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SuperDARN contributions to CAWSES-II

Akira Sessai Yukimatu[1*], Keisuke Hosokawa[2], Tetsuo Motoba[1], Natsuo Sato[1]

[1]ROIS/NIPR, [2]Univ. Electro-Communications

Super Dual Auroral Radar Network (SuperDARN) is an international collaborative HF-radar network originally designed to obtain global large scale two-dimensional polar ionospheric plasma convection patterns in both hemispheres with a temporal resolution of 1 to 2 minutes since 1995. SuperDARN is a powerful tool to be applied to many scientific issues, which can be used not only to deduce dynamics of global large-scale convection patterns, but also to study dynamics of transient meso-scale phenomena like flux transfer events (FTEs), magnetospheric responses to solar wind dynamic pressure like travelling convection vortices (TCVs) and polar cap boundary or open-closed field line boundary (OCB), to detect reconnection sites and to deduce reconnection rates, to study substorms, storms and phenomena related to subauroral regions like sub-auroral polarisation stream (SAPS), to deduce field aligned electric currents (FACs), to study MHD waves in a variety of frequency ranges, and also to study ionospheric irregularities in D-, E-, and F-regions. Moreover, it can be utilised not only to ionospheric researches but also to neutral atmospheric studies, e.g., on atmospheric waves e.g., traveling ionospheric disturbances (TIDs), tides and gravity waves, deducing neutral winds around mesopause region, and also detecting and studying polar mesospheric summer echoes (PMSEs), etc. These days, the fields-of-view (FOVs) of SuperDARN have been expanded to higher latitude (PolarDARN) and mid-latitude (StormDARN) which covers considerable portions of mid- and polar latitudes of earth's ionosphere in both hemispheres and enables us to address much wider ranges of scientific questions (including inner magnetospheric physics). SuperDARN has extensively evolved successfully and has been extremely productive by strong cooperation and competitions within the community and also by collaborative studies with other ground-based and satellite/rocket observations and theoretical research groups.

We present what SuperDARN has done so far and what could not be done by SuperDARN so far, and what SuperDARN will be able to do by recent technical development, e.g., by increasing spatial and temporal resolution and combining with other ground based and satellite observations, and then, discuss how SuperDARN can contribute to CAWSES-II program in terms of the main CAWSES-II themes, especially on the effect of short-term solar variability on the geospace environment (TG3), the geospace response to an altered climate (TG2), and the geospace response to variable inputs from the lower atmosphere.

Keywords: CAWSES-II, SuperDARN, magnetosphere-ionosphere coupling, MLT region dynamics, aurora, neutral winds