East-west asymmetric of scintillation occurrence in Indonesia using GPS and GLONASS observations

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By using GNSS (Global Navigation Satellite Systems) receiver to collect amplitude scintillation at L1 frequency (1.57542 GHz) from GPS and GLONASS, we investigated ionospheric scintillation occurrence at equatorial anomaly crest in Indonesia from July 2014 to June 2015. The receiver is installed at Bandung (6.9 deg S, 107.6 deg E; 9.9 deg S mag. latitude), Indonesia. In this study, we grouped our analysis into two groups based on duration of observation, (1) July-December 2014 (monthly F10.7 ranged from 124.7-158.7) which is named autumn equinox and (2) January-June 2015 (monthly F10.7 ranged from 120.1-141.7) which is named spring equinox. Our preliminary results can be summarized as follows; (1) the intensity of scintillations at spring equinox is higher than at autumn equinox although solar activity at autumn equinox is higher than at spring equinox and (2) the directional distribution of scintillation occurrences at spring equinox mostly concentrate in the western sky, so we see east-west asymmetric, but the distribution at autumn equinox doesn’t show clearly east-west asymmetric.

Previous studies have reported that occurrence rate of the scintillation at spring equinox season is higher than at autumn equinox. Our results suggest that equinoctial asymmetric of scintillation occurrence can be also as an asymmetric of scintillation intensity and east-west asymmetric of scintillation occurrence between spring and autumn equinox. In general, plasma bubble is tilted westward as it vertically develop due to vertical shear in the eastward plasma drift in F region, and consequently, it will be tilted westward as it extends in latitude. Scintillation intensity will be stronger when signal propagation tend to be parallel with structure of the plasma bubble. Our results also imply that the latitudinal extension of plasma bubble is higher at spring equinox than at autumn equinox. More the bubble extends in latitude, more the bubble structure exists in the western sky of the receiver. Thus, at spring equinox, scintillation intensity and occurrence may be stronger and higher in the west because signal propagation from the western sky with respect to the receiver location could be parallel with the structure of plasma bubble.