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Electron density in the ionosphere as measured by Swarm and RISR-C

The Swarm satellites have been collecting F region electron density data since late 2013. The Swarm A and C satellites are flying at altitudes of ~450 km and the Swarm B is at altitudes of ~510 km. For measurements of electron density in the ionosphere, an incoherent scatter radar RISR-C has been installed at Resolute Bay (Canada) in 2015. When operational the radar provides electron density profiles in the ionosphere with time resolution of up to 1 min. The RISR measurements cover altitudes of 100-600 km in multiple (up to 51) beams. The Swarm satellites cross the Resolute Bay zenith at least a couple of times per day so that a comparison of the data between the instruments can be made. In this study, we identified all the events when joint Swarm-RISR data are available for 2015-2018, covering the entire period of RISR-C data available online. Although the point-by-point comparison showed significant spread in the electron density data reported by the instruments, the cloud of points can be characterized by a linear relationship. We show that the best fit lines have a slope of 0.6-0.9, depending on the satellite considered and observational conditions. Potential reasons for the differences are discussed.

Swarm; Risr