SuperDARN

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Super Dual Auroral Radar Network (SuperDARN) : present and future perspective

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Super Dual Auroral Radar Network (SuperDARN) started in 1995 as an international co-operative organisation/project of HF radars network observation. About 20 radars operated by more than 10 countries and institutions cover the considerably large portion of polar ionosphere at both hemispheres, measure Doppler spectra of mainly F-region ionosphere, and hence derive plasma convection and electric field potential map over the whole polar ionosphere at high temporal resolution as snapshots which could not be achieved by either ground based or satellite observation before. As the derived physical parameters are extremely fundamental and important, a number of researches collaborating with other ground based and satellite measurements have been successfully made, which not only include dynamics of global-, meso- or small-scale convection including transient phenomena, but also include remote sensing of magnetic reconnection, field aligned currents, substorms, MHD waves, ionospheric irregularities (FAIs) and so on, some of which were not expected at the beginning of SuperDARN project. Other than many researches on ionosphere - magnetosphere - solar wind interaction including validation of theoretical and simulation works on M-I coupling, SuperDARN can also contribute to neutral atmosphere researches including gravity waves, TIDs, tides, meteor winds, PMSEs etc., which have been more stimulated by recent increasing researches. The reason why SuperDARN could have achieved a number of outstanding outcomes and even is still extensively growing, has been thought partly because of good balance between international co-operation and competition (as well as very informal good atmosphere in the community), and also partly because the community shares all the radars' data as well as radar control and analysis software, and also its open data policy.

More than 10 years have passed since the advent of SuperDARN. The number of the radars is still growing, including 'Polar-DARN' whose FOVs are centered around magnetic pole and 'StormDARN' installed at mid-latitude like Hokkaido radar with which we expect a variety of researches on substorms/storms, inner magnetosphere and mid-latitude ionosphere and MLT region. Though there exist many researches using SuperDARN data only, considerable collaborative researches with ground based radars like EISCAT and SPEAR, optical instruments, and satellites like IMAGE, CLUSTER, THEMIS, REIMEI etc. could have addressed a wide range of scientific questions. SuperDARN will be thought to be important to monitor ionospheric potential map including for space weather nowcast and forecast continuously, but we believe that improvement of the observation methods, which has often been recently discussed in the community, as well as more active collaboration with other science communities like polar and domestic dense ground based observation network, international satellites communities, and theoretical works, with concrete objectives, will be important keys for SuperDARN future perspective.

SuperDARN (Super Dual Auroral Radar Network) 1995
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TID
PMSE
ACF Web

SuperDARN 10
MLT - HF StormDARN
PolarDARN
SuperDARN EISCAT IMAGE
CLUSTER SuperDARN

SuperDARN

G. Chisham et al., A decade of the Super Dual Auroral Radar Network (SuperDARN): scientific achievements, new techniques and future directions, Surv. Geophys., 28, 33-109, 2007.