

Antarctic large area network observation of auroral phenomena using unmanned system

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Space and upper atmospheric sciences group in the National Institute of Polar Research (NIPR) is now planning to carry out a ground-based network observation project of auroral phenomena using unmanned observation system during the next term of the Japanese Antarctic Research Expedition (JARE) programme.

At present, 8 unmanned magnetometers have been deployed within the area of 66 to 72 degree magnetic latitude and 60 to 85 degree magnetic longitude around Syowa Station. Along the inland route to Dome Fuji Station, 3 BAS (British Antarctic Survey) type unmanned magnetometers are deployed, while along the coast area, 5 NIPR type ones are deployed. At these 8 points, 1 sec resolution magnetic observations are carried out continuously through the year with a 3-axis fluxgate magnetometer.

Within this JARE programme term (the 8th term), a new unmanned auroral observation system, which is equipped with 3-axis fluxgate magnetometer, all-sky auroral imager, and GNSS/TEC receiver, has been developed by NIPR, and one set of the system will be deployed around Molodezhnaya Station located about 300 km east from Syowa Station. In the next 9th term, another set will be deployed around the SerRondane area located about 800 km west from Syowa. In addition to the observations at these unmanned sites, we will promote a collaboration with the observations at Indian Station Maitri and South African Station Sanae, which are located further westward from SerRondane area at sub-auroral latitudes, to construct a large area auroral observation network within the area of 62 to 72 degree magnetic latitude and 45 to 85 degree magnetic longitude.

Scientific purposes of this large area network observation are as follows:

1. To observe phenomena which appear around the time of substorm onset.
2. To observe temporal variation of conjugacy of auroral phenomena.
3. To observe phenomena associated with various wave-particle interactions during the storm and substorm times in the inner magnetosphere region.

Keywords: unmanned observation, large area network, auroral phenomena, conjugacy