# A new algorithm and results of ionospheric delay correction for satellite-based augmentation system

Z. Huang (1,2,3,4), H. Yuan (3)

(1) Wuhan Institute of Physics and Mathematics, the Chinese Academy of Sciences, China, (2) Graduate School of the Chinese Academy of Sciences, China, (3) Academy of Opto-Electronics, the Chinese Academy of Sciences, China, (4) XuZhou normal university, China (huangz@xznu.edu.cn / phone: +86-10-82619317)

Ionospheric delay resulted from radio signals traveling ionosphere is the largest source of errors for single-frequency users of the Global Positioning System (GPS). In order to improve users' position accuracy, augmentation systems based on satellite have been developed to provide accurate calibration since the nineties. A famous one is Wide Area Augmentation System (WAAS), which is aimed to the efficiency of navigation over the conterminous United States and has been operating successfully so far. The main idea of ionospheric correction algorithm for WAAS is to establish ionospheric grid model, i.e., ionosphere is discretized into a set of regularly-spaced intervals in latitude and longitude at an altitude of 350km above the earth surface. The users calculate their pseudoranges by interpolating estimates of vertical ionospheric delay modeled at ionospheric grid points.

The Chinese crust deformation monitoring network has been established since the eighties and now it is in good operation with 25 permanent GPS stations, which provide feasibility to construct similar satellite-based augmentation system (SBAS) in China. For the west region of China, the distribution of stations is relatively sparse not to ensure sufficient data. If we follow the ionospheric grid correction algorithm, some grid points can't obtain their estimate and lost availability. Consequently, ionospheric correction measurement on the users situated in that region is inestimable, which constitute a fatal threat to navigation users.

In this paper, we presented a new algorithm that employs International Reference Ionosphere (IRI) as transport model. The delay estimate of user was determined using a linearly weighted combination of observations directly taken from ionospheric pierce points falling in a bin at the given epoch. The weight was chosen as a function of the inverse latitude. This paper detailed the main idea of algorithm, and presented results comparing the precision between grid algorithm and new one. We further analyzed the accuracy of ionospheric delay correction based on the new algorithm with data sets from network of the dual-frequency GPS receivers throughout China. The emphasis was placed on the precision of different latitude and longitude region considering the complexity of ionosphere in China.