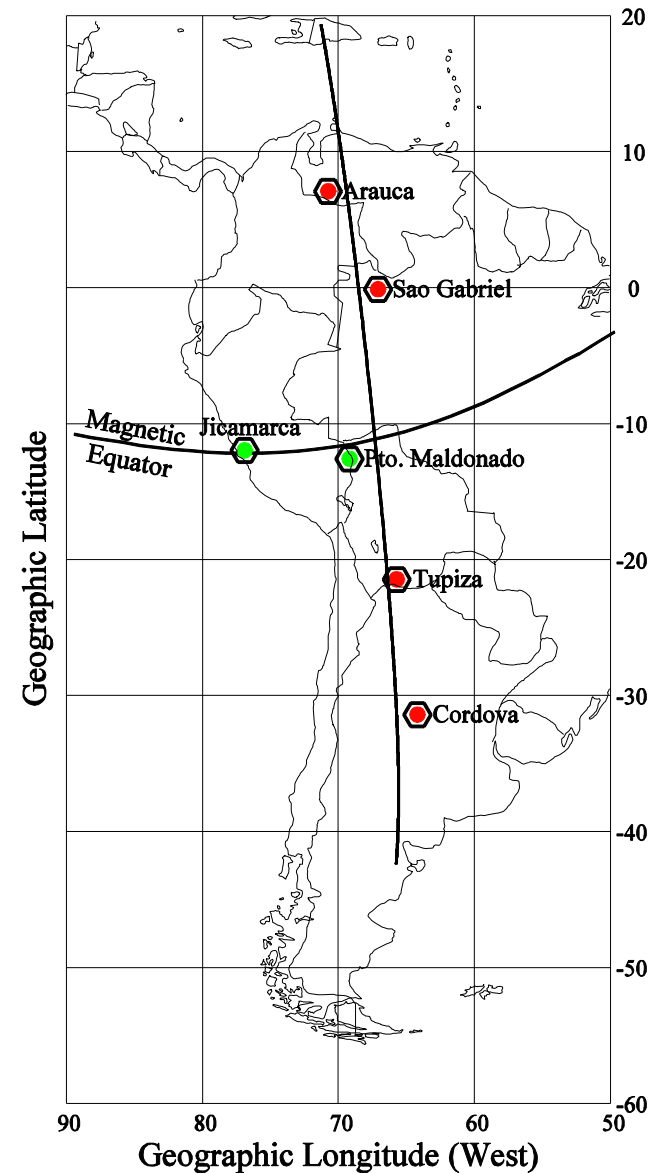
## E Region and ESF



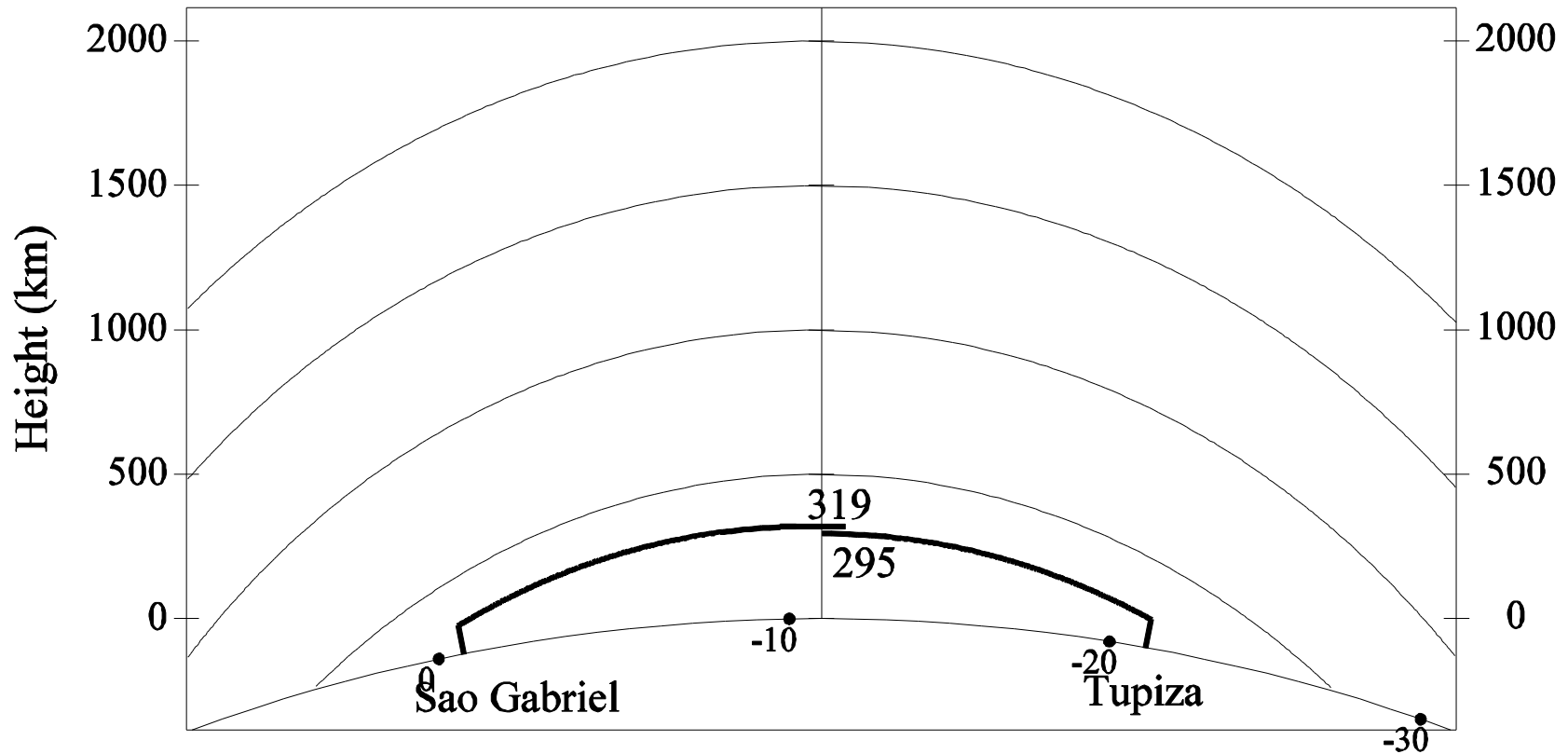
The field lines that intersect the E region over the cities of Sao Gabriel, Brazil and Tupiza, Bolivia map to between 295 – 320 km at the magnetic equator. We will be able to investigate: (1) if  $E_s$  layers short out ESF. (2) role of equatorial and off-equatorial E region to balance pre-reversal currents.

Drawing was Provided by K. Groves

## LISN Ionosondes

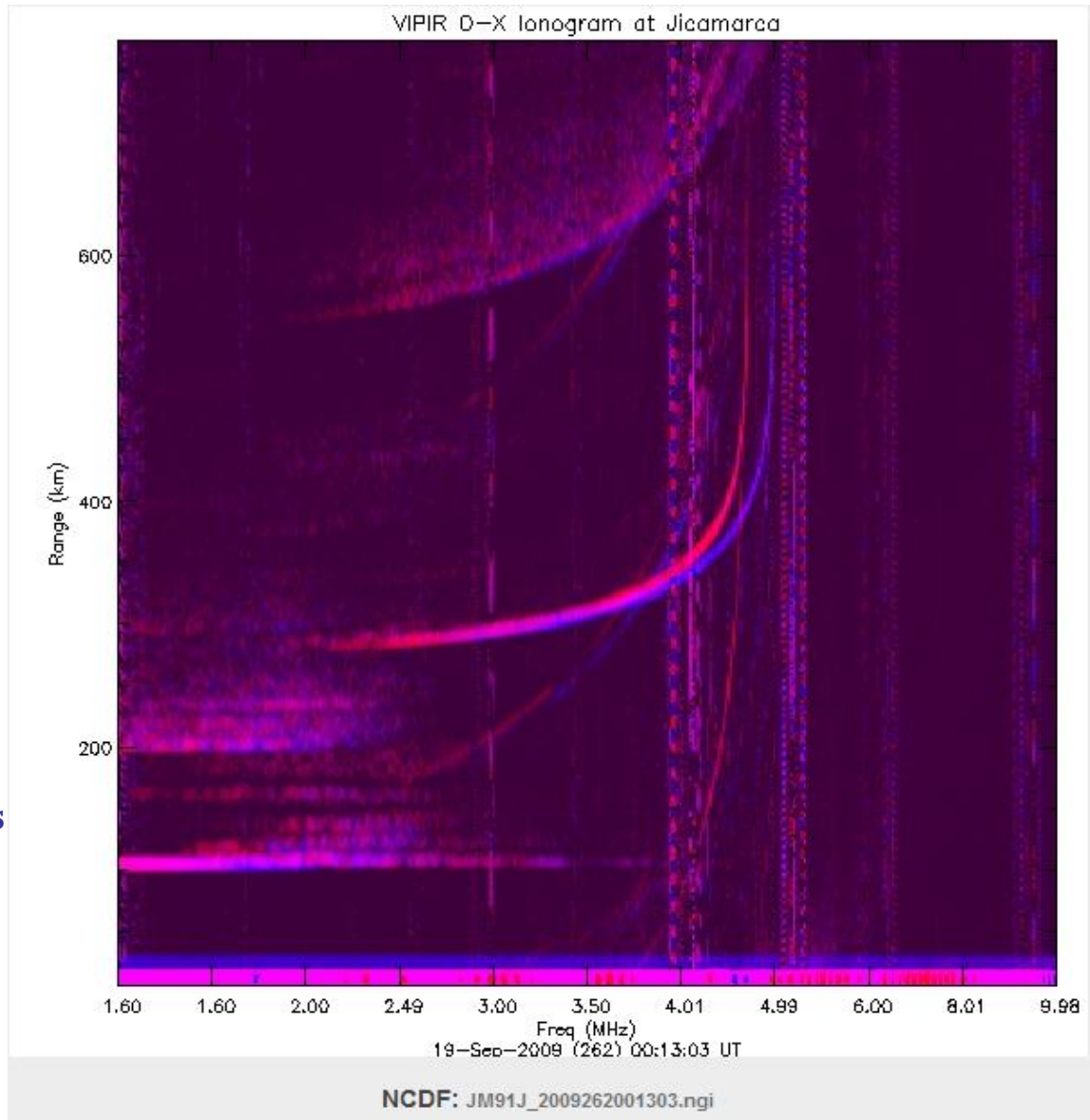


# Field-line Mapping from the E regions (105 km) of Sao Gabriel do Cachoera and Tupiza to the Magnetic Equator



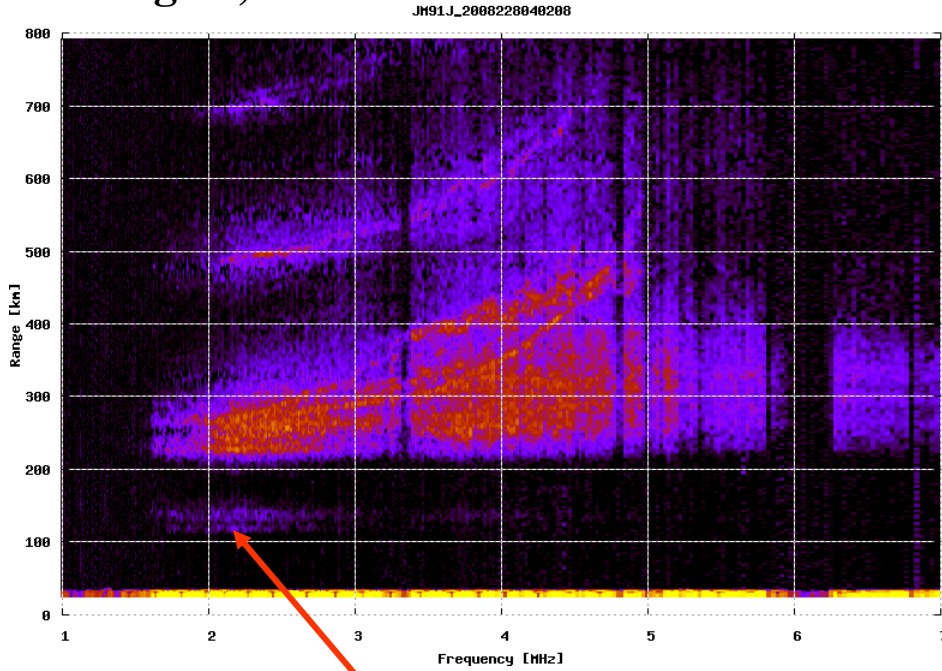
# Ionogram recorded on Sept 19, 2009 at JRO

Multiple  $E_s$   
traces



# Why the VIPIR ionosonde was selected for LISN

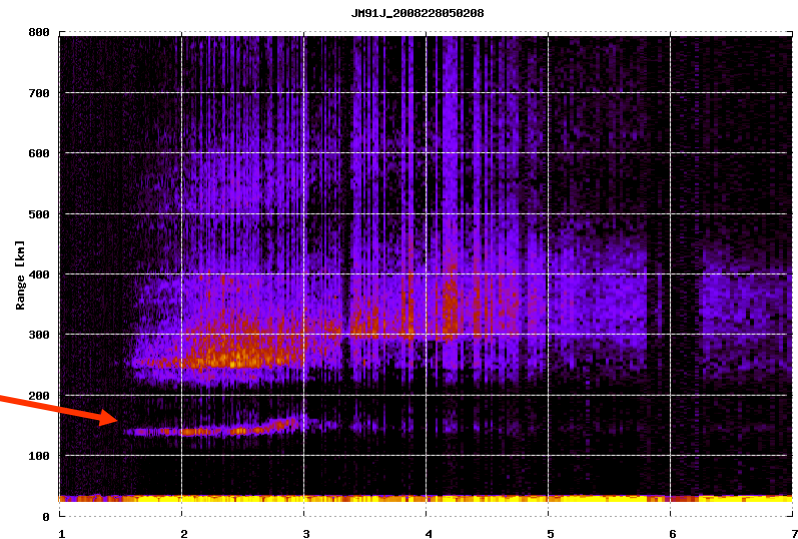
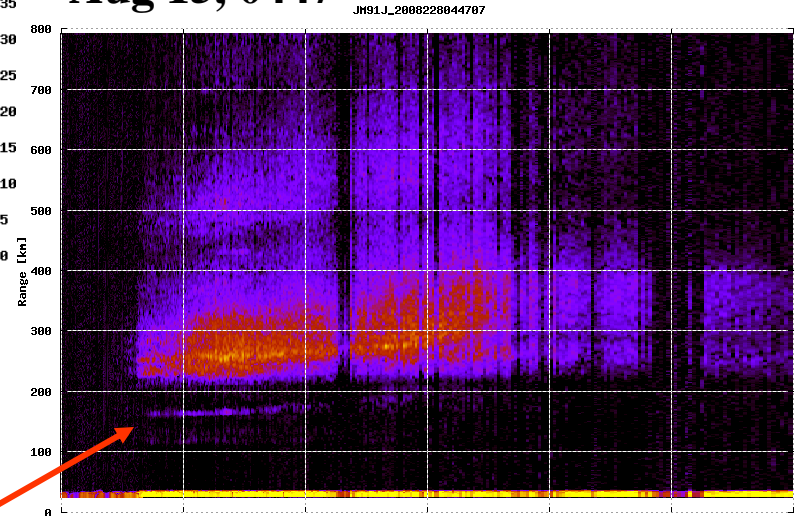
Aug 15, 0402



Double  $E_s$  layer

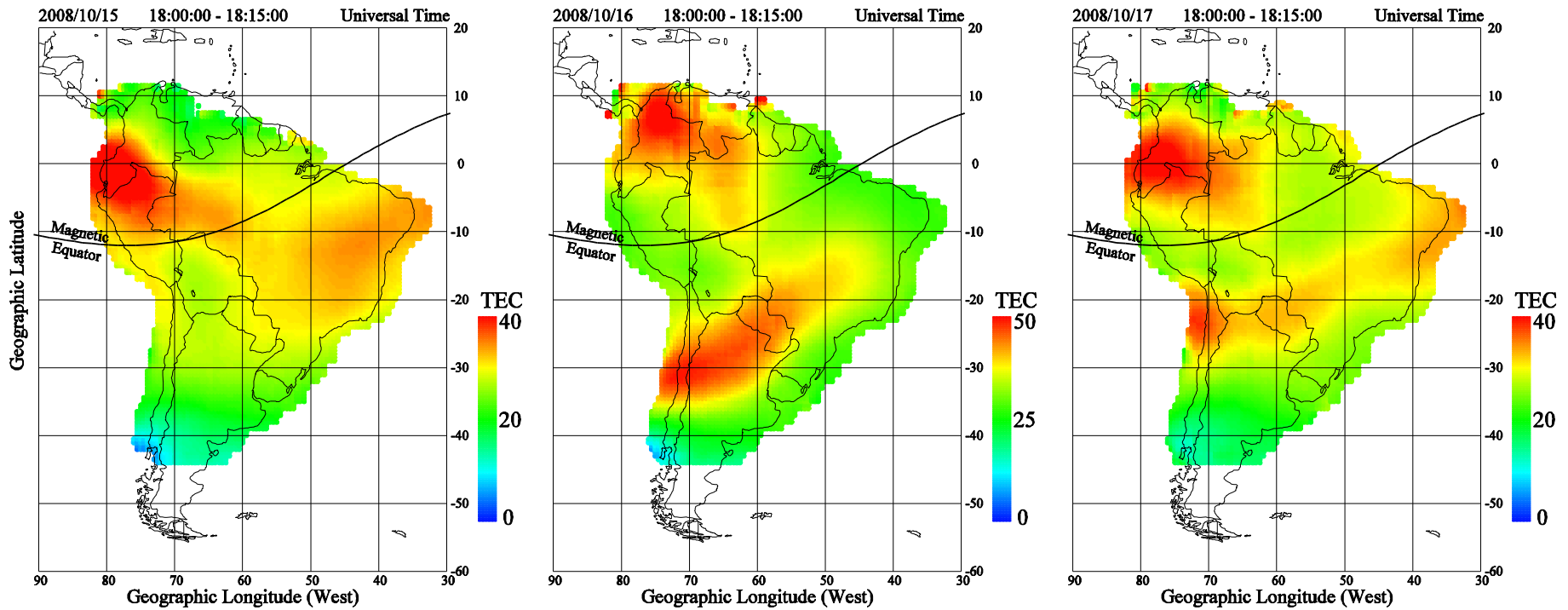
Descending  $E_s$  layer

Aug 15, 0447



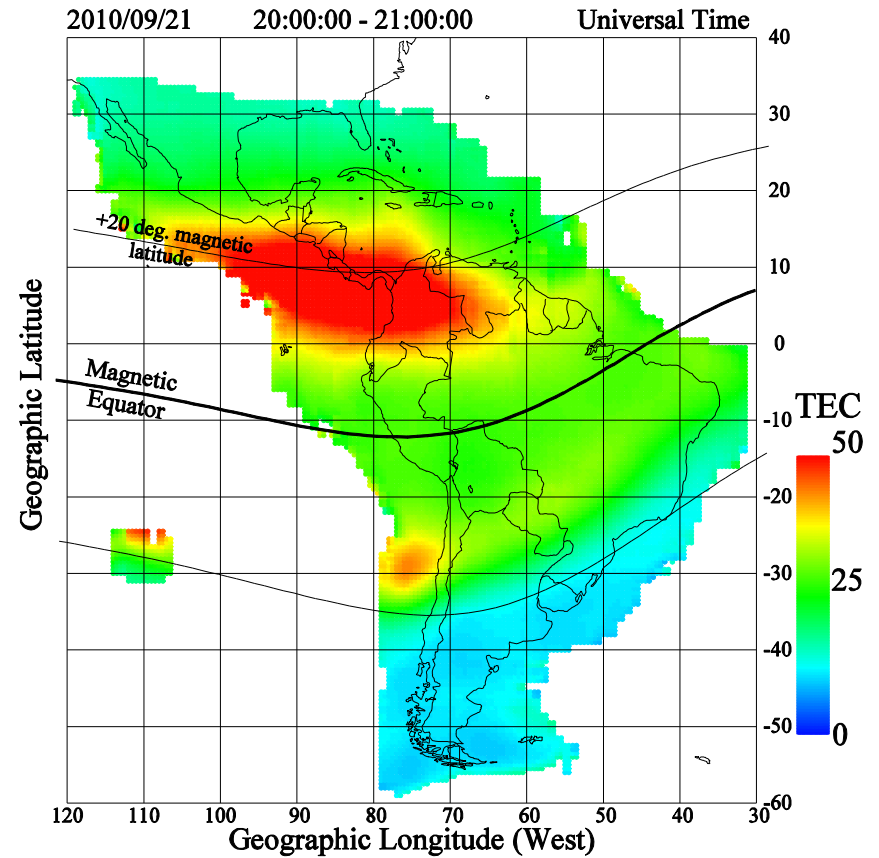
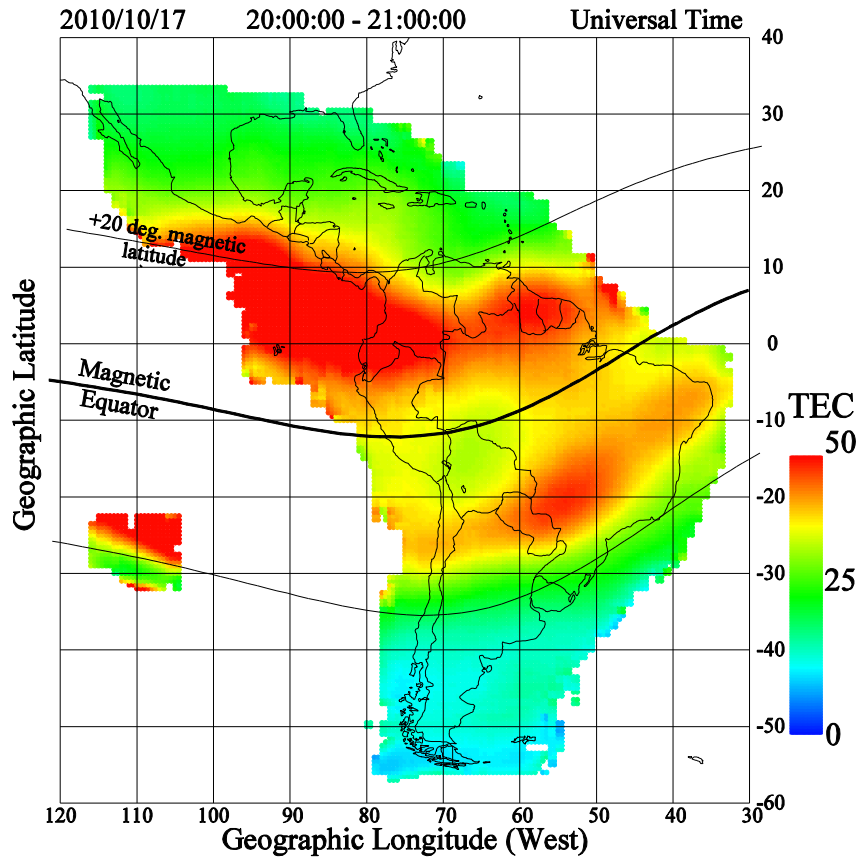
Aug 15, 0502

# TEC variability in a regional Context: TEC values observed on 3 consecutive days (Oct 15-17, 2008) at same local time (2 PM at 60° W)

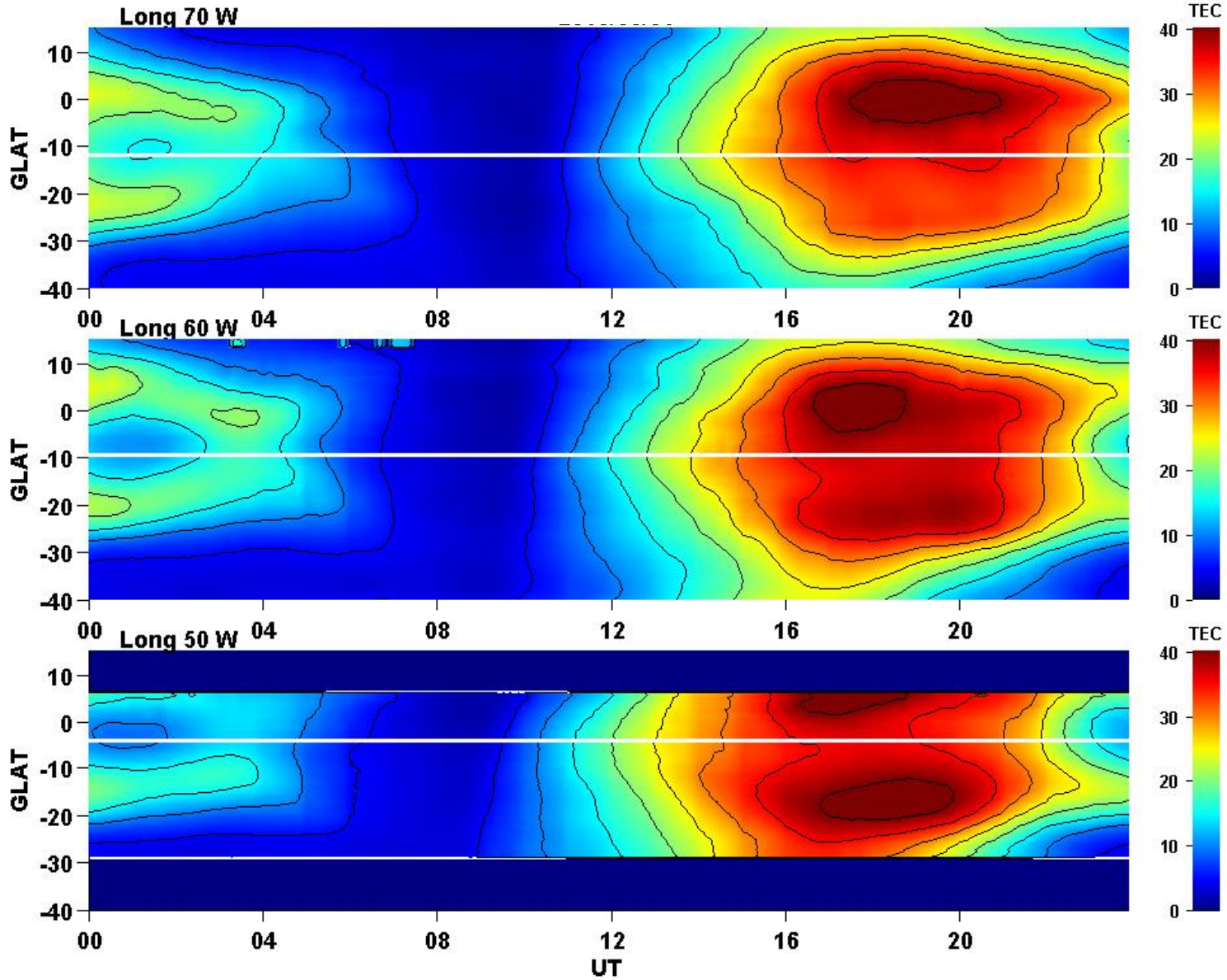




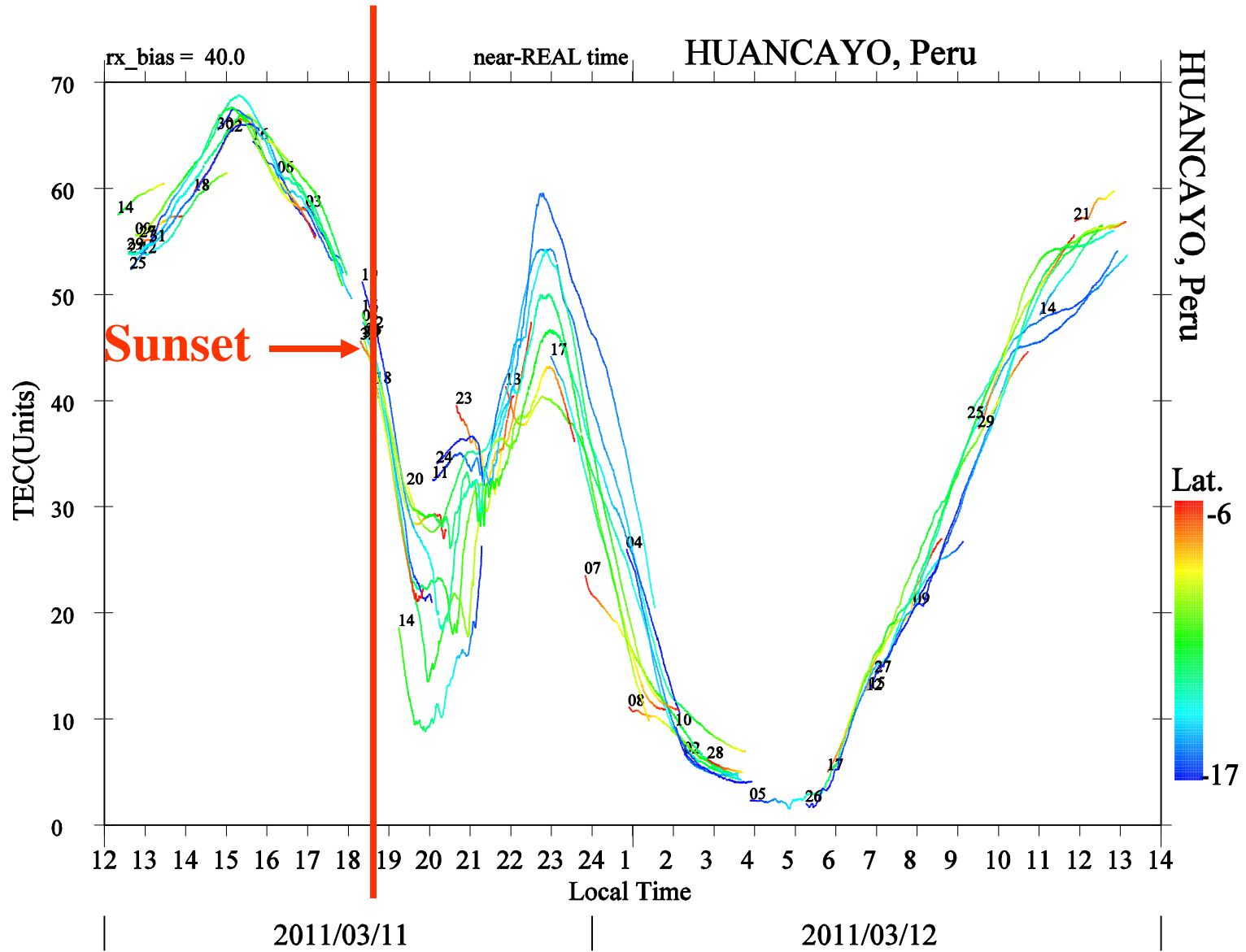
# TEC measured on 2 different days during the Equinox of 2010



# Average TEC values measured at 70° W, 60° W , 50° W during March 2010

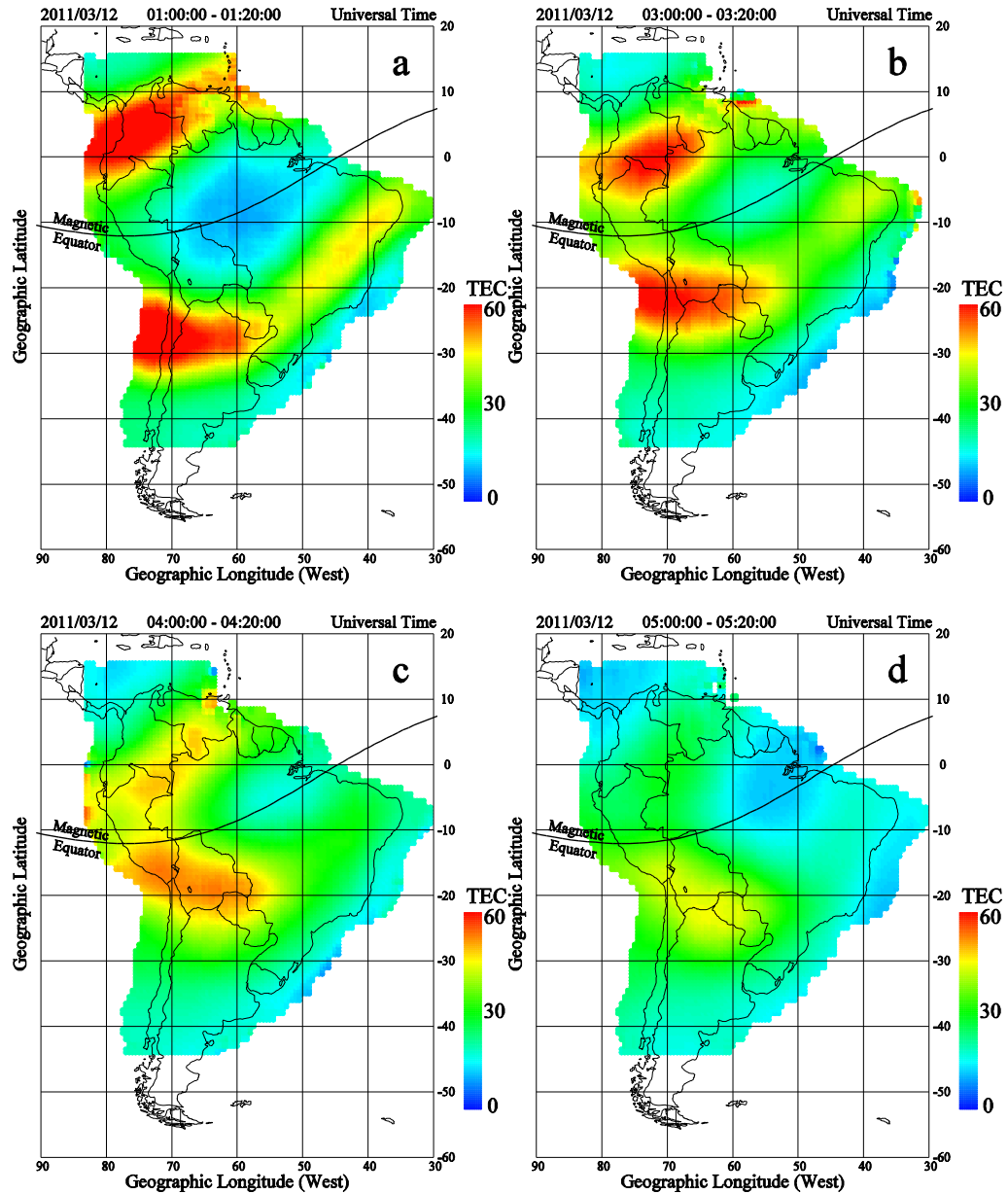


# Largest Midnight TEC enhancement





# TEC values measured at 01, 03, 04 and 05 UT on March 12, 2011



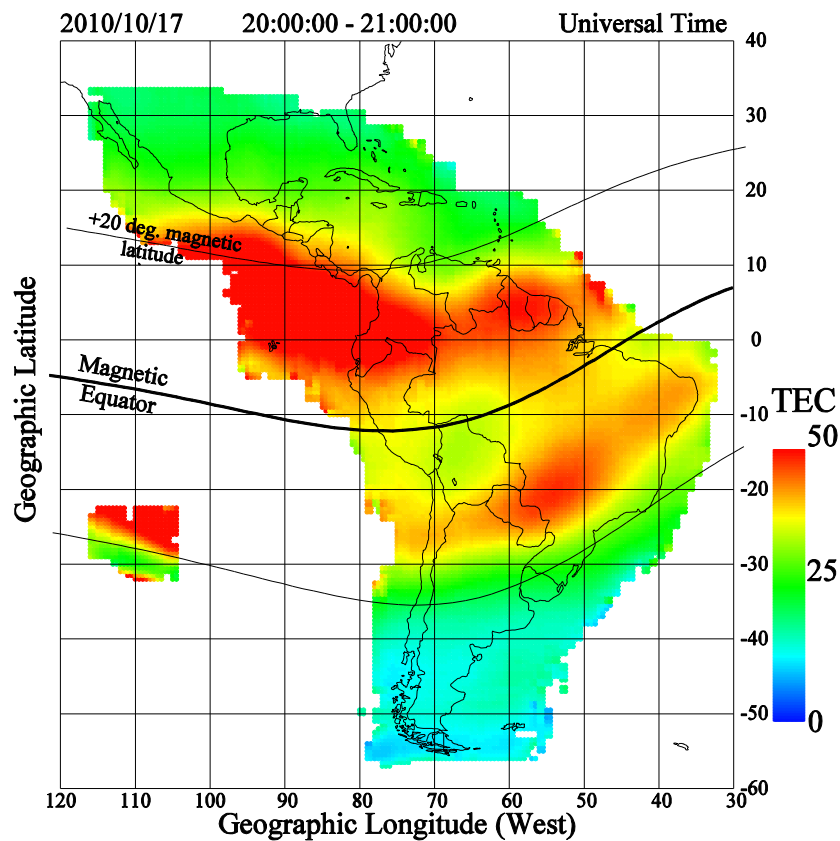
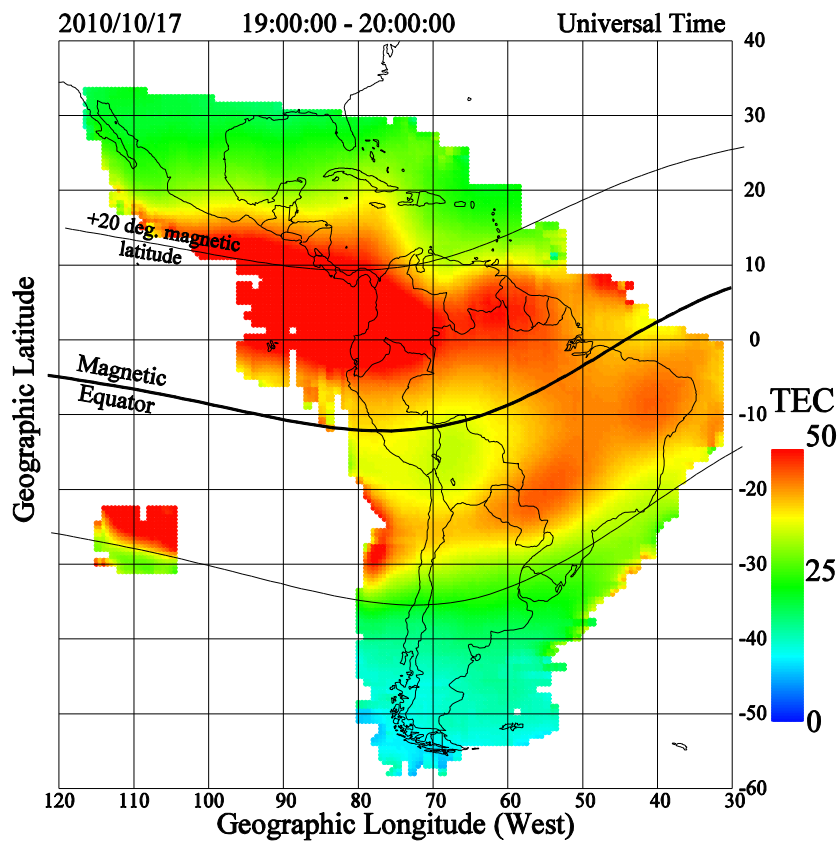
# Conclusions

**The prominent feature of the TEC distributions over South America is the strong longitudinal variability that exists during the afternoon and evening times. This shows during individual days and also in the monthly averages.**

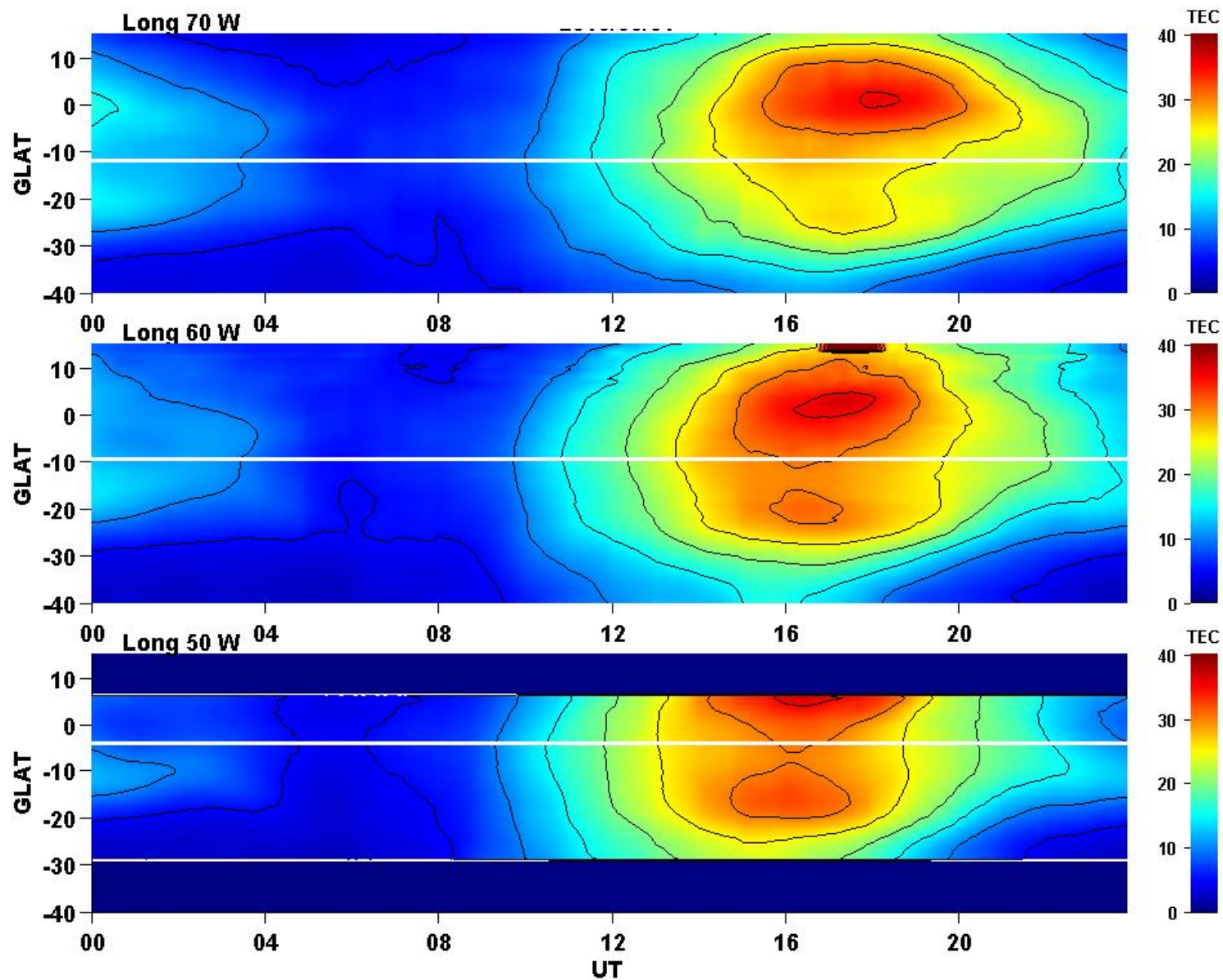
**LISN is able to capture this variability on a day-by-day basis. Every day of the year. We have TEC and Electric field values.**

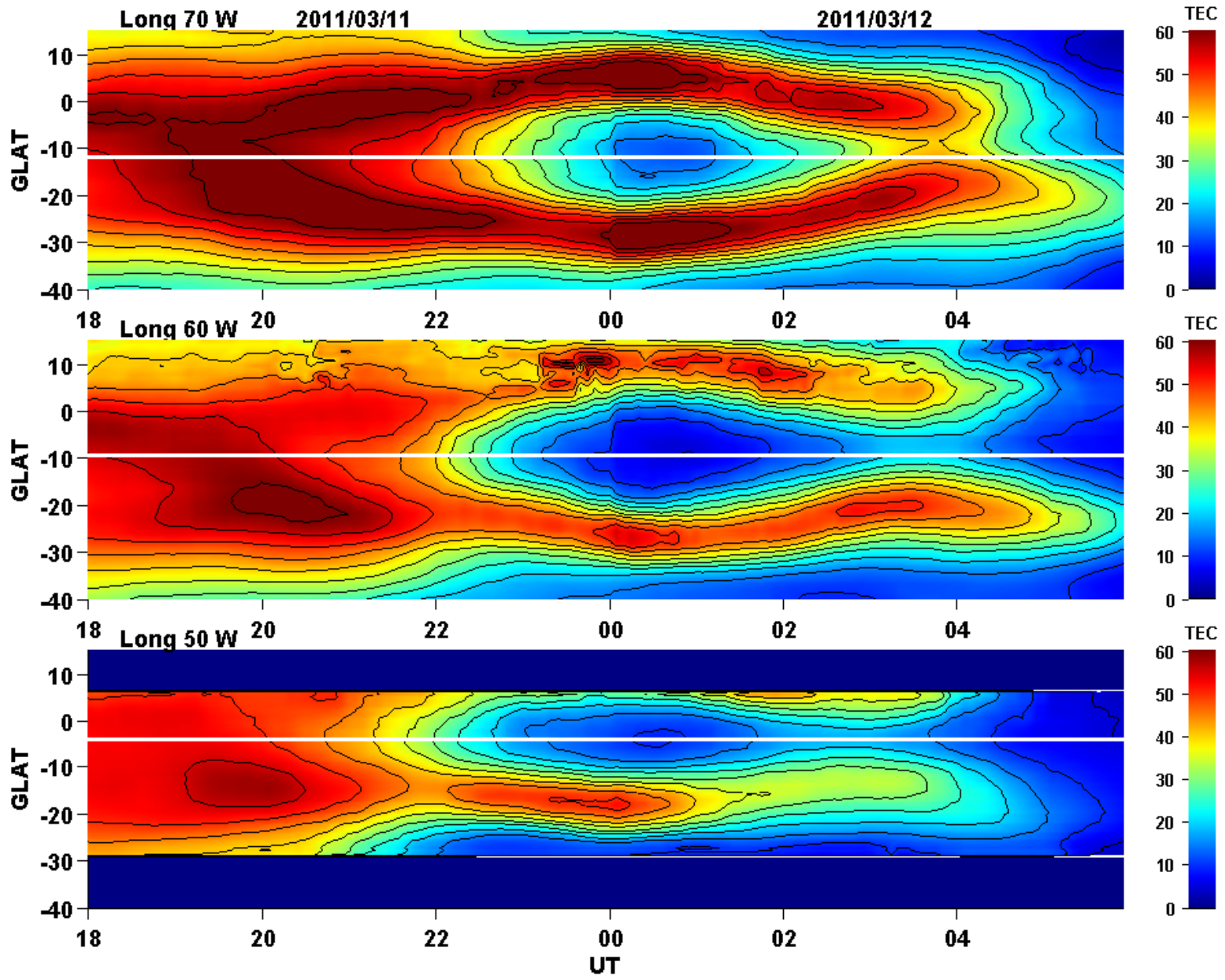
**More to be discussed tomorrow afternoon between 130 and 330 PM.**

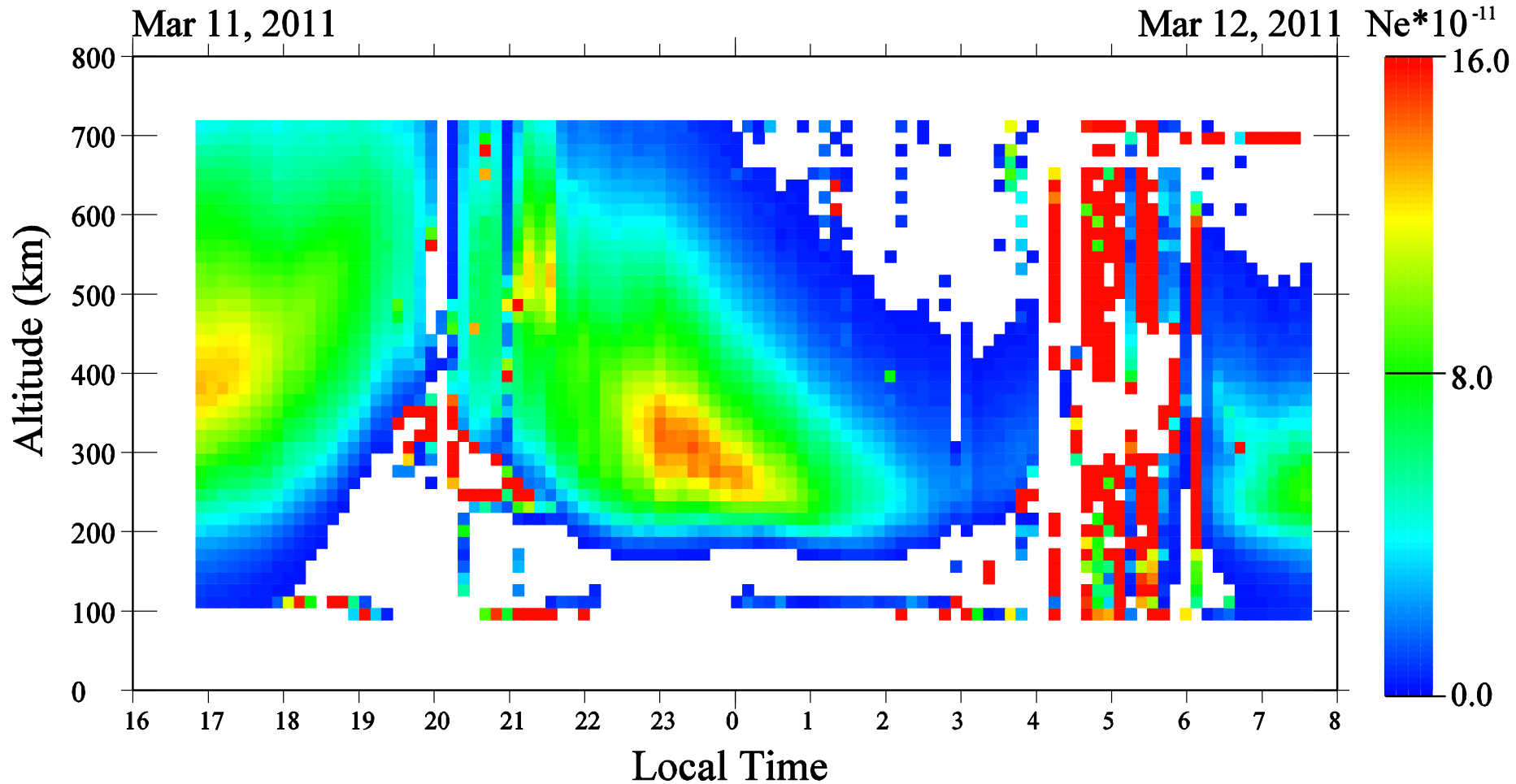
# TEC values measured over South and Central Americas on October 17, 2010 at 19 and 20 UT.



# Average TEC values measured at 70° W 60° W 50° W during September 2010

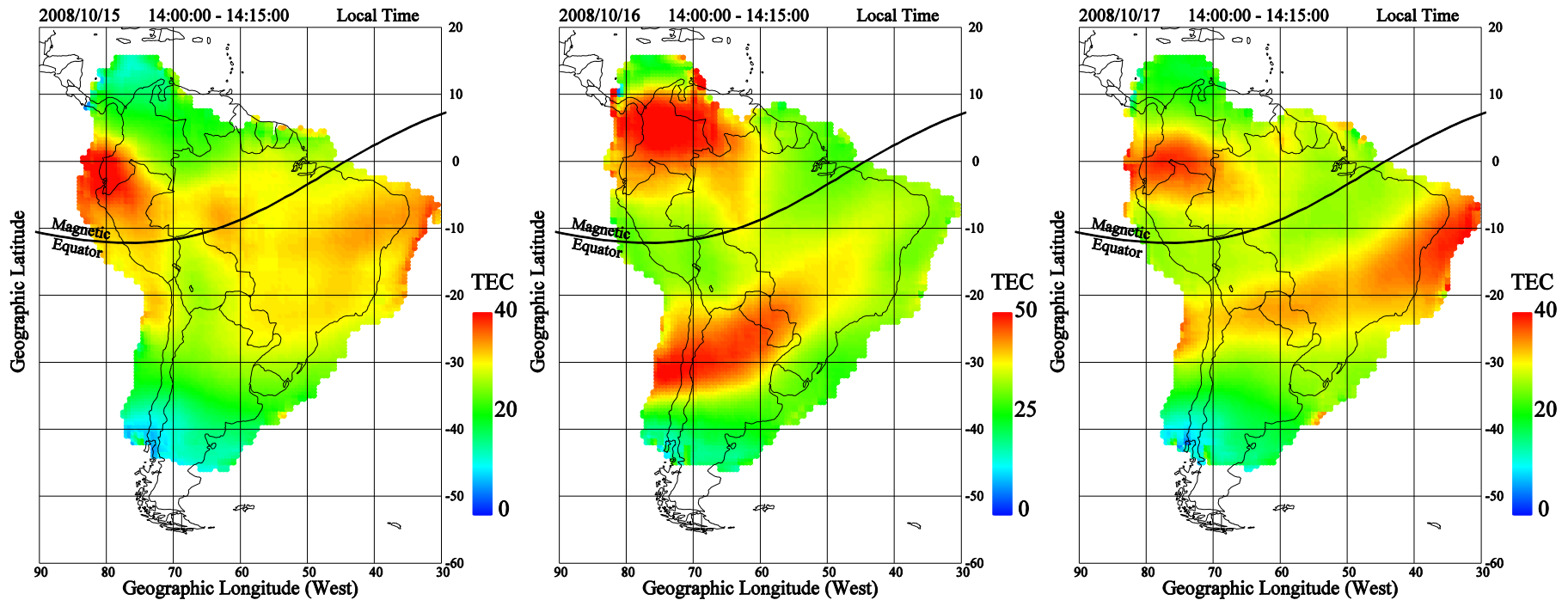








# TEC values observed on 3 consecutive days (Oct 15-17, 2008) displayed in the same local time frame (2 PM)



# Locations of LISN GPS Receivers (46)

