

Foreword

This special issue is based on the research reports presented at the 2012 Super Dual Auroral Radar Network (SuperDARN) workshop held at Polar Research Institute of China, Shanghai, China, during May 27–June 1, 2012.

SuperDARN is an international collaboration involving scientists and engineers from more than 10 countries. So far, SuperDARN has more than 30 high frequency coherent radars covering the middle latitudes to very high latitudes in both hemispheres, and has become the most powerful tool for monitoring large scale ionospheric convection. The backscatter targets of SuperDARN radars are ionospheric plasma irregularities aligned along the geomagnetic field. The Doppler velocity of the irregularities can be used to infer the strength and direction of the ionospheric electric field. These measurements, obtained continuously, provide valuable information about the electrodynamics of the coupled magnetosphere-ionosphere system over extended spatial scales and with high time resolution.

All SuperDARN radars operate continuously. In standard operation the temporal resolution is typically 1–2 min and the range resolution is 15–45 km. Special multi-pulse sounding sequences are used to simultaneously determine the range and Doppler velocity of the backscatter targets out to ranges in excess of 3 000 km. While there are some hardware differences between the radars, each is controlled with a common set of software and produces identical data products. This approach allows the data from all radars to be consolidated into a single data set, enabling straight forward analysis of ionospheric plasma motions on hemispheric spatial scales.

The workshop briefly reviewed the status of SuperDARN with a particular emphasis on the recent expansion of the network to mid- and higher-latitudes. Many phenomena and new results, such as the ionospheric response to earthquake and solar flare events, the radar signatures of the tongue of ionization (TOI) and medium scale traveling ionospheric disturbances (MSTIDs), amongst others, were widely discussed. Techniques, such as advanced data mining techniques, the usage of two-frequency operation mode, the assimilation multi-radar data were also presented. In all areas the need for improved, co-ordinated ground and satellite/rocket observations was stressed. This issue only collects a part of these reports.

This SuperDARN workshop was arranged in China for the first time. We gratefully acknowledge the International Collaboration Supporting Project, Chinese Arctic and Antarctic Administration, and we would like to thank the director of the Polar Research Institute of China, Professor Huigen Yang, his staff and students for providing excellent working conditions for this workshop. We also thank the Department of International Cooperation, State Oceanic Administration, China, who signed the documents for all the non-Chinese participants to apply for the visa for entering China.

Finally, we thank all the participants for their active participation, and thanks to all the contributors who made this special issue in *Advances in Polar Science* possible.

Guest editors:

Mark Lester
Hongqiao Hu

Shanghai, February 2013