

Near-Range Echoes Enhancement by Alaskan King Salmon HF Radar -Possible Outburst of Meteor Shower with Russian Fireball-

Tsutomu Nagatsuma^{1*}, Manabu Kunitake¹, Masaki Tsutsumi², Tadahiko Ogawa¹, Akira Sessai Yukimatu², Tomoaki Hori³, Nozomu Nishitani³

¹National Institute of Information and Communications Technology, ²National Institute of Polar Research, ³STEL, Nagoya University

Localized and Sporadic enhancement of near-range echoes, possibly the outburst of meteor shower, observed by King Salmon HF radar during the Russian (Chelyabinsk) fireball event at 2013/02/15 03:20UT. King Salmon HF radar is located in Alaska, USA. The major purpose of this radar is to monitor the global ionospheric convection around northern and southern polar region based on the Super Dual-Auroral Radar Network (SuperDARN).

The HF radar has 16 directions of beams with 3.24 deg. of beam width. The total azimuthal width of field of view is more than 50 deg. There are 75 gates with 45 km spatial resolution for beam direction. The scan period of the beams is 1 min. or 2 min. Usually, the HF radar can detect echoes from ionospheric irregularities and ground and sea scatter. However, the HF radar can detect echoes from plasma produced by meteors around near-range gates, too. Because of the meteor plasma can reflect radar beams orthogonal to the direction of the meteor motion, we can estimate the direction of the meteor motion from that of the radar beams which have detected meteor echoes. In this event, sporadic enhancements of near-range echoes are observed within the beam 7 to beam 10, and range 0 to range 5. The beam direction which can detect meteor echoes shows time dependence. The earlier time period, the meteor echoes can be detected by larger beam No. On the contrary, the later time period, the meteor echoes can be detected by smaller beam No. This character can be interpreted as a rotation of radar field of view by the Earth's rotation. So the directions of the meteors motions are almost the same during this time period.

Preliminary comparison between velocity vector of these meteor echoes and that of Chelyabinsk fireball are almost identical. This result strongly suggests that the origin of the outburst of meteor shower and the Chelyabinsk fireball was the same. This will regulate the origin and its component of the Chelyabinsk fireball.

Keywords: HF Radar, Meteor Echo, Chelyabinsk Fireball, Outburst of Meteor Shower, SuperDARN