

# **Observations of pre-sunset ionospheric F region bottom-type scattering layer at low latitude**

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The bottom-type irregularity scattering layer (BSL) that can appear in the ionospheric F region bottomside has been observed generally after sunset, serving as a possible telltale of equatorial spread-F (ESF). Using simultaneous multi-beam radar measurements over two low-latitude stations, Sanya (18.3°N, 109.6°E; dip latitude 13°N) and Fuke (19.3°N, 109.1°E; dip latitude 14°N) in China, we report, for the first time, a thin BSL that initially occurred at pre-sunset (~1720 LT), much earlier than the occurrence of BSL generated from the equatorial plasma shear vortex driven instability. The pre-sunset BSL was situated around 225 km altitude, and continued to exist until the appearance of ESF plumes after sunset (~1930 LT). Interestingly, the Doppler velocities of the pre-sunset BSL echoes measured by the radar, and the F layer virtual heights obtained from the collocated Digisonde measurements over Sanya both show oscillations with a period of about 1 hour, suggesting a close link between the occurrences of the BSL and of F region plasma density large-scale wave structure (LSWS) before sunset. A preliminary statistics from the Sanya radar observations show that the pre-sunset BSL were observed on the days with F layer height oscillations presenting downward phase propagation. These observations could imply an important role of gravity waves in the generation of the pre-sunset F region bottom-type irregularities.