



Ionospheric frequency sounding experiments with SuperDARN HF radars: First results

Evan G. Thomas^{*(1)}, Simon G. Shepherd⁽¹⁾, Gareth Chisham⁽²⁾, Darrell M. Elton⁽³⁾, Maria F. Marcucci⁽⁴⁾,
Kathryn A. McWilliams⁽⁵⁾, Nozomu Nishitani⁽⁶⁾, and Kevin T. Sterne⁽⁷⁾

(1) Dartmouth College, Hanover, NH, USA

(2) British Antarctic Survey, Cambridge, United Kingdom

(3) La Trobe University, Bundoora, Australia

(4) INAF-IAPS, Rome, Italy

(5) University of Saskatchewan, Saskatoon, Canada

(6) Nagoya University, Nagoya, Japan

(7) Virginia Tech, Blacksburg, VA, USA

1 Extended Abstract

The Super Dual Auroral Radar Network (SuperDARN) is an international network of more than 30 ground-based, high-frequency (HF) space weather radars which continuously monitor the line-of-sight Doppler velocity of plasma irregularities at E- and F-region altitudes in the mid- to high-latitude ionosphere [1]. We describe a new operating mode, based on the prior work of [2] and adapted for the current generation of SuperDARN radars, which is designed to collect oblique ionospheric sounding data in the down-time at the end of each 1- or 2-min radar scan. First results are shown from four network-wide tests in 2020 and 2021 demonstrating how the maximum usable frequency (MUF) and critical frequency of the ionospheric F2-layer (foF2) can be resolved across the SuperDARN radars' extensive fields of view [3].

References

- [1] N. Nishitani, et al., "Review of the accomplishments of mid-latitude Super Dual Auroral Radar Network (SuperDARN) HF radars," *Prog Earth Planet Sci*, **6**, 18, March 2019, pp. 1–57, doi:10.1186/s40645-019-0270-5.
- [2] J. M. Hughes, W. A. Bristow, R. A. Greenwald, and R. J. Barnes, "Determining characteristics of HF communication links using SuperDARN," *Ann. Geophys.*, **20**, 31, July 2002, pp. 1023–1030, doi:10.5194/angeo-20-1023-2002.
- [3] E. C. Bland, A. J. McDonald, S. de Larquier, and J. C. Devlin, "Determination of ionospheric parameters in real time using SuperDARN HF radars," *J. Geophys. Res. Space Physics*, **119**, 27, June 2014, pp. 5830–5846, doi:10.1002/2014JA020076.