

# **Thermospheric Inter-annual Variability: Implications for Effects of ENSO and QBO**

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Using a 46-year long dataset of the thermospheric density during 1967-2012, we examined the inter-annual variability in the thermosphere at 400 km and its potential connection to El-Nino Southern Oscillation (ENSO) and stratospheric Quasi-Biennial Oscillation (QBO). Wavelet analysis reveals two major modes of the thermosphere inter-annual oscillation, with the slower mode having an average period of ~64 months, and the faster mode of ~28 months. The slower mode bears high coherence with the ENSO during 1982--2012, while the faster mode is found to vary coherently with the QBO around 1972, 1982 and 2002. Further examination reveals that the coherence between QBO and the faster mode is significantly influenced by their common coherent variation with the solar flux, while high coherence between the slower mode and ENSO is much less contaminated. Therefore, we conclude that the 28-month periodicity in thermospheric density may be caused by both QBO and solar radiation, whereas the 64-month periodicity possibly arises mainly from ENSO processes, with little/small contribution from solar radiation.

Key words: thermosphere, inter-annual variability, ENSO, QBO, atmosphere coupling

## **References**

Liu, H., 2016: *Earth, Planet and Space*, in press.