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Determining decay rates of polar cap plasma using observations of polar cap patches

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Polar cap patches are large scale structures occurring in the high-latitude ionosphere. They are regions of enhanced plasma density of at least twice the background density, and they are often observed in the polar cap region. The primary decay mechanism is via a two-step rearrangement and recombination reaction involving Oxygen and Nitrogen. Small scale structures within polar cap patches can result in scintillation of radio signals such as those used in Global Navigation Satellite Systems (GNSS). As such, quantifying the decay rate of the plasma is of importance if the effects on such communications are to be predicted.

Observations were obtained during the Northern Deep Winter experiment, a series of incoherent scatter radar world days that took place in December 2014. Data from multiple incoherent scatter radars at high latitudes will be utilised to observe the same plasma at several locations as it is transported. From these observations, the decay of the plasma will be calculated and compared to the results of laboratory experiments.