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Comparison between ionospheric peak parameters from COSMIC and ionosonde measurement over China

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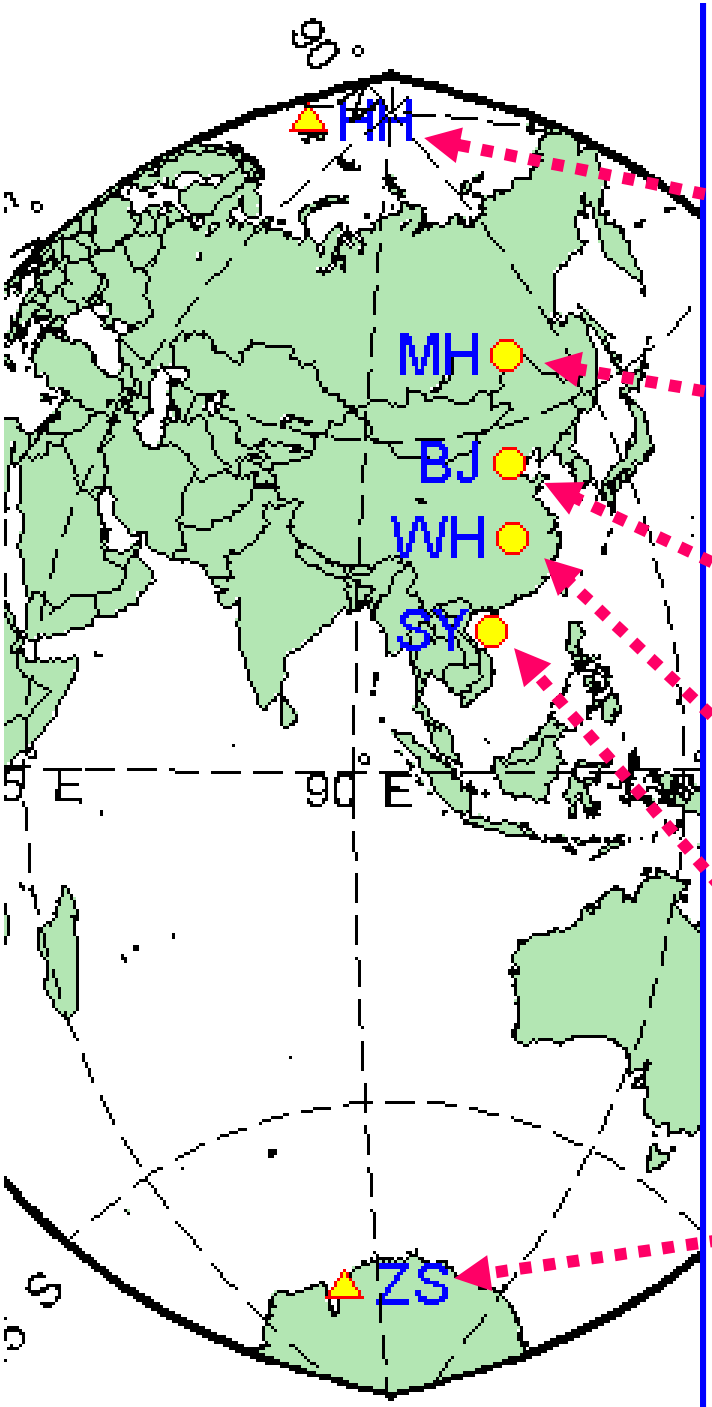
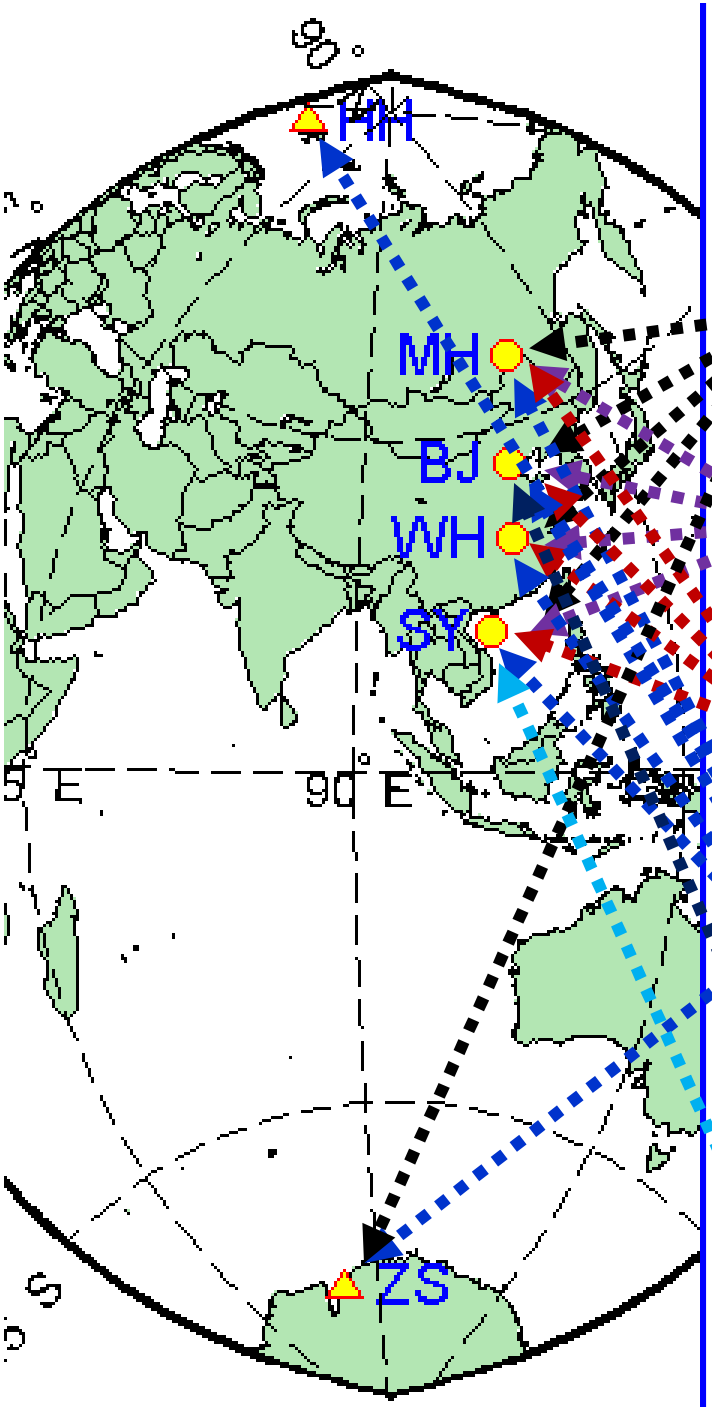


■ IGGCAS observation network

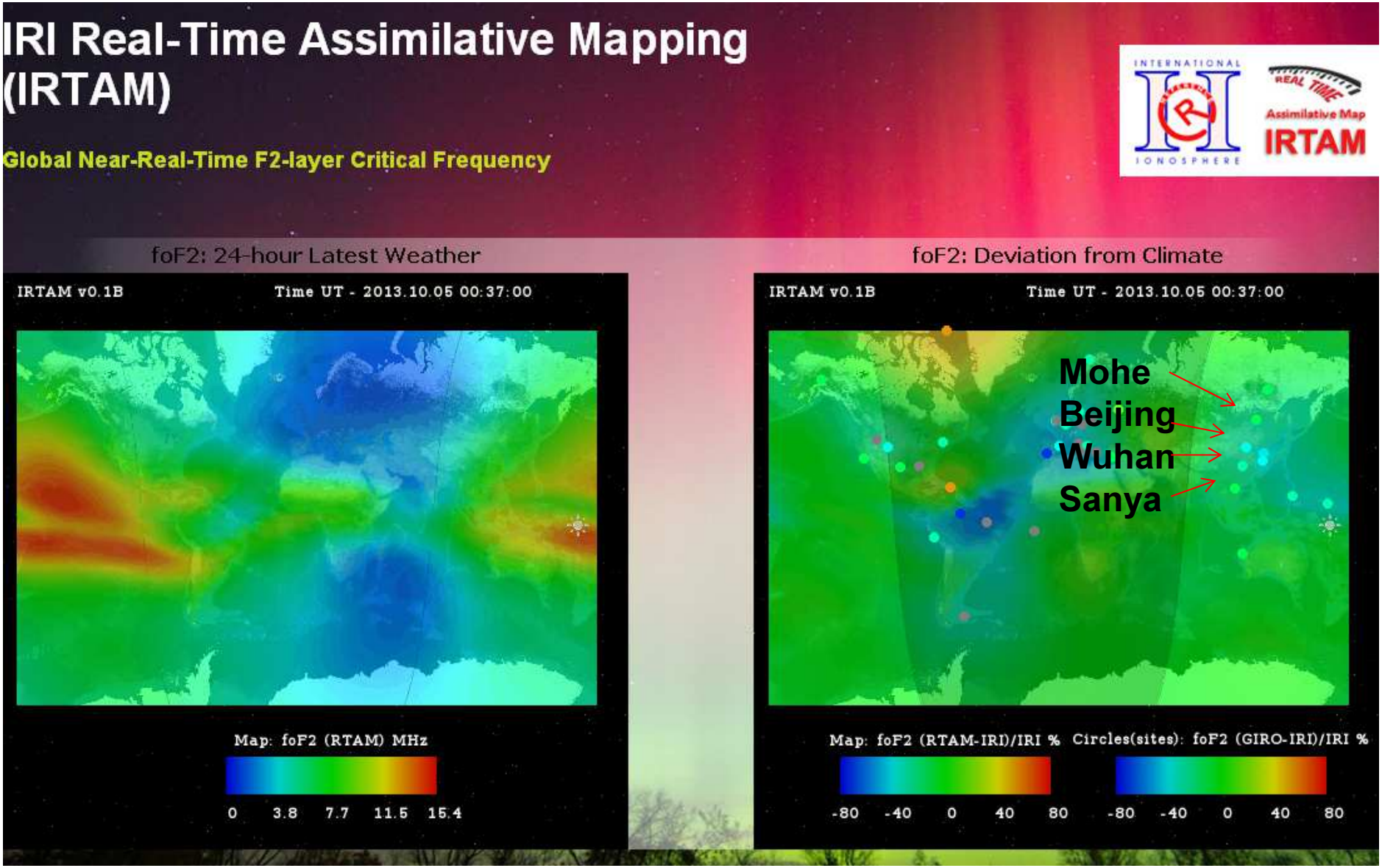
- Δ Huanghe (11.9E, 78.9N)
  (Arctic Station) @ PRIC
- ● Mohe (122.3E, 53.5N)
- ● Beijing (116.2E, 40.1N)
- ● Wuhan (114.5E, 30.4N)
- ● Sanya (109.6E, 18.4N)
- Δ Zhongshan (76.4E, 69.4S)
  (Antarctic Station) @ PRIC



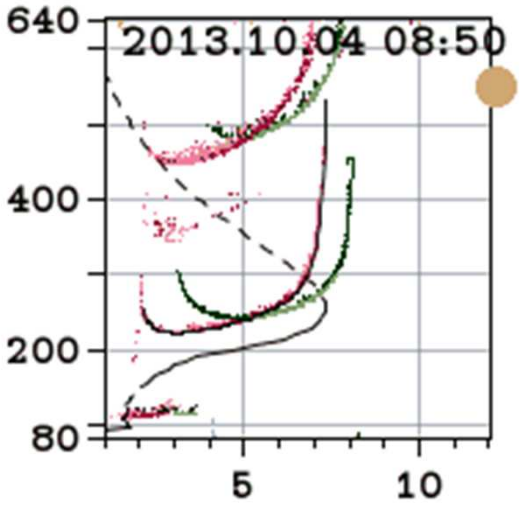
Observation Instruments

- Magnetmeters(20 set)
- Meteor Radar (4 set)
- Digisonde (4 set)
- GPS TEC/Scintillation(6+1 set)
- Airglow Interferemeter (1 set)
- VHF Radar (1 set)

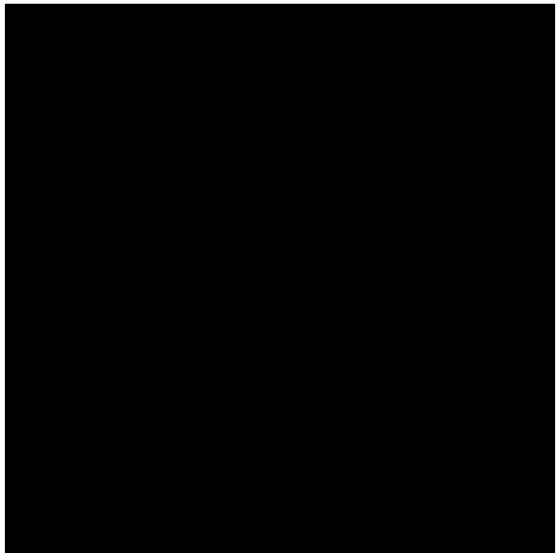
Real-time Digisonde data in IRTAM from IGGCAS



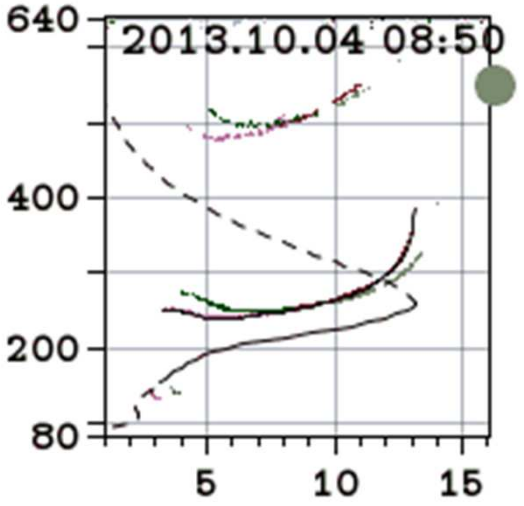
24 Hour Ionogram Movie at GIRO Web



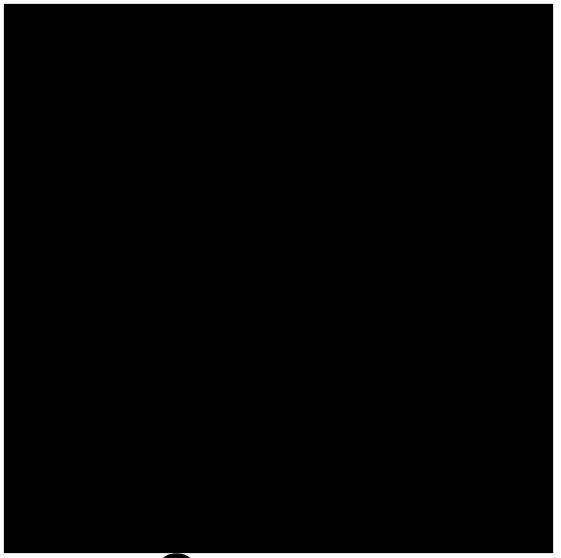
Mohe



Beijing

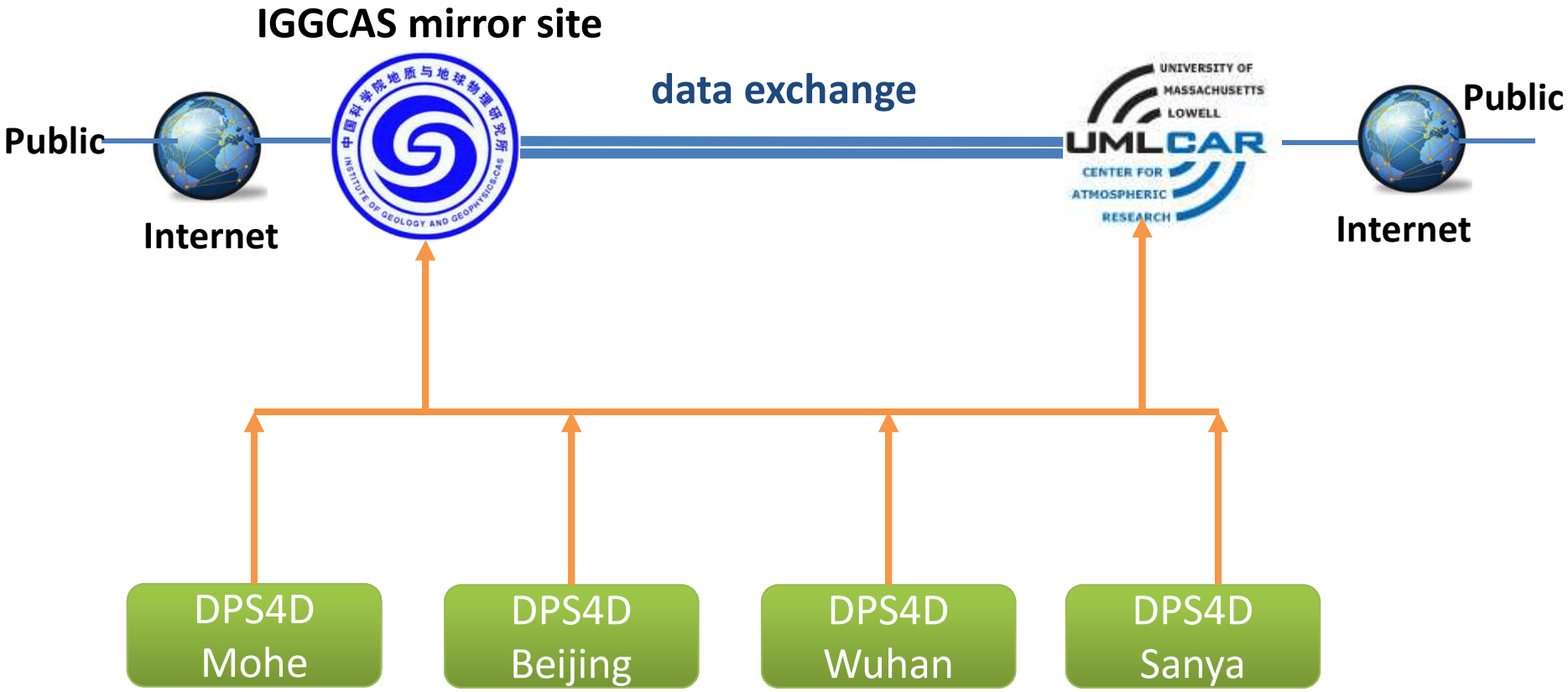


Wuhan



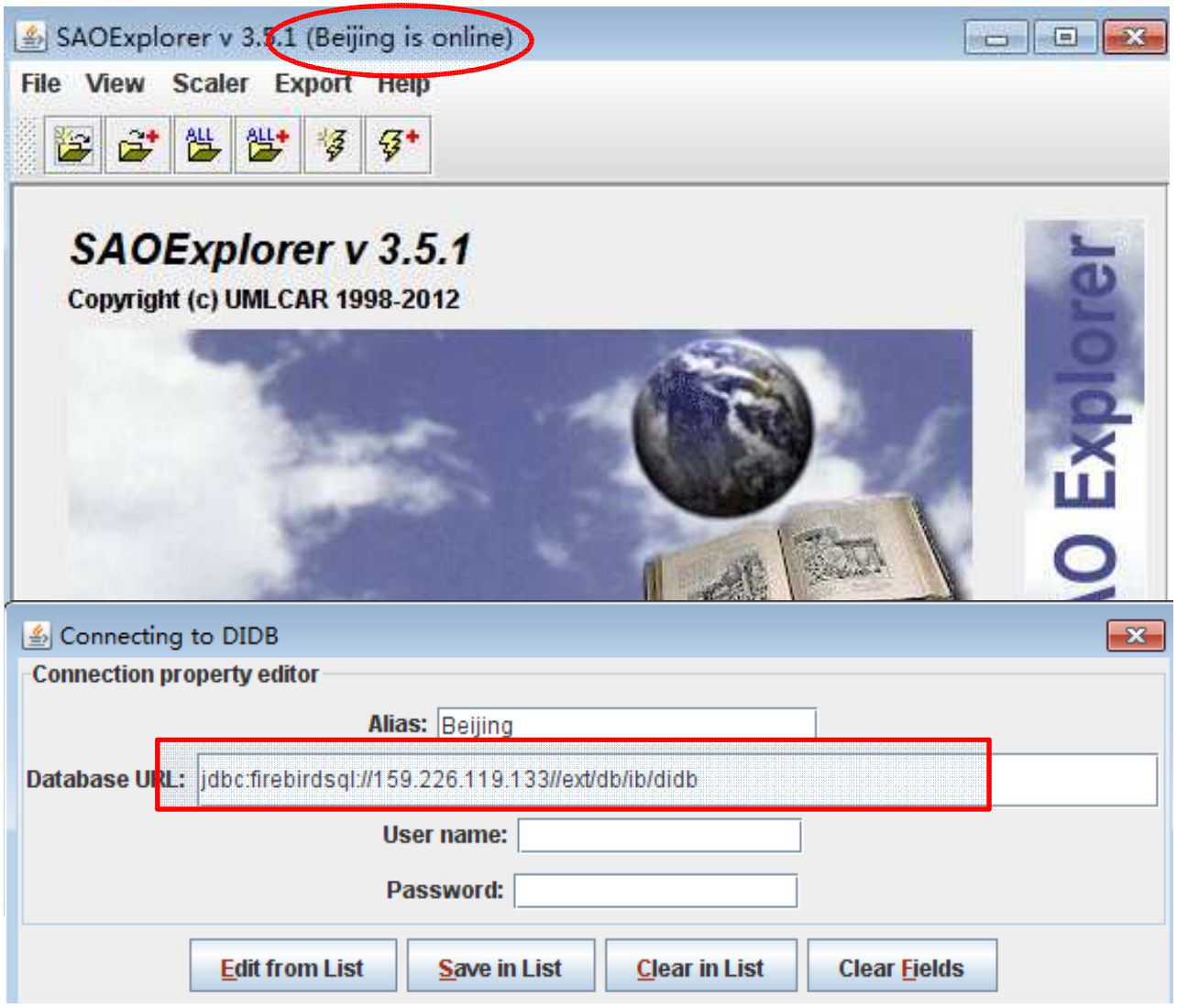
Sanya

IGGCAS Beijing Mirror Site of GIRO



Four digisondes send data to UMLCAR and IGGCAS.
IGGCAS Beijing mirror site of GIRO is online recently.

Online data service of Beijing mirror site



78 stations

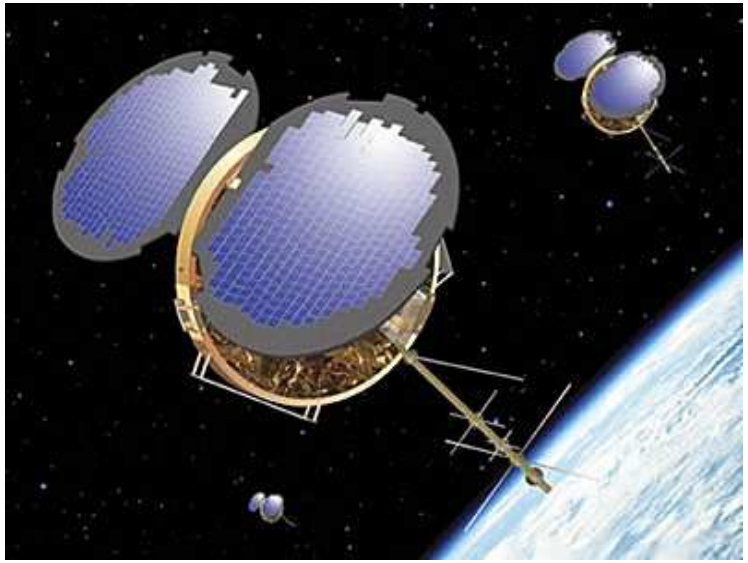
1987-2013

(27 years)

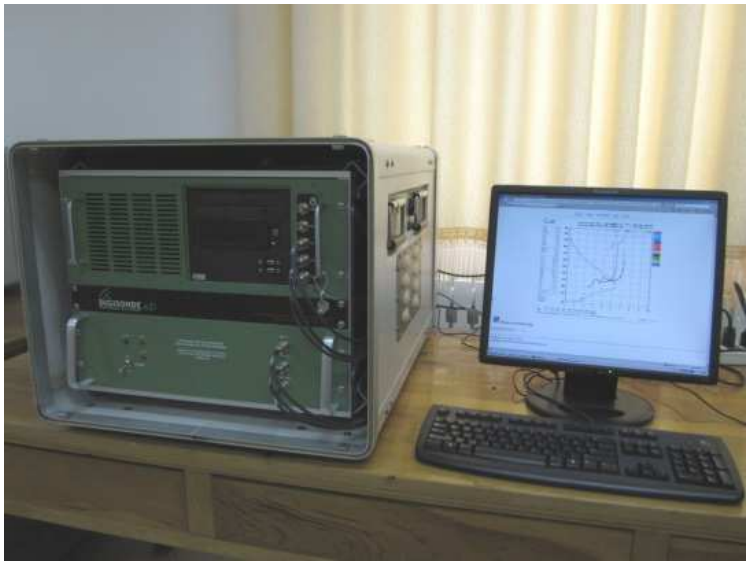
IP： 159.226.119.133 Data updated to Sept. 22, 2013

■ Analysis method and results

（1）Validation of COSMIC ionospheric peak parameters with ionosonde chain over China



COSMIC satellites to get ionospheric electron profile by GPS radio occultation



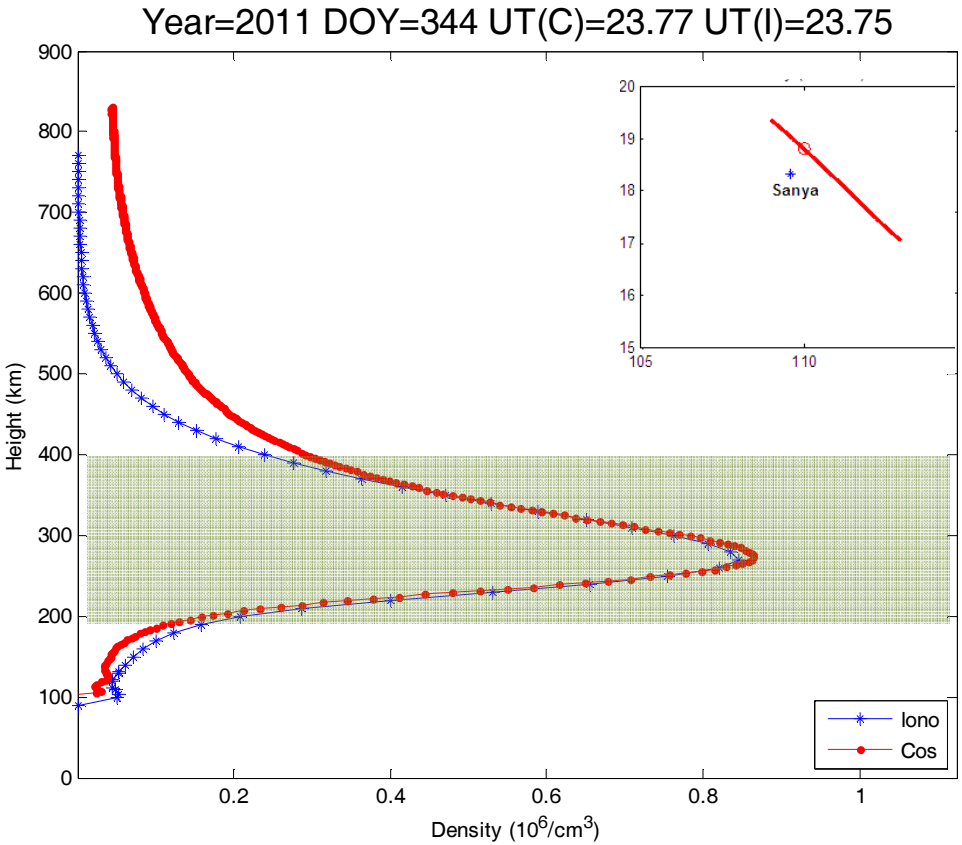
Ionosonde to get ionospheric parameters and electron profile from ionogram

■ Analysis method and results

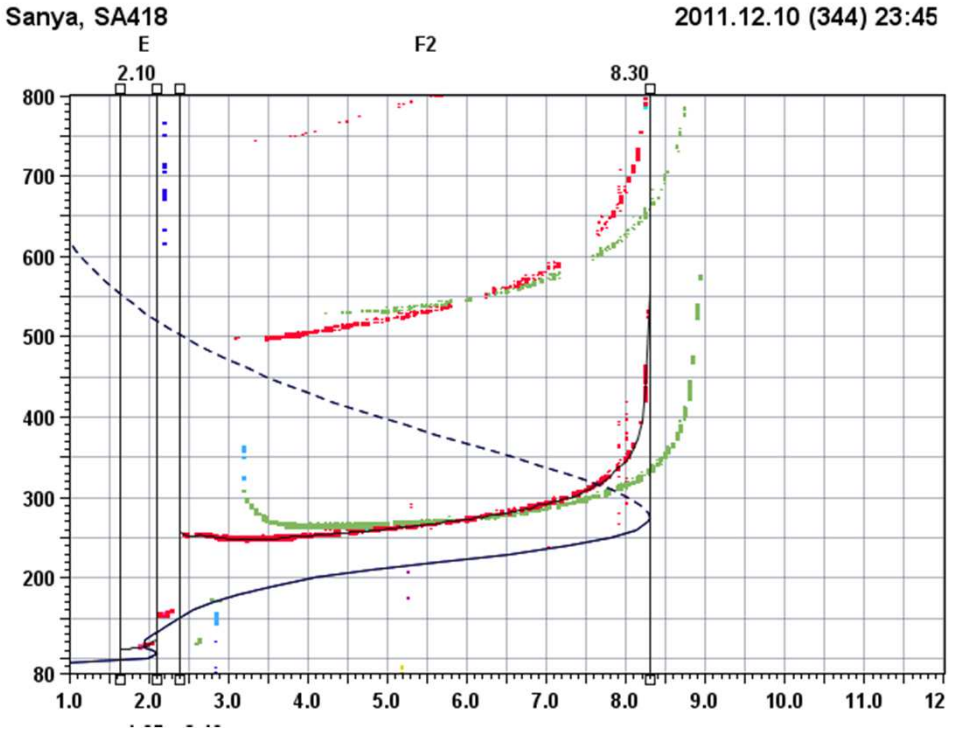
（1）Validation of COSMIC ionospheric peak parameters with ionosonde chain over China

- Ionosonde
  - Solar maximum (2011-2013)
  - Mohe, Beijing, Wuhan and Sanya whith DPS4D Digisonde
  - All ionograms were manually scaled to retrieve ionospheric peak parameters.
  - Ionosonde data with time difference less than 7.5min to Cosmic occultation and tangent point with difference less than 2.5 degree in latitude and longitude to Ionosonde were selected to compose the data pairs.
- COSMIC
  - CDAAC level2 ionprf data.
  - Peak paramters were retrieved from the Champman α fitting of the COSMIC profiles.

Example of concurrent measurement

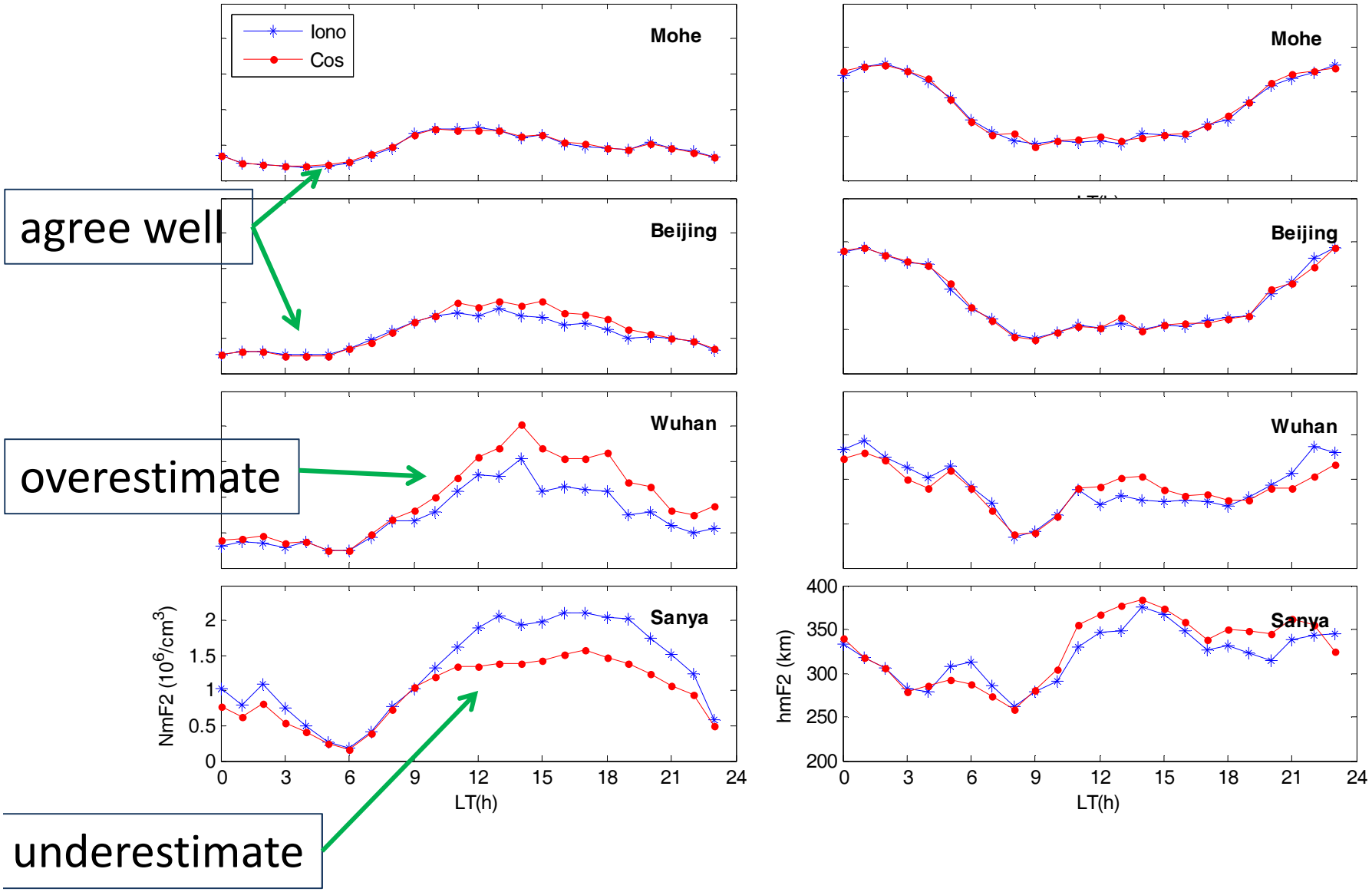


Profiles obtained by COSMIC and DPS4D Digisonde

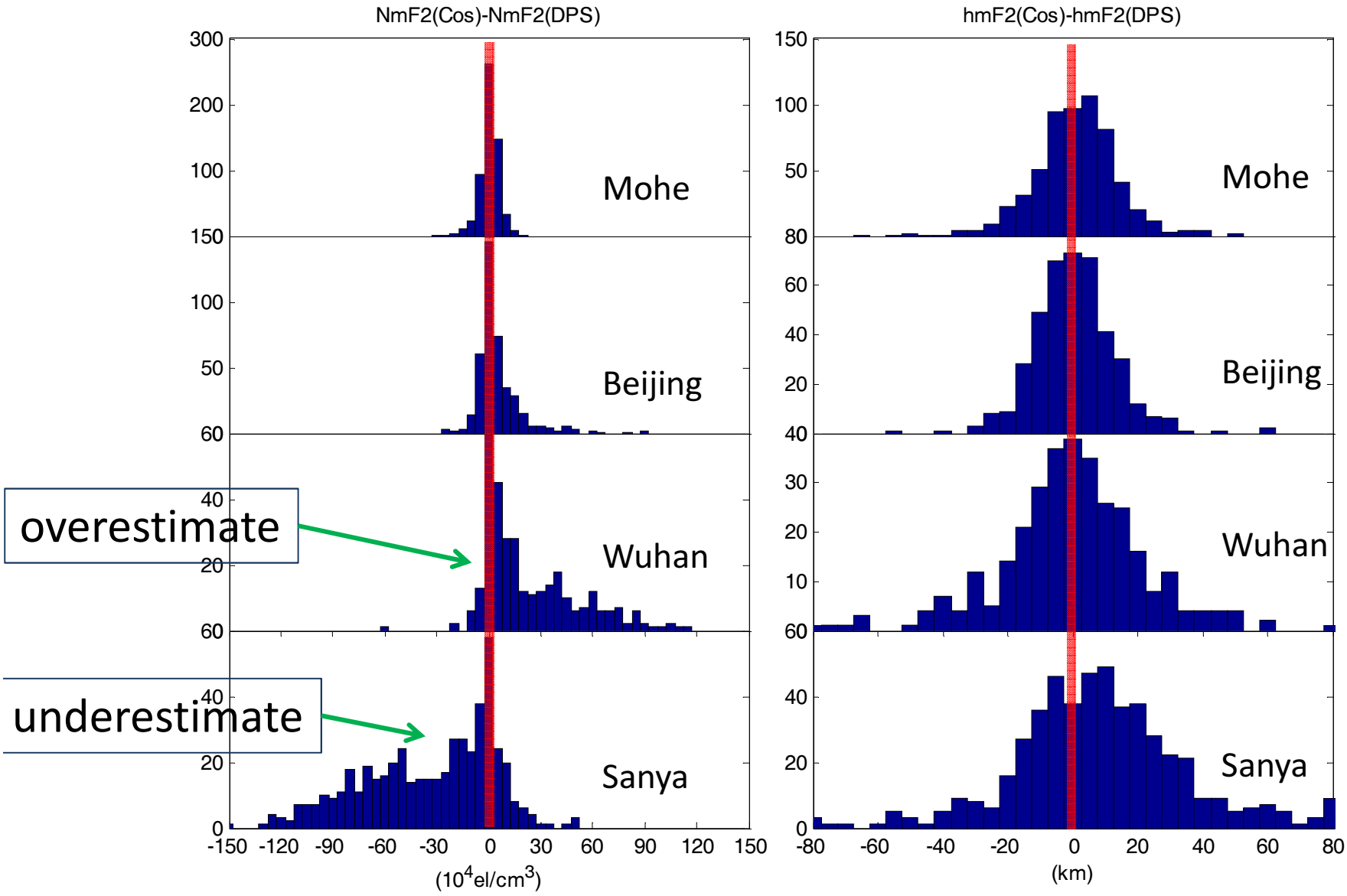


Corresponding Ionogram

Diurnal variation of peak parameters

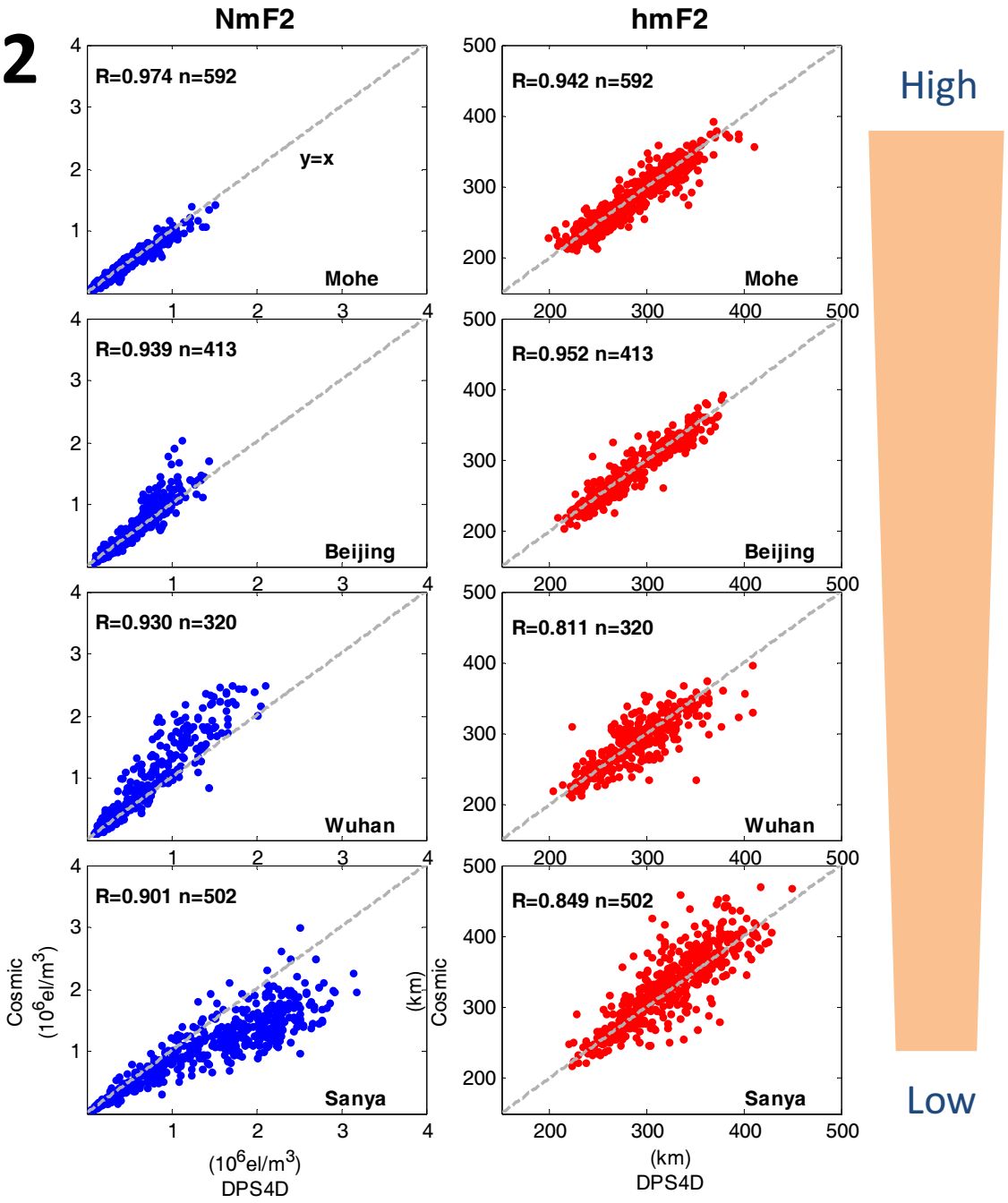


Histogram of absolute deviation of peak parameters



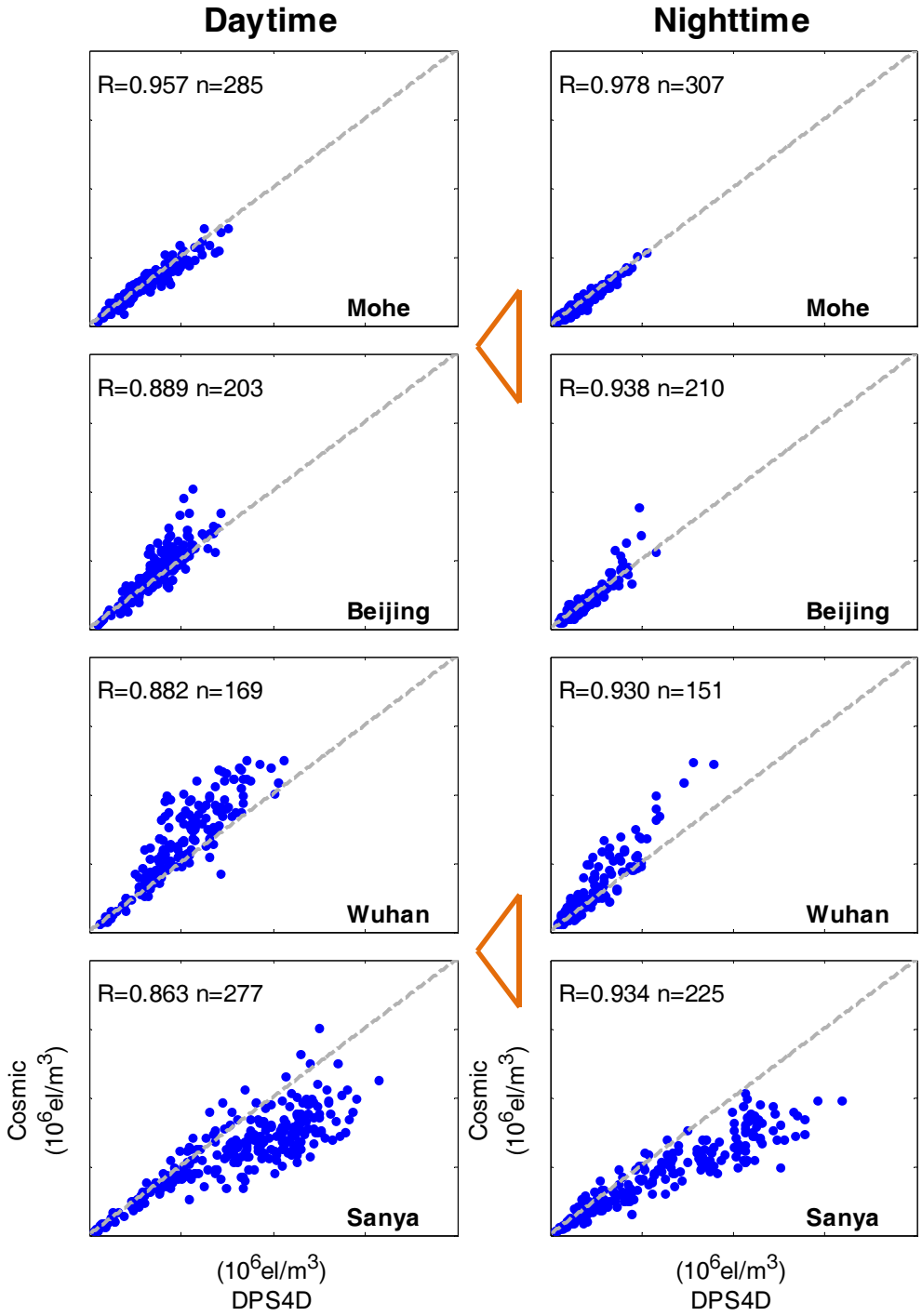
Scatter plots of NmF2 and hmF2

- Correlation of NmF2 and hmF2 decrease with latitude



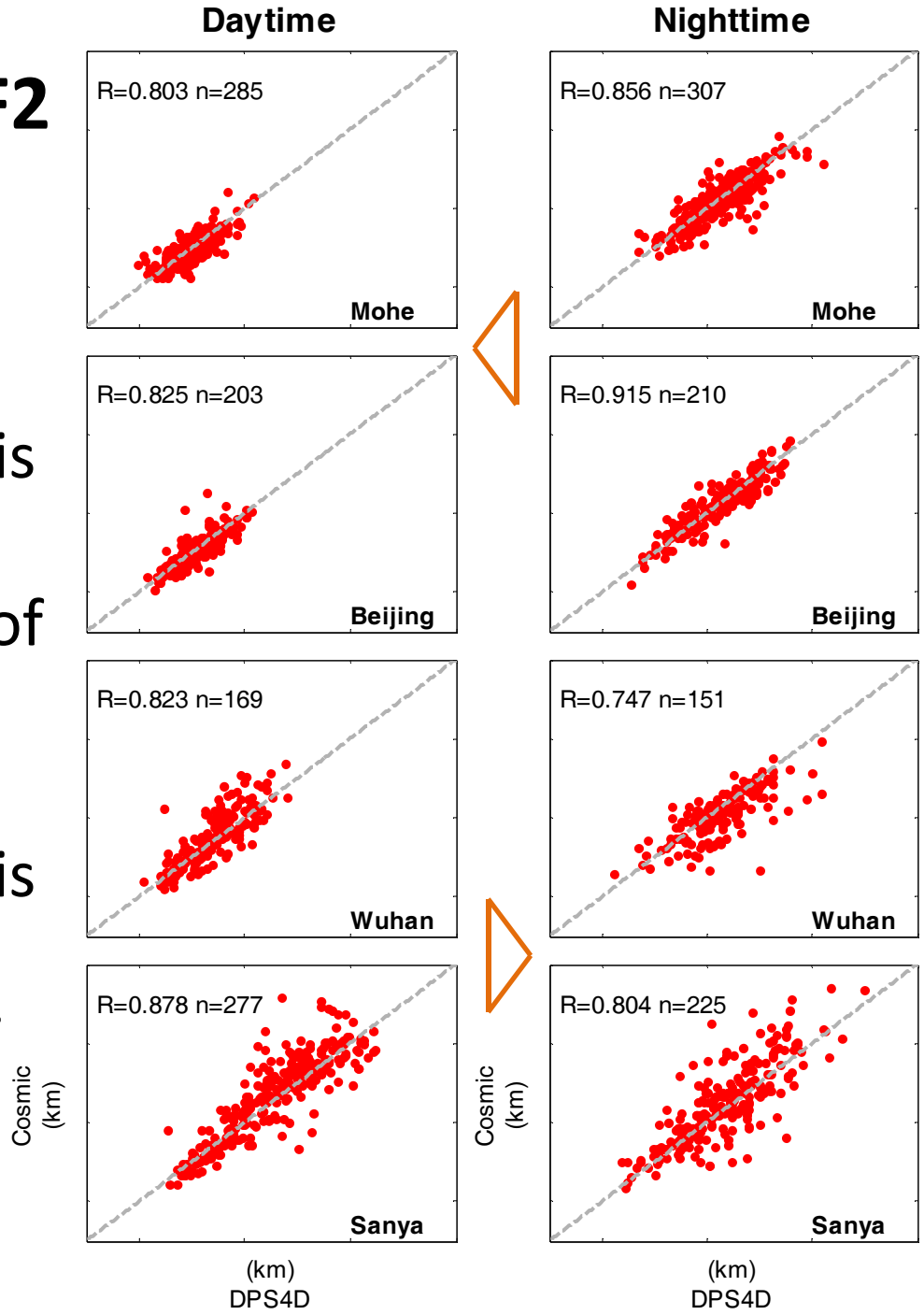
Scatter plots of NmF2 in day and night

- Correlation of NmF2 is higher during the nighttime than that of daytime at all latitude



Scatter plots of hmF2 in day and night

- In mid-latitude area, correlation of hmF2 is higher during the nighttime than that of daytime
- In low-latitude area, correlation of hmF2 is higher during the daytime than that of nighttime

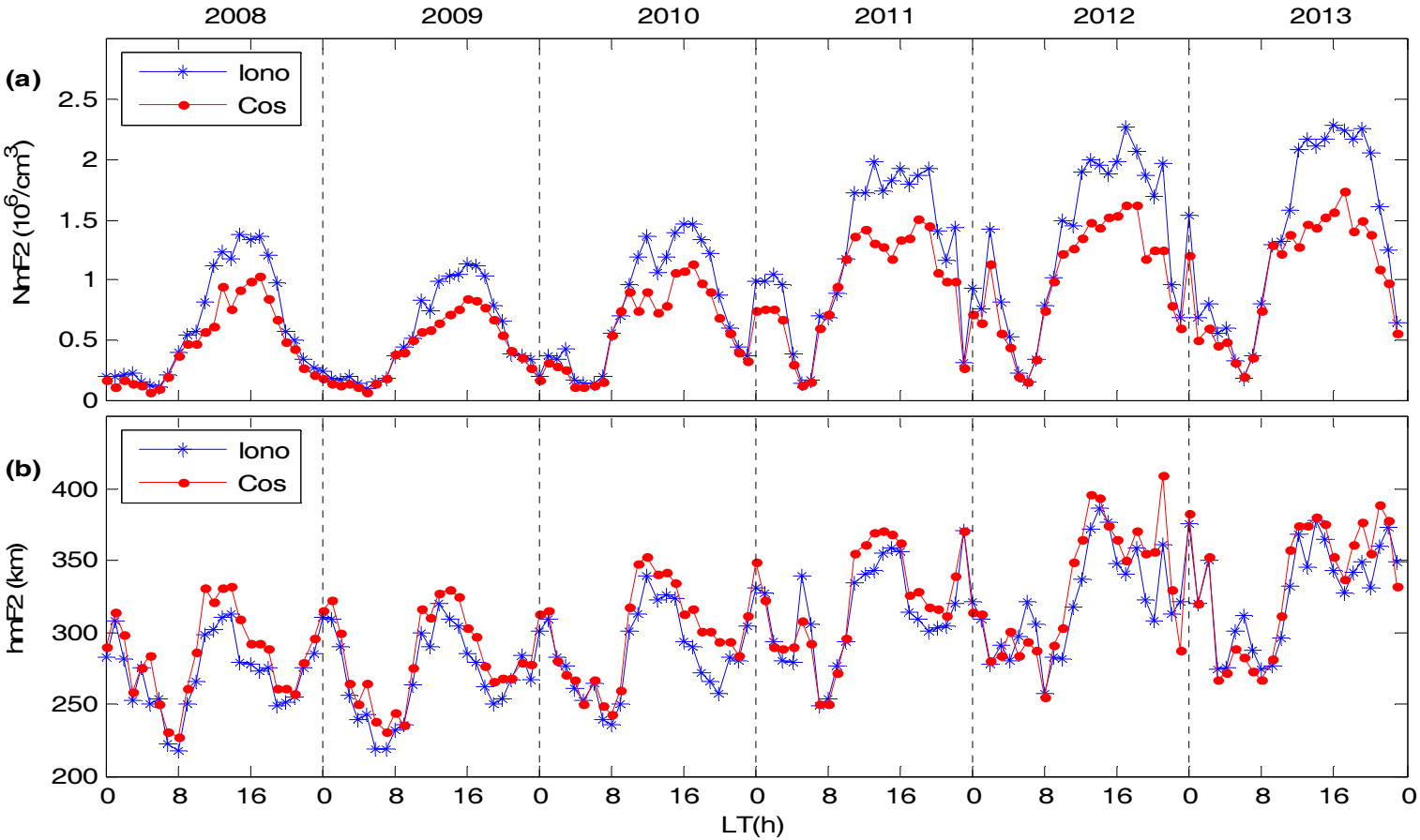


■ Analysis method and results

（2）Validation of COSMIC ionospheric peak parameters with ionosonde over Sanya, China

- Ionosonde
  - 2008-2010, CADI ionosonde
  - 2011-2013, DPS4D ionosonde
  - All ionograms were manually scaled to retrieve ionospheric peak parameters.
  - Ionosonde data with time difference less than 7.5min to Cosmic occultation and tangent point with difference less than 2.5 degree in latitude and longitude to Sanya were selected to compose the data pairs.
- COSMIC
  - CDAAC level2 ionprf data.
  - Peak paramters were retrieved from the Champman α fitting of the COSMIC profiles.

Diurnal variation of peak parameters

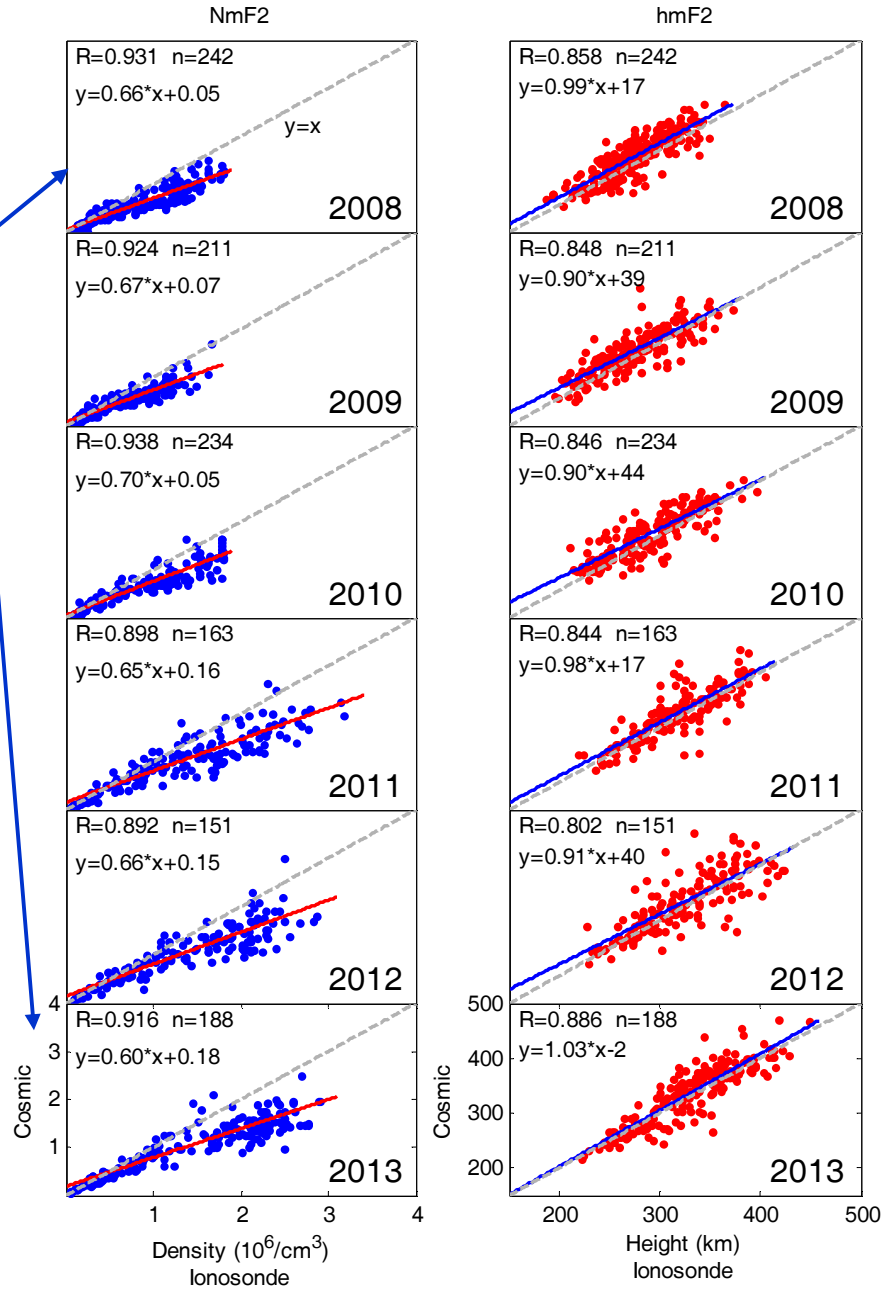


- COSMIC NmF2 and hmF2 follow the similar tendency to ionosonde
- Both parameters are higher in solar maximum (2011-2013) than in solar minimum (2008-2010).
- Short term variation similar to ionosonde also be shown by COSMIC

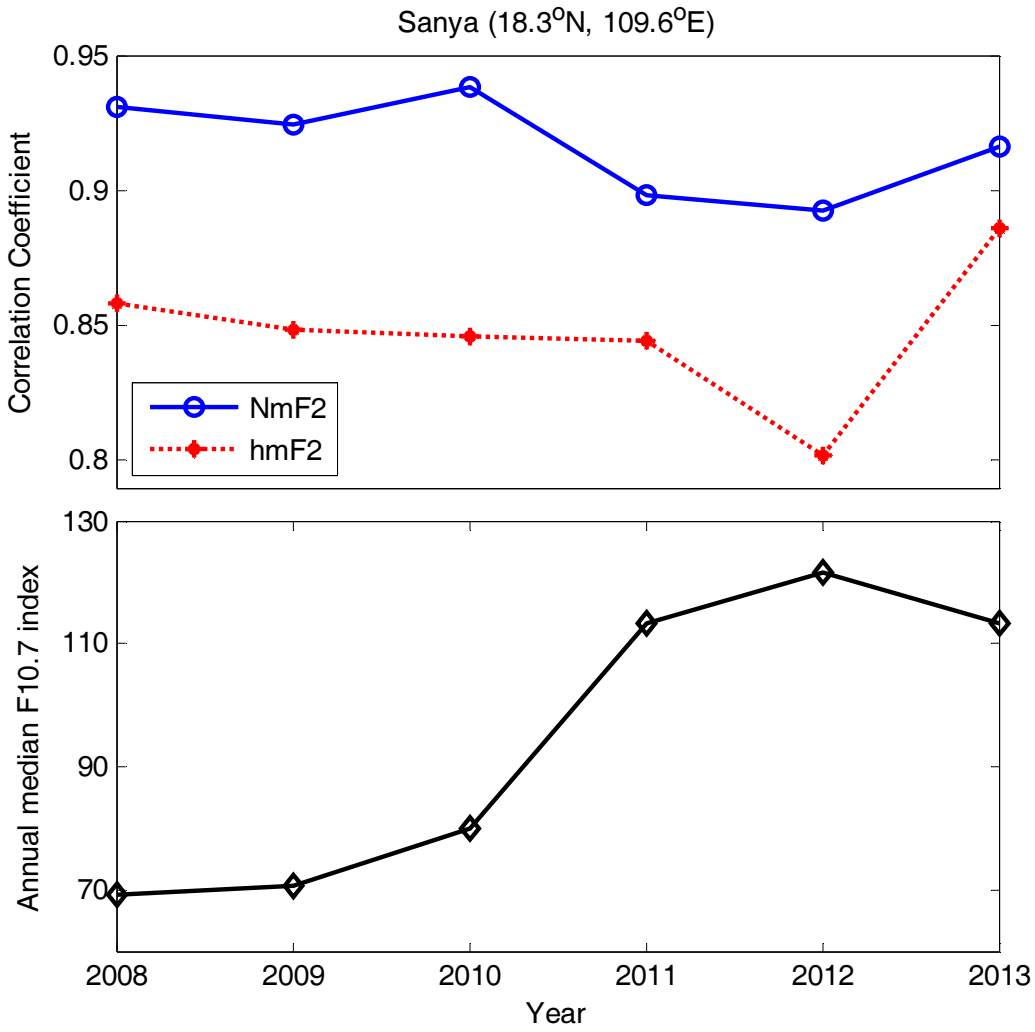
Scatter plots of NmF2 and hmF2

underestimate

- COSMIC NmF2 underestimation that of ionosonde
- NmF2 correlation is higher than hmF2

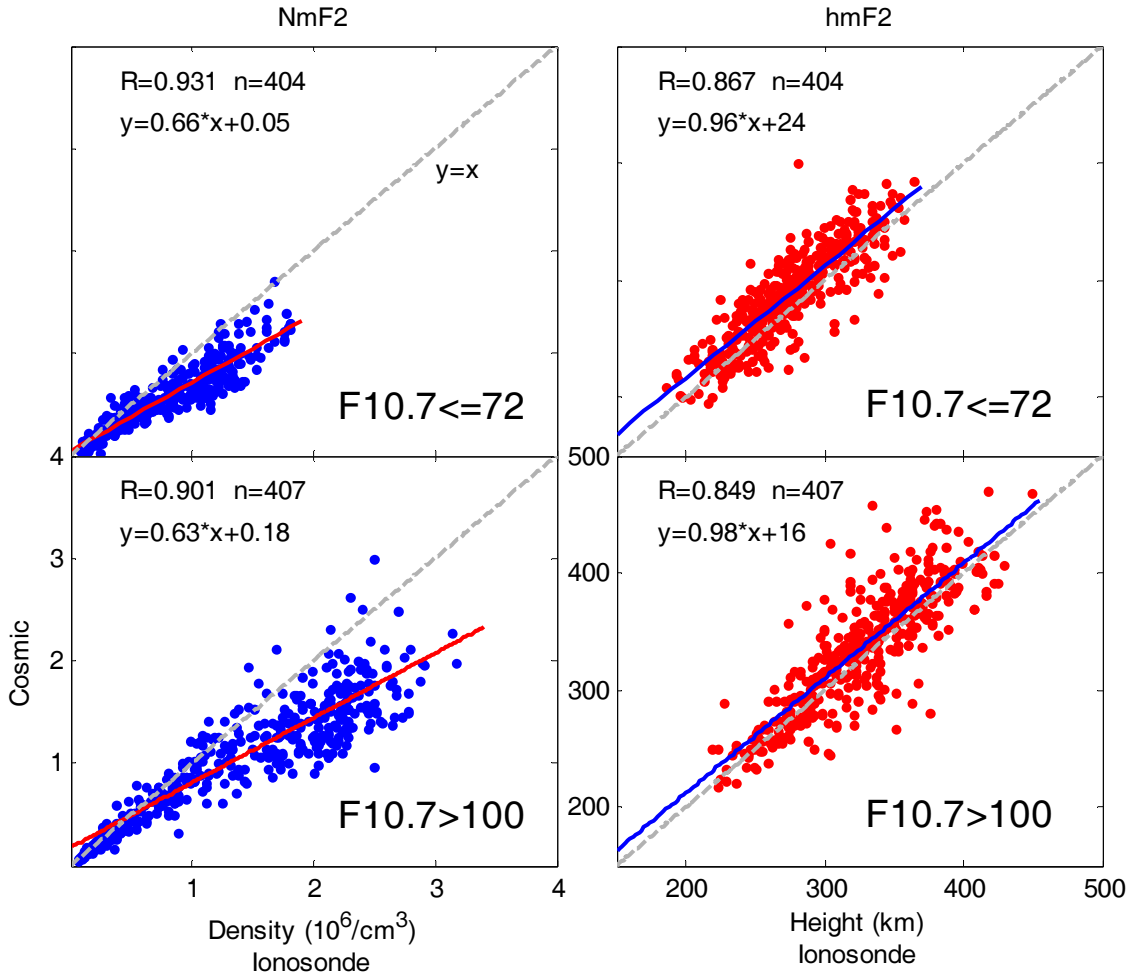


Correlation variation with F10.7



Correlations inversely related to solar activities

Correlation under high and low solar activity

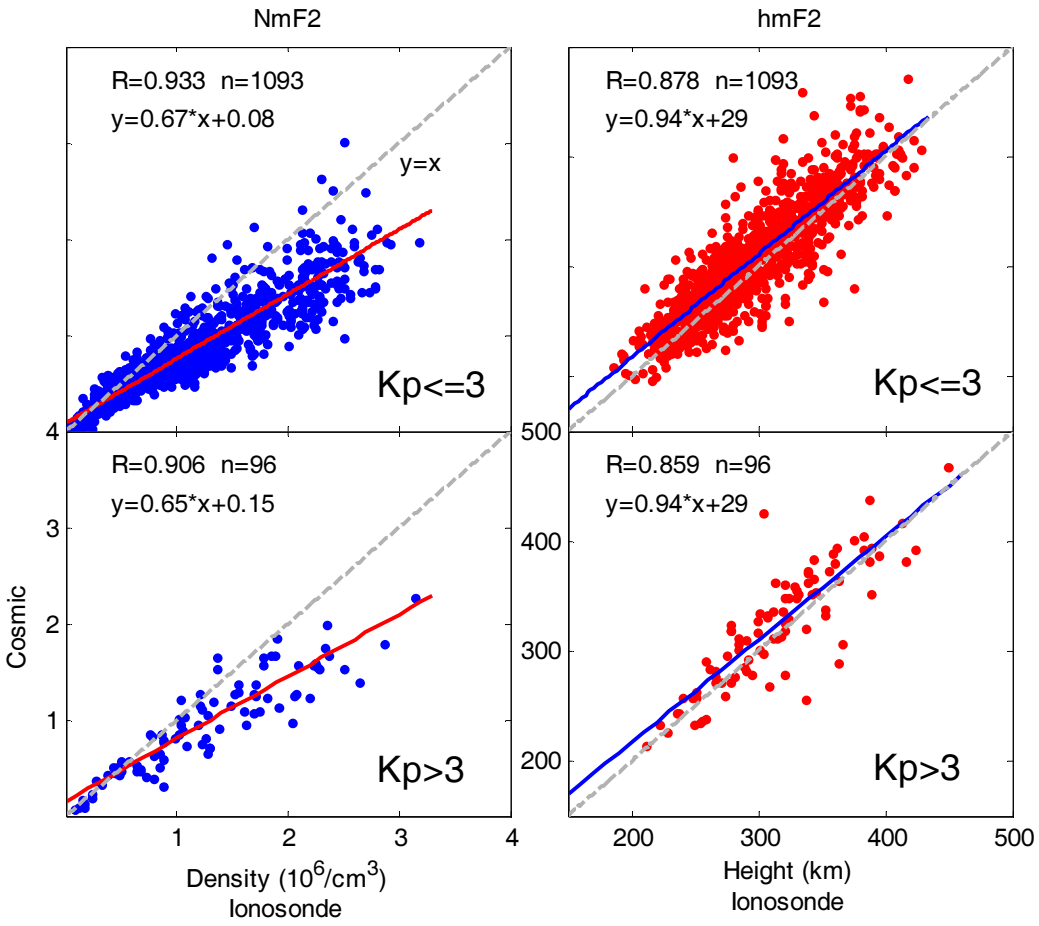


Both parameters have good correlation under high and low solar activity

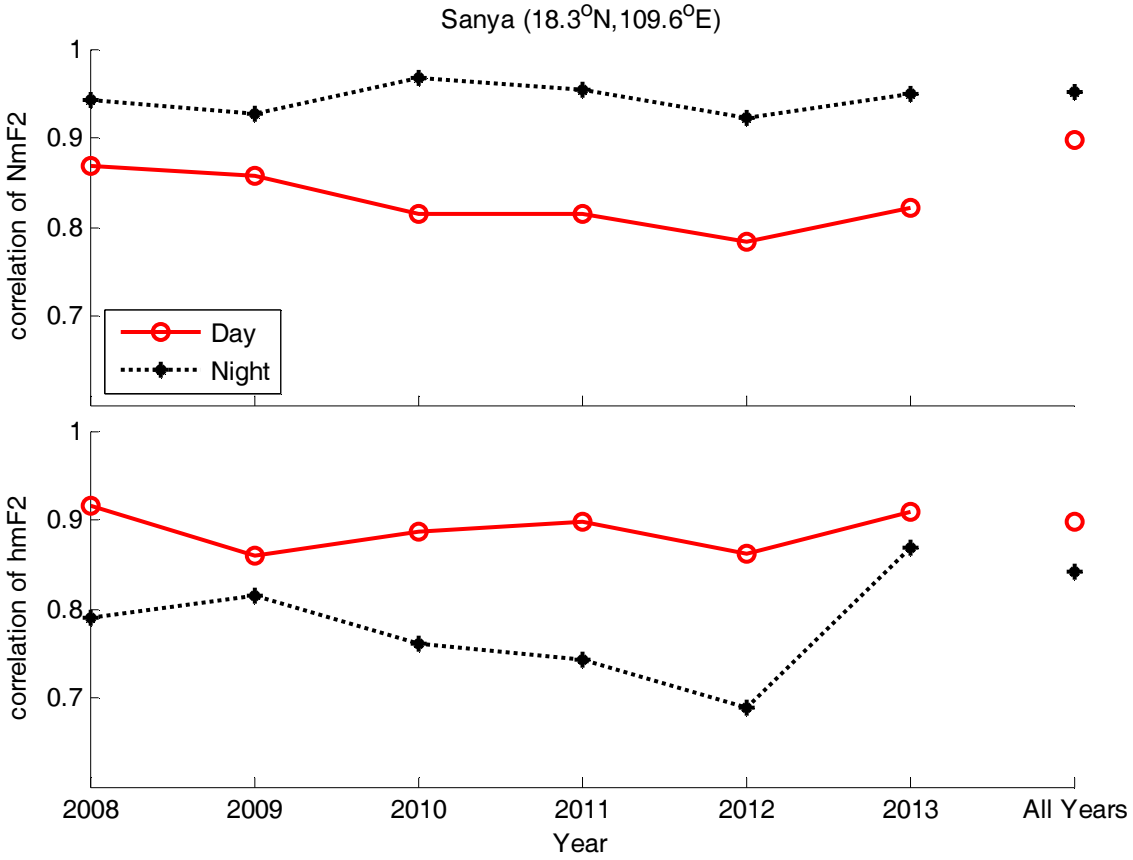
Correlations are higher in low solar activity

Correlation under geomagnetic quiet and disturbed conditions

- Both NmF2 and hmF2 have good correlation under geomagnetic quiet and disturbed conditions
- Correlations seems higher in geomagnetic quiet condition



Yearly variations of correlation coefficients in daytime and nighttime



The correlation of NmF2 is better during the nighttime and worse during the daytime.

The correlation of hmF2 is better during the daytime and worse during the nighttime.

Conclusions

- A chain of 4 DPS4ds with ability to monitoring ionosphere along 120° E was setup in China. The data is open to the public through the DIDB mirror site at Beijing. （IP: 159.226.119.133）
- The COSMIC NmF2 and hmF2 generally agree well with those from ionosonde observation over China.
- Correlation of NmF2 is higher in nighttime over China. But correlation of hmF2 is higher during the nighttime in mid-latitude, While it is lower during the nighttime in low-latitude.
- The correlations of NmF2 and hmF2 between COSMIC and ionosonde measurements decrease with the increment in solar activity and decrease with latitude.
- NmF2 and hmF2 of COSMIC agree well with those of ionosonde at mid-latitude area (Mohe, Beijing). But NmF2 of COSMIC overestimates (underestimates) that of ionosonde at Wuhan (Sanya).

Thank you for your attention!