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Retrieval of ionospheric slab thickness and its variations from 3-D GPS observations

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The ionospheric slab thickness is the ratio of the total electron content (TEC) to the maximum electron density of the F-region (*Nm*F2, proportional to the square of the F2-layer critical frequency foF2). It represents the equivalent slab thickness (EST) of the ionosphere having a constant uniform density of the F2 peak. The equivalent slab thickness is of great influence on the shape of ionospheric electron density profile Ne (h), and also a convenient one-parameter summary of the electron density profile that may be related to the various physical processes. Therefore, the ionospheric slab thickness is thus very helpful in understanding the nature of variations of upper atmosphere and is therefore employed in modelling the ionosphere such as International Reference Ionosphere, IRI (Bilitza, 2001). However, in the past decades, the equivalent slab thickness and its variability were generally studied with several independent data, such as the TEC from the GOES satellite and the *fo*F2 from the ionosonde or with other expensive techniques, such as incoherent scatter radar, which maybe induces unreliable estimations in equivalent slab thickness as each observation technique has its feature and representative**.** In this paper, the continuous GPS observations in South Korea are the first used to study the equivalent slab thickness (EST) and its seasonal variability**.** The averaged diurnal medians of December-January-February (DJF), March-April-May (MAM), June-July-August (JJA) and September-October-November (SON) in 2003 have been considered to represent the winter, spring, summer and autumn seasons, respectively. The results show that the systematic diurnal changes of TEC, NmF2 and EST are significantly appeared in each season and the higher values of TEC and NmF2 are observed during the equinoxes (semiannual anomaly) as well as in mid-

daytime of each season. The EST is significantly smaller in winter than in summer but with a consistent variation pattern. During 14-16 LT in daytime, the larger EST values are observed in spring and autumn while the smaller ones are in summer and winter. The peak of EST diurnal variation is around 10-18 LT, which are probably caused by the action of the thermospheric wind and the plasmapheric flow into the F2-region.

Key words: Ionospheric slab thickness; GPS; TEC; South Korea