EISCAT 3D Norway Newsletter

Newsletter Introduction

The newsletter will be released every 3 months and cover recent contributions and developments involving the Norwegian EISCAT 3D community. Norwegian EISCAT news and contributions are also welcome to be posted. If you wish to be included in the mailing list for the newsletter distribution, please use the contact details at the bottom of the page.

EISCAT Radar Time Requests

May 1, 2022 is the deadline for general requests for EISCAT radar time for the second half of 2022 (July-December). This radar time is managed by EISCAT. More information at: https://eiscat.se/news/eiscat-peer-reviewed-program-experiments-3/

There is also time specifically allocated for Norwegian users through a separate program. Norwegian users can apply for radar time through both methods. https://en.uit.no/prosjekter/prosjektsub?p_document_id=487937&sub_id=590083

Upcoming EISCAT 3D Norway Meeting

Plans for a EISCAT 3D Norway meeting during the week of May 9-13 are currently underway. Some of the topics to be included are:
- The potential for an EISCAT 3D Norway charter
- Revisiting Science Objectives for EISCAT 3D Norway
- Determining a set of Key Performance Indicators for EISCAT 3D Norway
- The EISCAT 3D Andøya receiver array

The EISCAT 3D Andøya Receiver Array

There is an importance for complementary EISCAT 3D and rocket measurements for further investigating ionospheric dynamics. For this reason an EISCAT 3D receiver site at Andøya would be beneficial for future science campaigns. Discussions will be held on how best to ensure the Andøya receiver site stays on the EISCAT 3D implementation schedule.

Time will be allotted in the next EISCAT 3D Norway meeting for these discussions. If you are interested in EISCAT 3D at Andøya, you are invited to contact Martin Flügge (martin.fluegge@andoyaspace.no) and Kolbjørn Blix (kolbjoern.blix@andoyaspace.no) of Andøya Space.

New Hires and Promotions

Dr. Noora Partamies Promoted to Professor at UNIS
From the UNIS Intranet announcement:
Noora Partamies in the AGF department has been appointed professor at UNIS. Noora has a long history with UNIS. As many of her colleagues, she spent a year here as a student back in 1996-1997. Over the years she has kept in touch and in 2011 she became a guest lecturer, before starting working here full-time in 2015.

Congratulations Noora!

Recent EISCAT Norway Publications

Recent publications regarding EISCAT Norway are provided below. If you have a publication that should be included in the list and is missing, please contact us and it will be included in the next issue!

Narayanan, V. L., Häggström, I., Mann, I. (2022), Effects of particle precipitation on the polar mesospheric summer echoes observed by EISCAT VHF 224 MHz radar, Advances in Space Research, In press, https://doi.org/10.1016/j.asr.2022.02.015

Tesema, F., Partamies, N., Whiter, D. K., and Ogawa, Y.: Types of pulsating aurora: comparison of model and EISCAT electron density observations, Ann. Geophys., 40, 1–10, https://doi.org/10.5194/angeo-40-1-2022, 2022.

Recent and Upcoming Projects

Lompe
PI: **Dr. Karl Laundal** - University of Bergen

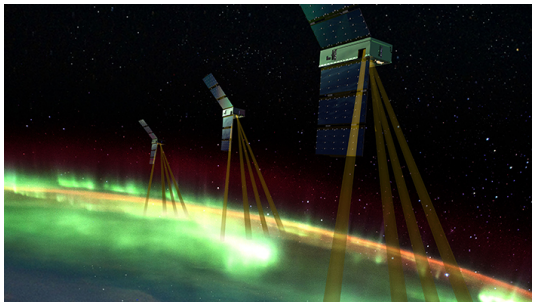
Lompe (Local mapping of polar ionospheric electrodynamics) is a new technique for regional data assimilation, which accommodates different types of measurements – ground magnetic field perturbations, space magnetic field perturbations, convection measurements from radars and satellites, and conductance measurements – to yield a continuous map of the ionospheric electrodynamics in a localized region. The technique is currently 2D, but expansion to 3D is planned in preparation for EISCAT_3D. This work is also supported by an ISSI team, "Understanding Mesoscale Ionospheric Electrodynamics Using Regional Data Assimilation", which had their first meeting in Bern in March. The Lompe development is funded by a Research Council of Norway researcher project, and by a Trond Mohn Foundation starting grant project, led

by Karl Laundal at the University in Bergen. The paper that describes the technique is submitted to Journal of Geophysical Research, and a preprint is available at https://www.essoar.org/doi/abs/10.1002/essoar.10510450.1.

EZIE

PI: **Dr. Jeng-Hwa (Sam) Yee** - Johns Hopkins Applied Physics Laboratory

The Electrojet Zeeman Imaging Explorer (EZIE) is a NASA mission that will launch in late 2024. It consists of three 6-unit cubesats equipped with antennas to measure emissions from meosospheric O2, which will be used to infer magnetic field disturbances using the Zeeman effect. This will be the first mission dedicated to measure ionospheric magnetic fields with the Zeeman effect. As the satellites traverse the auroral zone, they will image the electrojet at unprecedented spatial resolutions. Jesper Gjerloev (20% at UiB) is mission scientist and Karl Laundal (UiB) is co-investigator, and leads the team that makes the algorithm for mapping the electrojet. EZIE will investigate how substorm currents close in the ionosphere, and EISCAT_3D overpasses may be used to study this in 3D.



Credit: NASA/Johns Hopkins APL
201229-NASA-selects-EZIE-heliophysics

CASCADE

PI: **Dr. Andres Spicher** - UiT The Arctic University of Norway

Turbulent media exhibit a spatio-temporal randomness, or “irregular” character, and, in the ionosphere, the irregular structures in plasma density with scales shorter than a few kilometers are of particular interest for space weather applications. They can for instance disturb High Frequency (HF) radio communication, and degrade Global Navigation Satellite Systems (GNSS) signals. Our key scientific motivation is understand how these density structures occur and to identify the dominant mechanisms responsible for their creation in the auroral region, where they are known to be strongest.

Our main objective is thus to characterize plasma density structuring in the auroral region. To address this challenging topic, we will take advantage of the new EISCAT_3D, a three-dimensional (3D) phased-array system currently under development capable of volumetric imaging, and of providing 3D vector measurements at unprecedented temporal and spatial resolution. We will develop novel measurement techniques allowing to resolve the spatio-temporal evolution of density structures, and to monitor the meso-scale electromagnetic conditions in the ionosphere. EISCAT_3D observations will be coordinated with national and international research infrastructures, including high-resolution cameras, GNSS receivers, and sounding rockets from the Grand Challenge Initiative mesosphere lower thermosphere (MLT), a large-scale international collaboration dedicated to study the physics and chemistry of the MLT system. Additionally, theoretical work and numerical simulations will be conducted to validate and understand the observations, as well as to predict and constrain the plausible physical mechanisms taking place. Altogether, the novel methods developed combined with multi-instrument multi-scale observations and modelling work will allow to resolve outstanding issues about the spatio-temporal characteristics of turbulence with space weather impacts on technology.

Source: CASCADE - Research Council of Norway

Highlighting Postdoctoral Research

Dr. Lindis Bjoland

Lindis is a postdoctoral researcher at UNIS and is investigating high-latitude electron density depletion regions, both statistically and for single events. Using radar measurements scheduled on the EISCAT Svalbard Radar (ESR) for March 29-30 and data from previous measurements, she hopes to understand the formation and variability of such depletion regions. A recent publication related to this work is:

Bjoland, L. M., Ogawa, Y., Løvhaug, U. P., Lorentzen, D. A., Hatch, S. M., & Oksavik, K. (2021). Electron density depletion region observed in the polar cap ionosphere. Journal of Geophysical Research: Space Physics, 126, e2020JA028432. https://doi.org/10.1029/2020JA028432

We look forward to seeing the results from this research!

EISCAT Symposium 2022

As a reminder, the EISCAT Symposium will be held August 15-19, 2022 in the Sundbyholm castle near the town of Eskilstuna in central Sweden. Abstracts are due May 15, 2022. For more details on the workshop and to register, please visit: https://www.space.irfu.se/workshops/LPMR-EISCAT/

Future International EISCAT 3D Meetings

Information about EISCAT and the EISCAT 3D User Meetings is distributed via the mailing list moderated by EISCAT. To subscribe, email listmaster@eiscat.se. A Slack account is also organized for EISCAT 3D Discussions. To receive an invitation for the Slack channels, email channelmaster@eiscat.se.

Questions, Suggestions, Changes?

The next newsletter will be released in June, 2022. If there are any questions about EISCAT 3D, suggestions for the format of this newsletter, or changes that should be implemented, please let us know with the contact information at the bottom of the page. Thank you.