Double Pulse Operations with SuperDARN

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The use of ground-based radars for observations of ionospheric and magnetospheric dynamics is well established. The Super Dual Auroral Radar Network (SuperDARN) consists of networks of HF radars surrounding the northern and southern poles, which have yielded extensive data on our near space environment. The Cooperative UK Twin Auroral Sounding System (CUTLASS) radars, in the STEREO mode of operation, provide a good temporal resolution. However, to further improve this resolution, we require an increase in the cadence of pulse sequence transmissions by the radar. The use of a “double pulse" scheme could significantly increase the temporal resolution of the ionospheric plasma flow measurements. Here we emulate a double pulse transmission sequence using just the zero and first lags in the standard SuperDARN multi-pulse mode. We demonstrate a high positive statistical correlation between the emulated Double Pulse Ionospheric convection velocities and the standard SuperDARN fit velocities. Secondly, we utilised STEREO, allowing the continued operation of the standard multi-pulse mode whilst the Double Pulse mode operated on the second channel. We illustrate the first double pulse results from SuperDARN, utilising backscatter induced by the high power RF facility at Tromsø and the TMS raw data analysis technique[1], and discuss the implications and challenges associated with such a radar mode.

[1]Yukimatu, A. S., Tsutsumi, M.: A new SuperDARN meteor wind Measurement: raw time series analysis method and its application to mesopause region dynamics, Geophysical Research Letters, 29, NO. 20, 1981, 2002.