

Reassessment of SuperDARN/SENSU near range echoes

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SuperDARN (Super Dual Auroral Radar Network) is an international high-frequency radar network and a powerful and unique tool primarily contributed to space weather researches by providing global (high and mid-latitude) ionospheric plasma convection and electric potential map in high temporal resolution of ~1-2 min in quasi real time with its wide global coverage of fields-of-view. It also contributes to MLT (mesosphere and lower thermosphere) or MTI (mesosphere, thermosphere and ionosphere) region dynamics and vertical coupling of ionised and neutral atmosphere in middle and upper atmosphere by observing TIDs (traveling ionospheric disturbances), neutral winds and PMSE/PMWE etc as well as ionospheric D and E region echoes.

SuperDARN near range echoes are important targets especially for lower altitude echoes like those in D and E regions and in MLT regions. As typical range resolution of SuperDARN is rather coarse and HF ray paths bend in ionosphere, determining correct height/altitude information is key to understand the physics in the regions. These years SuperDARN community has tried to greatly improve and re-establish the method of interferometer calibration (in several ways). Some radars have also started to try higher range resolution using imaging (SDI/FDI) and pulse coding technique etc independently.

Calibration of interferometer and elevation angles at all the available SuperDARN radars is especially important. It will enable all the well-calibrated SuperDARN radars to obtain neutral wind vertical profile around mesopause region and its temporal evolution with more reliable height information if our raw time series analysis method for underdense meteor echoes is applied. The ways forward to improve the SuperDARN neutral wind measurement as well as to make SuperDARN a global meteor radar network will be shown and discussed.

Another issue is to determine echo altitude more precisely for non meteor (non grainy) near range echoes. We here try to re-calibrate the interferometer and elevation angles in our Antarctic Syowa SuperDARN SENSU radar data and to reassess the height information of the near range echoes. Some recent papers related to this issue proposed near range echoes in summer midday obtained in Canadian SuperDARN radars data seems not from mesopause region altitude but from slightly higher altitude so those echoes might not be PMSEs. Results of reassessment of near range echoes in Syowa SENSU radars and origins of the echoes will be shown and discussed.

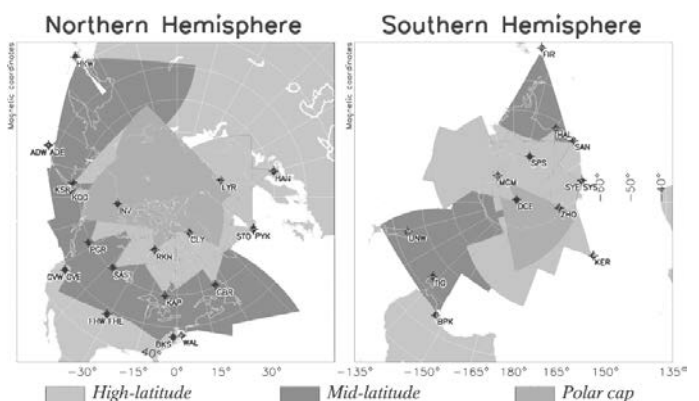


Figure 1. SuperDARN fields-of-view in northern and southern hemispheres

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