

Analysis of ionospheric range delay corrections for navigation in South America and Caribbean region

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The ionosphere introduces large errors in GPS signals; these inaccuracies can be mitigated using a Satellite Based Augmentation System (SBAS) scheme. SBAS corrections are based on several approximations which are generally valid for mid latitudes and in Northern Hemisphere. In this paper we have simulated ionospheric conditions for a South American and Caribbean scenario and have analyzed the performance of a SBAS type algorithm for this region. Since slant range delays came from a numerical simulation, they are perfectly known, and therefore the mismodeling produced by each SBAS approximation can be separately quantified. Our study has focused on the inaccuracy introduced by two components of the problem: 1) the single layer shell representation of the ionosphere and 2) the simple geometric mapping function that relates vertical and slant TEC. The effect of both components on positioning are evaluated and discussed. Tests were done in periods with different levels of ionospheric activity during solstices or equinoxes and La Plata Ionospheric Model (LPIM) algorithms were used for computing the results.