

# Observation of GPS phase fluctuations at high-latitude under low solar activity

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This study investigated the GPS phase fluctuations over the high-latitude site, Tromsø, Norway, during the low solar activity years 2007-2008. The index of GPS phase fluctuations,  $F_p$ , was used to quantify GPS phase fluctuations. It is noted that the method calculating the  $F_p$  index was proposed by Mendillo et al. [2000]. The classes  $50 \leq F_p < 200$  and  $F_p \geq 200$  were set to represent moderate and strong irregularities, respectively. This investigation examined the seasonal and diurnal variations of  $F_p$  and the correlation between  $F_p$  and the geomagnetic index,  $K_p$ . Figure 1 shows that  $F_p \geq 50$  and  $F_p \geq 200$  occurred more frequently in the equinoctial months. For the diurnal variation, the occurrences of  $F_p \geq 50$  were higher during 18:00-04:00 LT. The duration and starting times of  $F_p \geq 50$  were shorter and later in summer than in other seasons. In Figure 2, the value of  $F_p$  generally increased with an increasing  $K_p$  in both daytime and nighttime. Furthermore, through comparing the electron density profiles of EISCAT radar with  $F_p$  (Figure 3),  $F_p \geq 50$  mainly occurred when the electron density in the E-region was enhanced.

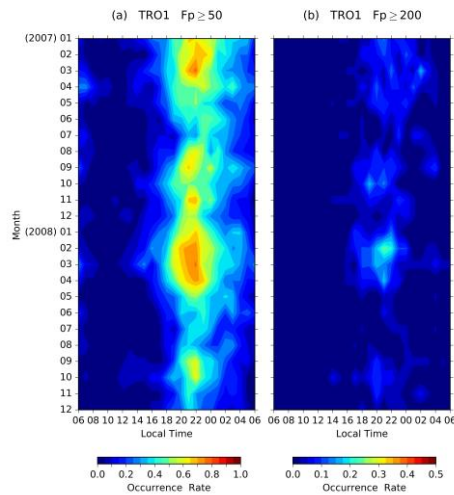


Figure 1. The hourly occurrence rates of (a)  $F_p \geq 50$  and (b)  $F_p \geq 200$ .

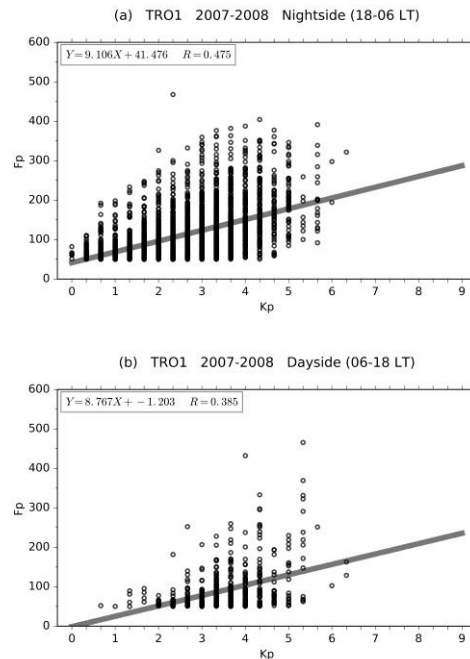


Figure 2. The scatter plots of  $F_p$  against  $K_p$  for (a) the nightside sector (18-06 LT) and (b) 659 the dayside sector (06-18 LT).

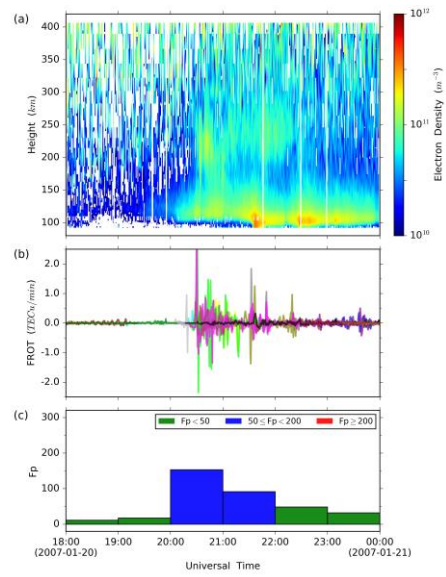


Figure 3. The variations of (a) raw electron density (without calibration) observed by the EISCAT radar, (b) FROT, and (c) Fp during 18-24 UT on 20 January 2007.

### References

Mendillo, M., B. Lin, and J. Aarons, The application of GPS observations to equatorial 586 aeronomy, *Radio Sci.*, 35(3), 885-904, doi:10.1029/1999RS002208, 2000.