

## Recent and future projects by Finnish research teams in bi-polar region

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Sodankylä Geophysical Observatory (SGO) carries out geophysical measurements and related research at high latitude in the arctic for more than 100 years now. One of the main research interests of SGO is the influence of solar forcing on climate and weather. Here measurements of polar geospace and atmospheric environment are needed in the bi-polar region. SGO is also entering the category of institutes which have instrumentation both in the Arctic and Antarctic, since installation of a newly constructed neutron monitor will soon happen in Antarctic. A special expertise of SGO is remote sensing of the upper atmosphere by radio methods. New software-defined-radio type of instruments have been utilized in modernizing geophysical instrumentation. An example of this is the Kilpisjärvi Atmospheric Imaging Receiver Array, KAIRA facility, which is Finland's largest radio telescope but also serves as a platform to develop EISCAT\_3D type radar reception by simultaneous multiple beams and world-wide new instrumental methods, such as for example the interferometric wide-band imaging radiometry, where maps of energy characteristics of the precipitating high energy particles is the ultimate data product. SGO also carries out instrument development to support observation networks with low power, reliable but modern hardware, including SDR products. During the last international Polar Year, SGO with colleagues carried out extensive seismic measurements, and SGO is currently increasing the number of its permanent seismic stations for studies of polar seismology. Global change related issues can be studied also based on upper atmospheric measurements. SGO has been running an ionospheric vertical sounder since 1957 and the data was used to study the expected long-term cooling of the thermosphere. Currently SGO has developed a small version of SDR-based receiver for its chirp sounder and the idea is to make mapping of ionosphere in larger spatial scales by oblique soundings with a network of these receivers. SGO also actively participates in developing the next generation incoherent scatter radar EISCAT\_3D, which is a phased-array facility with several tens of thousands of antennas, distributed in 5 stations across 3 countries in Northern Scandinavia. EISCAT\_3D will be a vector imaging radar studying the geospace and atmospheric environment, supporting studies of couplings between space environment and atmospheric layers at the southern edges of the polar vortex and auroral oval.

### References

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