Klobuchar model for ionospheric delay correction in Saudi Arabia

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Abstract: The ionospheric delay is the major source of potential range delay for single-frequency GNSS users (Kunches and Klobuchar, 2001). Single-frequency GNSS users are in critical need of an ionospheric model to eliminate the ionospheric delay to a high degree of accuracy. GPS system uses the Klobuchar model for this task, its coefficients are sent through the GPS navigation message to GPS users. Klobuchar model uses the Ionospheric Corrections Algorithm (ICA) (Klobuchar, 1987) designed to account for approximately 50% (rms) of the ionospheric range delay. Center for Orbit Determination in Europe (CODE) is currently generating ionospheric coefficients compatible with the Klobuchar model by making use of global TEC map information. Global TEC maps are processed routinely by the CODE analysis center and they are available in Ionosphere map Exchange (IONEX) format (Schaer et al., 1998). A comparison study between the behaviour of the Klobuchar model using the GPS broadcast coefficients and the same model using CODE-coefficients has been presented in this paper. The zenith range delay correction by the two models has been assessed using the highly accurate IGS-Global Ionospheric Maps for Riyadh station situated in Riyadh capital of Saudi Arabia. The study was carried out over three different months that each of them reflects a different state of solar activity, which is a major indication for the ionospheric activity. It can be concluded that for middle-latitude geographic region, the behaviour of Klobuchar-CODE model is better than the Klobuchar-GPS model as it reflects the day-to-day variation of the ionospheric delay and provides similar or better accuracy than the Klobuchar-GPS model for different states of ionospheric activity.

Keywords: Ionosphere, Klobuchar, GPS, CODE, Middle latitude