Galileo Local Component for the detection of atmospheric threats

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The presence of small-scale structures in the atmosphere (ionosphere and troposphere) can strongly affect the reliability of GNSS high precision real time applications. The concepts of reliability and integrity play a crucial role in the development of Galileo. In particular, small-scale structures in the ionosphere TEC due to Travelling Ionospheric Disturbances or to geomagnetic storms can be the origin of strong disturbances in high precision positioning.

The GALOCAD project has been submitted in response to Galileo Joint Undertaking call for proposals 2423. GALOCAD stands for GAlileo LOcal Component for the detection of Atmospheric Disturbances that affect high accuracy Galileo applications. The objective of GALOCAD is to develop a methodology for the implementation of a Galileo Local Component for the nowcasting and the forecasting of atmospheric threats (ionosphere and troposphere) which can degrade the "integrity" of high precision Galileo applications. The paper presents the results obtained in the frame of that project about the influence of ionospheric threats on GNSS.

The philosophy of GALOCAD is the following: in a first step, small-scale atmospheric disturbances are detected using GNSS data. Since the end of 2003, Belgium is equipped with a network of 67 permanent GPS stations. The typical distance between the stations ranges from 4 to 30 km. Based on this dense network, we have characterized the behaviour of small-scale disturbances over Belgium. In addition, a long-term climatological study of ionospheric disturbances has been obtained using the measurements collected in the permanent GPS station Brussels (Belgium) from April 1993 up to now. In a second step, the effects of such atmospheric disturbances on high precision real time positioning is assessed based on software which simulates GNSS user "positioning conditions" on the field.