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Comparative study of the influence of different ionospheric disturbances on the GPS scintillations at high latitudes

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In this work we compare the influence of auroral particle precipitation and polar cap patches (PCP) on scintillations of the GPS signals in the polar ionosphere. We use the GPS scintillation receivers at Ny-Ålesund and Skibotn, both operated by the University of Oslo. The presence of the auroral particle precipitation and polar cap patches was determined by using data from the EISCAT 42m radar on Svalbard. We analyzed more than 100 events for years 2010-2017, when simultaneous EISCAT 42m and GPS data were available. For some of the events, the optical aurora observations on Svalbard were also used. We consider the following types of the auroral precipitation: i) the dayside and morning precipitation, ii) precipitation on the nightside during substorms, iii) precipitation associated with the arrival of the interplanetary shock wave. All considered types of ionospheric disturbances lead to enhanced GPS phase scintillations. For the polar cap patches, the morning and daytime precipitation (i), and precipitation related to the shock wave (iii), the phase scintillations index reaches values less than 1 radian. We observe that auroral precipitation during substorms leads to the greatest enhancement of the phase scintillation index (up to 3 radians). Thus, the substorm precipitation has the strongest impact on the scintillation of GPS radio signals in the polar ionosphere.