“Intriguing aspects of low latitude night-time F region irregularities over East and South-East Asia”

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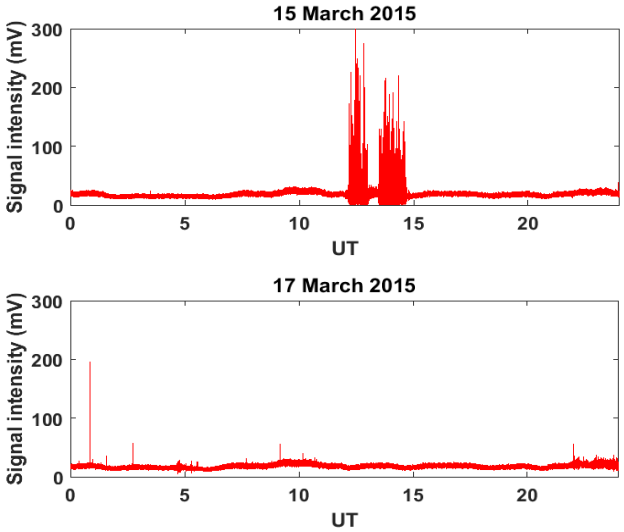
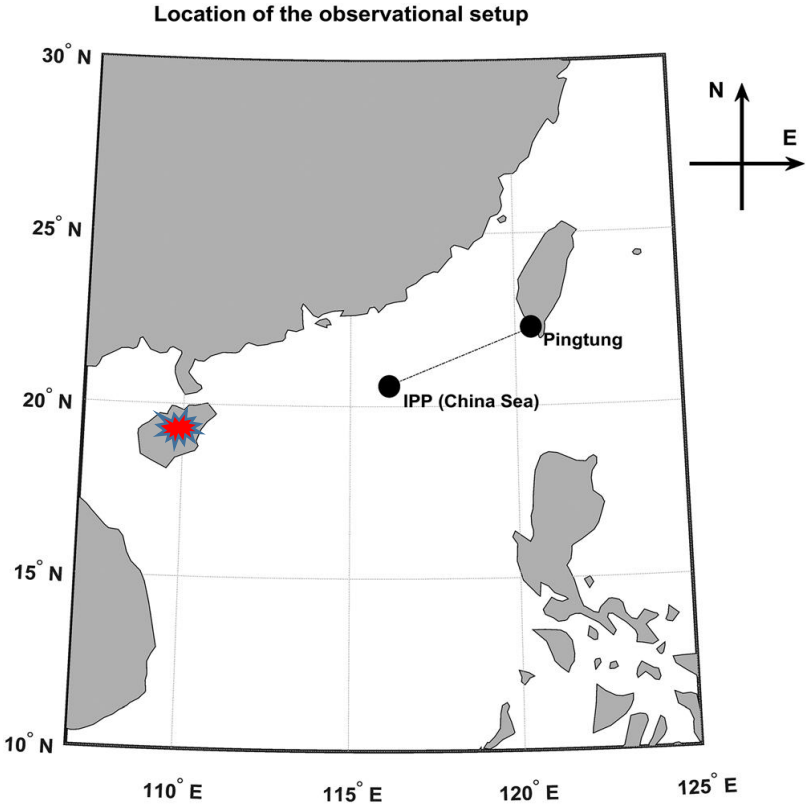
VHF Scintillation receiver at Pingtung

- SCINDA receiver station at Pingtung, Taiwan is a set of two VHF (244 MHz) receiver system installed to monitor ionospheric scintillation.
- It receives signal from a geostationary satellite.
- The satellite to receiver line of sight is such that it intersects the ionospheric pierce point (IPP) over the China Sea Area.
- Thus it provides a unique capability to study and monitor in real time, the scintillation activity over the China Sea Area.



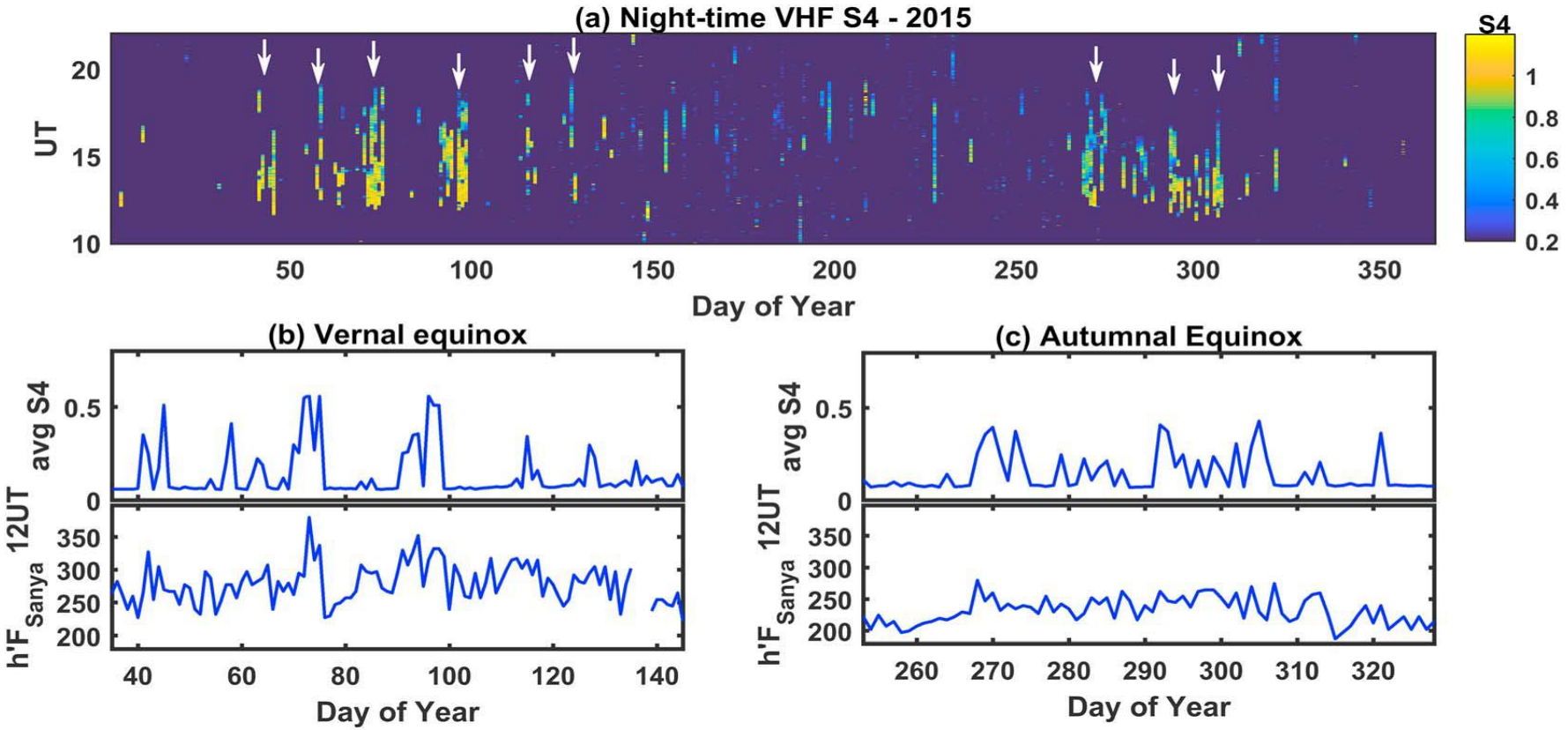
Typical example of ionospheric scintillation (raw data)



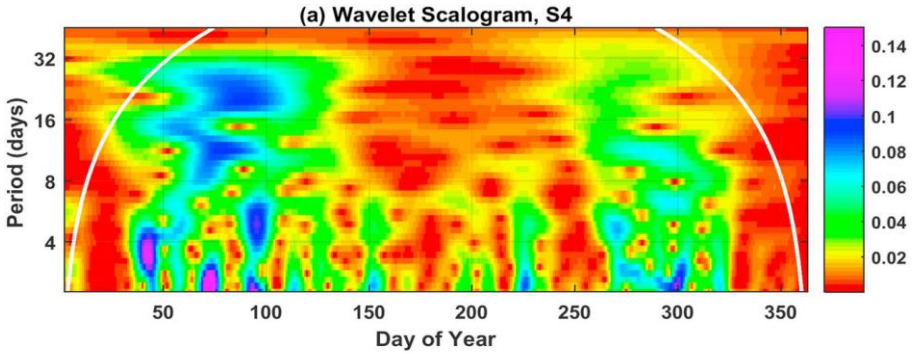
Digital ionosonde installed at Sanya, China is also utilized for the study

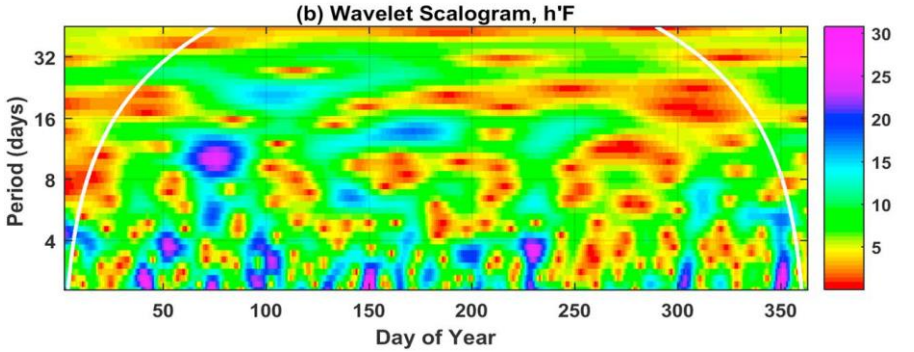
Results: Planetary scale variability of Scintillation

- Year long continuous recording of the VHF scintillation from Pingtung revealed the presence of planetary scale quasi-periodic wave activity
- h'F recorded over Sanya in the evening hour also display planetary scale wave like behavior
- Interestingly, the dominant wave appears to have period greater than 4-8 day atmospheric Kelvin wave

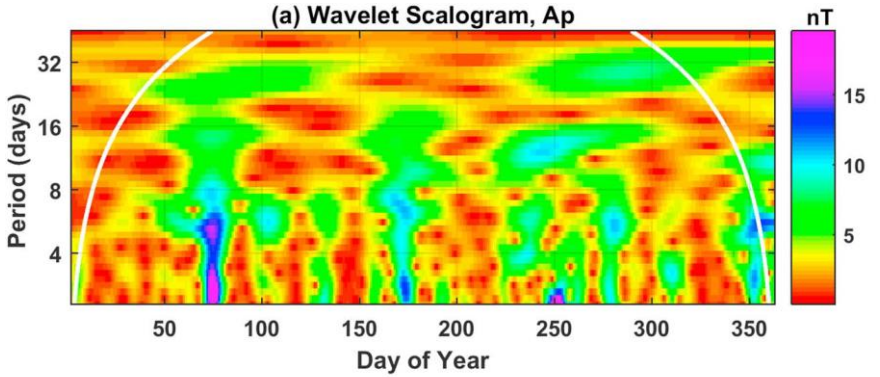


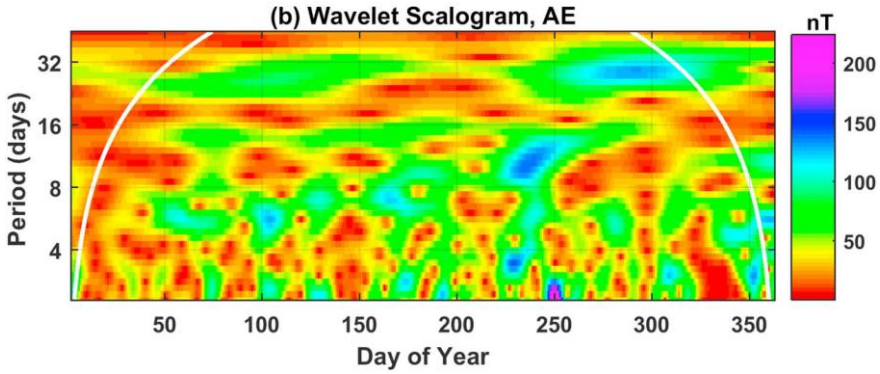
Results: Wavelet analysis of ionospheric and geomagnetic parameters





- Wavelet decomposition of scintillation S4 and h'F from Sanya clearly shows strong amplitude of wave periods greater than the Kelvin wave period of 4-8 days.

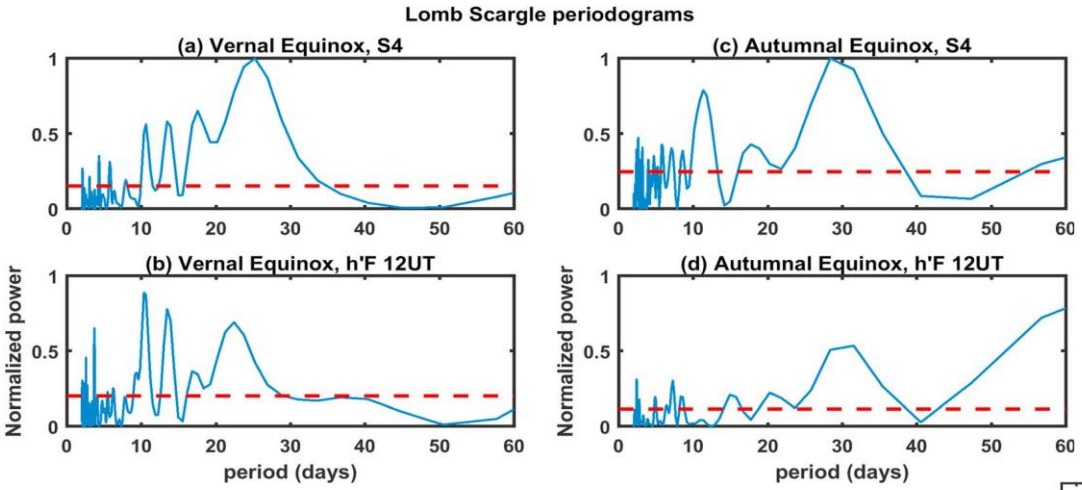




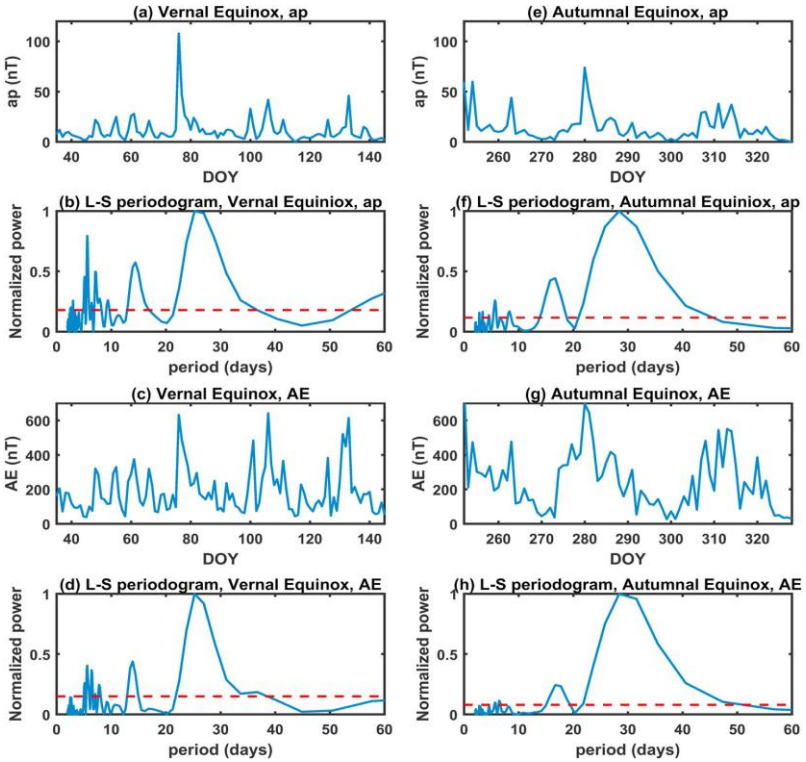
- Geomagnetic indices also shows similar periods
- This indicates that the scintillation periodic variabilities are associated with the space weather processes.

- **These ionospheric and geomagnetic variability matches well with the quasi-27 day solar rotation period.**

Lomb-Scargle spectral analysis



- Lomb-Scargle spectra (ionospheric)
- Dominant S4 period : 25 day in Vernal equinox and 28.5 day in Autumnal equinox
- h'F also have similar period (but not dominant)



- Lomb-Scargle spectra (geomagnetic)
- Dominant S4 period : 25 day in Vernal equinox and 28.5 day in Autumnal equinox
- **These periods are exactly similar to the ionospheric scintillation variabilities.**
- This indicate that the planetary scale variability of ionospheric scintillation is controlled by space weather processes.

- **These ionospheric and geomagnetic variability matches well with the quasi-27 day solar rotation period.**

Conclusions

- Ionospheric scintillation is a random fluctuation in the intensity of trans-ionospheric signals.
- However, the occurrence pattern of ionospheric scintillation is **not random.**
- Ionosphric scintillation clearly display planetary scale quasi-periodic variability.
- Time period of scintillation variability was found to match exactly with the geomagnetic variability.
- This clearly indicates that the variability of ionospheric scintillation is controlled by space weather process.