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Abstract

**Heliosphere Impact on Geospace: Solar-Terrestrial and Aeronomy Research
During the Fourth Polar Year Campaign**

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The concept which Austrian lieutenant Karl Weyprecht suggested for the first international polar year (1882-83) of making coordinated multi-stational auroral and geomagnetic observations is still valid for the ongoing fourth International Polar Year (IPY). While the network of the first IPY included some tens of stations today the polar instrument networks include hundreds of stations both in the Arctic and Antarctic. The IPY science program covering all the most important disciplines in environmental physics and also some aspects in social sciences has more than 160 research projects and several tens of initiatives dedicated for PR and education. Understanding of the complex near-Earth space environment has matured to the level of being able to describe many of its component parts and a major goal now is to seek a unified framework that can specify and predict its global state and, therefore, space weather.

The IPY project 63 (“Heliosphere Impact on Geospace”) conducts multinational research on solar-generated events which affect the composition and dynamics of the atmosphere in the terrestrial polar areas. This cluster is a collective effort of 29 international consortia which run versatile bi-polar space research instrumentation to support the IPY campaign. The activity is led by two complementary initiatives: the International Heliophysical Year (IHY) programme coordinates the use of spacecraft missions with ground-based observatory instruments to study the Sun’s influence on the heliosphere, including effects at the Earth; ICESTAR, endorsed by SCAR (Scientific Council of Antarctic Research), coordinates research on magnetospheric and upper atmospheric responses to solar inputs, with emphasis on inter-hemispheric relationships. Several groups of Cluster 63 have recently installed new instrumentation to the polar regions in order to improve the spatial coverage and resolution and to provide pairs of geomagnetically conjugate observations from both hemispheres. The resulting observations and value-added data products are used together with state-of-the-art models and simulations to improve our quantitative understanding of the near-Earth space environment.

In the presentation we will discuss recent findings in Cluster 63 scientific work which can be categorized under three main themes:

- (i) Coupling processes between the different atmospheric layers and their connection with the solar activity (E.g. effects of extreme solar activity on the content of stratospheric ozone).
- (ii) Energy and mass exchange between the ionosphere and the magnetosphere (E.g. tomographic studies of ionospheric phenomena).
- (iii) Inter-hemispheric similarities and asymmetries in geospace phenomena (E.g. comparison studies of southern and northern auroral structures).