



Solar Activity Effects on PPP Accuracy

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There are many error sources affecting the GPS precision. In this study, we focus on how GPS measurements (i.e. baseline components n , e , up that form GPS time series) are affected by the disturbances in the ionosphere. The solar activity is one such error source. To quantify the effect of solar activity, sunspot numbers and the solar cycle are taken into account.

For this aim, we generated GPS campaign measurements one day per each month between 2002 and 2018. Thus the period of solar cycle extending about 11 years was taken into account. We designed an experiment in which 6 GPS stations from different latitude regions of the International GNSS Service were used, and the data was sampled to be 8-14 hours GPS campaigns. PPP module of the NASA/JPL's GIPSY/OASIS II software was used for the processing. We examined the correlation between the number of sunspots and the standard error of the coordinate components constituting the campaign GPS time series. The effect of the solar activity was investigated for 3 different periods (solar minimum, solar moderate and solar maximum) with respect to the intensity of the number of sunspots. Along the solar cycle, positive and negative correlations between sun spot numbers and standard errors were found at some of the stations. This deteriorates the positioning accuracy level which was previously found using the traditional ways.

Keywords: Solar Activity, Accuracy, GNSS, PPP