GPS and Ionosonde Measurements at the Pruhonice Observatory

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Introduction
The Pruhonice ionospheric station (50°N, 14.5°) has measured the ionosphere since 1957. The Topcon NET-G3 receiver has operated since 2011 in Pruhonice station to give additional information about ionospheric dynamics. The combination of the digisonde and the GPS/GNSS receiver in one place is relatively unique and it brings new possibility to study ionospheric processes.

Topcon NET-G3
Signals TRACKED: GPS (L1, L2, L5 carrier, CA, L1 P, L2 P, L2O), GLONASS (L1, L2, L5 carrier, L1CA, L2CA, L1, P, L2, P), *GALILEO (E2-L1-E1, E5) Antenna Type: CR-G3 Choke ring

Dynamics of the ionosphere
The ionosphere is highly variable system with a wide range of periods. Its state depends on the solar and geomagnetic activity, daytime and season and it is influenced by the neutral atmosphere. In the ionogram (right) the reflections from layers E, F1 and F2 are present (red) and the profile of electron concentration is computed (black line). While the lower part of the electron concentration profile is computed directly using digisonde measurement (green area) the upper part (the topside ionosphere, orange area) is estimated indirectly using a model. Drift measurement estimates horizontal and vertical velocity of the plasma in chosen height window using Doppler shift of the reflected signal (right bottom panels) and thus it gives us information about the plasma movement.

Conclusion and future work
GPS ionospheric measurement is a convenient complement to “classical” ion/digisonde observation and vice versa. High temporal resolution of the GPS enables us to analyze short-term variation in the ionosphere (e.g. the E layers observations, changes in TEC compared to state of the neutral atmosphere etc.). On the other hand, the digisonde is capable to estimate the part of TEC below the maximum of electron concentration with a high accuracy and describe the dynamics of the ionosphere and thus give additional information which may help in TEC measurement and modeling.

Long-term TEC datasets will be used to analyze wider range of periods of ionospheric variations (e.g. TIDs, planetary or gravity waves).