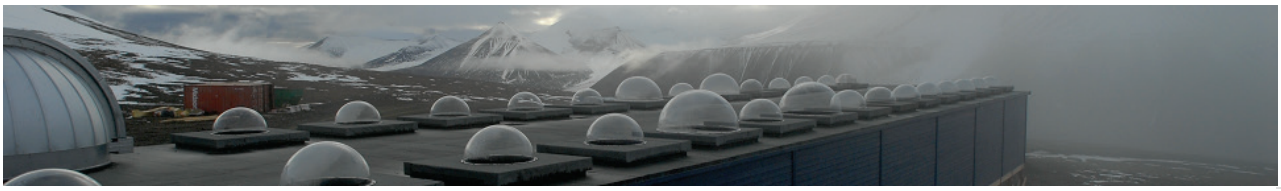

The Kjell Henriksen Observatory (KHO) 2014

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Abstract

The following is a summary for the activity at the Kjell Henriksen Observatory (KHO) in 2014. The current active personnel of the observatory are presented together with the operational instruments. A brief summary of the progress of the new SuperDARN radar is given in addition to project highlights from 2014.

The observatory crew

The current crew of KHO is listed below. F. Sigernes headed and had the daily operational responsibility.

Name	UNIS position	E-mail
Fred Sigernes	Professor, Optics and Atmospheric Research, Head of The Kjell Henriksen Observatory	freds@unis.no
Dag Arne Lorentzen	Professor, Upper polar atmosphere Head of the SuperDARN radar project	dagl@unis.no
Lisa Baddeley	Associate Professor, Radar applications, Head of the Doppler Pulsation Experiment	lisab@unis.no
Margit Dyrland	Post Doc, Middle atmospheric physics	margitd@unis.no
Silje Eriksen Holmen	PhD candidate, Middle atmospheric physics	siljeh@unis.no
Xiangcai Chen	PhD candidate, Aurora physics	xiangcai.chen@unis.no
Pål Gunnar Ellingsen	Post Doc, Space physics	pale@unis.no

Table 1. The Kjell Henriksen Observatory crew (2014).

Our Norwegian Construction and Property Management Department in Longyearbyen contact is Tommy Frantzen (tofr@statsbygg.no).

Operational instrumentation

The instruments at KHO are grouped into mainly five categories (#):

A. All-sky cameras and narrow field of view imagers,
B. Meridian scanning photometers,
C. Spectrometers / spectrographs
D. Scanning / imaging interferometers
E. Radio or non-optical instruments

Table 2 below lists all of the instruments according to institution and category (#).

	Instrument	Institution	#	Country
1	All-sky imager	University of Oslo (UiO)	A	Norway (NO)
2	All-sky intensified video camera	University Centre in Svalbard (UNIS)	A	NO
3	All-sky intensified camera	Finnish Meteorological Institute (FMI)	A	Finland
4	All-sky color camera	University College London (UCL)	A	England
5	All-sky video camera	UNIS	A	NO
6	All-sky DSLR camera	UNIS	A	NO
7	All-sky Airglow Imager	UNIS	A	NO
8	Auroral meridian spectrograph	National Institute of Polar Research (NIPR)	C	Japan
9	CCD spectrograph	Embry Riddle Aeronautical University (ERAU)	C	USA
10	Spectrographic Imaging Facility	The University of Southampton/UCL	C	England
11	Meridian-Scanning Photometer	University of Alaska Fairbanks/UNIS	B	USA/NO
12	1m S.Ebert-Fastie spectrometer	University of Alaska Fairbanks/UNIS	C	USA/NO
13	1m G.Ebert-Fastie spectrometer	University of Alaska Fairbanks/UNIS	C	USA/NO
14	1/2m B.Ebert-Fastie spectrometer	University of Alaska Fairbanks/UNIS	C	USA/NO
15	1/2m W.Ebert-Fastie spectrometer	University of Tromsø (UiT)	C	NO
16	Michelson Interferometer	ERAU	D	USA
17	Fabry-Perot interferometer	UCL	D	England
18	Scanning Doppler Imager	UCL	D	England
19	Monochromatic Auroral Imager	Polar Research Institute of China (PRIC)	A	China
20	All-sky Airglow Imager	University of Electro-Communications (UEC)	A	Japan
21	Fluxgate magnetometer	UiT	E	NO
22	2-axis search coil magnetometer	Augsburg College/Univ. of New Hampshire	E	USA
23	Ionospheric Tomography receiver	University of Wales Aberystwyth (Aber)	E	England
24	Auroral Radio Spectrograph	Tohoku University	E	Japan
25	HF acquisition system	Institute of Radio Astronomy/UiT	E	Ukraine/NO
26	64xBeam Imaging Riometer	Danish Meteorological Institute (DMI)/UiT	E	Denmark/NO
27	Balloon Telemetry Station	Nobile/Amundsen - Stratospheric Balloon Center/Italian Space Agency	E	US/Italy
30	Hyperspectral tracker (Fs-Ikea)	UNIS	C	NO
31	All-sky hyperspectral camera	UNIS	C	NO
32	Narrow field of view tracker	UNIS	A	NO
33	Scintillation and TEC receiver	University of Bergen (UiB)	E	NO
34	Automatic weather station	UNIS	E	NO
35	4xWEB cameras (safety)	UNIS	A	NO
36	Celestron 4m Telescope	UNIS	A	NO

Table 2. Instruments at the Kjell Henriksen Observatory (2014).

During the auroral winter season from November to the end of February, 25 optical instruments operate 24 hours a day. The 10 non-optical instruments run all-year-round 24 hours a day. A detailed description of the performance and the scientific objective of each instrument are found online. 21 different institutions from 9 nations were present at KHO in 2014. A map of where the instruments are located can be downloaded here. Note that out of 29 instrument domes, only four are currently not in use.

Teaching and courses

KHO serves as the main laboratory for hands on training and teaching of students in the Space physics group at UNIS.

Fig. 1 show students on field work using both the EISCAT radar and KHO. They used state-of-the-art facilities to do in-situ observations of the aurora.

Fig.1. AGF-345 students at Breinosa. Photo: Njål Gulbrandsen

In 2014 the following 4 courses have used KHO as part of field work:

Code	Course name	ECTS
AGF-216	The Stormy Sun and the Northern Lights	5
AGF-301/801	The Upper Polar Atmosphere	15
AGF-304/804	Radar Diagnostics of Space Plasma	15
AGF-345/845	Polar Magnetospheric Substorms	10

Table 3. UNIS courses using KHO as laboratory (2014)

A grand total of **45 ECTS** (European Credit Transfer and Accumulation System) have been taught.

Highlights 2014

(1) Dr. Holmes, I presume?

A new protonic is born! Jeff Morgan Holmes defended on Friday the 29th of August at the University of Oslo (UiO) his PhD titled: The Protonics project: distributed observations of auroral dayside Doppler-shifted hydrogen emissions. KHO salute you!
More info: [1][2]

(2) Master Kinga

Congratulation to Master Kinga Albert! The thesis is called: Svalpoint: A multi-track optical pointing system. It enables us at KHO to track any object on the night sky with multiple instruments, simultaneously. Her work opens new opportunities for us and we really look forward to start using the system.
More info:[3]

(3) C-REX launched successfully!

KHO was a central part of the Cusp Region EXperiment (C-REX), a NASA sounding rocket mission that released a large constellation of artificial clouds into the ionosphere above the Greenland Sea. The rocket was launched from Andøya Space Centre at 08:05 UT on 24th of November, 2014.
More info: [4][5]

Fig. 2. The SuperDARN workshop group in front of the Kjell Henriksen Observatory (KHO). Photo: Xiangcai Chen/UNIS.

(4) SuperDARN (Super Dual Auroral Radar Network) HF Radar

The project is currently on target to have the facility operational by October 2015. Planning permission for the facility was awarded in May 2014 and construction on site began in October 2014. The antenna masts are currently in storage at UNIS and will be deployed on site in summer 2015. Mains power and optical fiber connections will also be installed in summer 2015. The transmitter units will arrive in summer 2015 and will be connected at the site in September 2015.

UNIS held Norway's first international SuperDARN meeting in May 2014. We had 50 upper atmospheric / auroral scientists from 11 countries attend the meeting.
More info: [6]

(5) The total eclipse

The preparations for the total eclipse of 20th of March 2015 have started with both airborne and ground-based campaigns planned. The totality of the event is only 147 seconds beginning at ~11:10 LT. Look 166^{o} South-East and 11^{o} above the horizon to see it.
More info: [7]

(6) New HF transmitter
A new HF transmitter deployed to Hornsund to study gravity waves (with the help of colleagues from the sea ice group within AGF). The receiver will be deployed at KHO this summer.

(7) SPEAR
Results from a collaborative experiment with colleagues in Barentsburg has just been accepted for publication in Annales Geophysicae. The experiment detailed artificial ionospheric emissions detected by radio receivers in Barentsburg which were generated using the SPEAR facility.

Graduated students:
Kinga Albert, Master, August 2014, Department of Computer Science, Electrical and Space Engineering Division of Space Technology, Kiruna, Luleå University of Technology, SvalPoint: A Multipoint Optical Tracking System.

Jeff Holmes, PhD, August 2014, The Protonics project: distributed observations of auroral dayside Doppler-shifted hydrogen emissions, University of Oslo, Norway.

Public outreach
Numerous presentations, visits and interviews have been conducted at KHO. At some point, we stopped counting. A media seek could be done by personnel that are professionals.

Publications
E.R. Reisin, J. Scheer, M.E. Dyrland, F. Sigernes, C.S. Deehr, C. Schmidt, K. Höppner, M. Bittner, P.P. Ammosov, G.A. Gavrilyeva, J. Stegman, V.I. Perminov, A.I. Semenov, P. Knieling, R. Koppmann, K. Shiokawa, R.P. Lowe, M.J. López-González, E. Rodríguez, Y. Zhao, M.J. Taylor, R.A. Buriti, P.J. Espy, W.J.R. French, K.-U. Eichmann, J.P. Burrows, and C. von Savigny, Traveling planetary wave activity from mesopause region airglow temperatures determined by the Network for the Detection of Mesospheric Change (NDMC), Journal of Atmospheric and Solar-Terrestrial Physics, Vol. 119, 71-82, 2014.

F. Sigernes, S. E. Holmen, D. Biles, H. Bjørklund, X. Chen, M. Dyrland, D. A. Lorentzen, L. Baddeley, T. Trondsen, U. Brändström, E. Trondsen, B. Lybekk, J. Moen, S. Chernouss, and C. S. Deehr, Auroral all-sky camera calibration, Geosci. Instrum. Method. Data Syst. Discuss., 4, 515-531, 2014.

Holmes, J. M., Johnsen, M. G., Deehr, C. S., Zhou, X. Y. and Lorentzen, D. A., Circumpolar ground-based optical measurements of proton and electron shock aurora, J. Geophys. Res., 119, DOI: 10.1002/2013JA019574, 2014.

C. van der Meeren, K. Oksavik, D. Lorentzen, J. Moen, V. Romano, GPS scintillation and irregularities at the front of an ionization tongue in the nightside polar ionosphere, Accepted for publication, J. Geophys. Res, 2014.

Holmen, S.E., M.E. Dyrland, and F. Sigernes (2014), Mesospheric temperatures derived from three decades of hydroxyl airglow measurements from Longyearbyen, Svalbard (78°N), *Acta Geophysica*, Vol **62**, No 2, pp. 302-315, doi: 10.2478/s11600-013-0159-4.

Holmen, S. E., M. E. Dyrland, and F. Sigernes (2014), Long-term trends and effect of solar cycle variations on mesospheric winter temperatures over Longyearbyen, Svalbard (78°N), *J. Geophys. Res. Atmos.*, **119**, doi: 10.1002/2013JD021195.

Conferences - talks

F. Sigernes, SuperDARN workshop, Color matching the aurora, Longyearbyen, Norway, May, 2014.

Fred Sigernes, Jyrki Mattanen, Dag Arne Lorentzen, Sergey Chernouss and Charles Sterling Deehr, Color matching the aurora, The 41st Annual European Meeting on Atmospheric by Optical Methods, Stockholm, Sweden, August 17-21, 2014.

V. Roldugin, F. Sigernes, A. Roldugin, S. Pilgaev, The electron and proton precipitation in Scandinavian sector during SC on 24 January 2012 (Poster), The 41st Annual European Meeting on Atmospheric by Optical Methods, Stockholm, Sweden, August 17-21, 2014.

D.A. Lorentzen, F. Sigernes, K. Oksavik, L. Baddeley, J. M .Moen, A validation of the UNIS auroral oval model-preliminary results, Birkeland March meeting, 2014.

D.A. Lorentzen, L. Baddeley, F. Sigernes, M. Dyrland, J.M. Moen and P. Brekke, An update on the Svalbard SuperDARN radar, SuperDARN workshop, Color matching the aurora, Longyearbyen, Norway, May, 2014.

D.A. Lorentzen, Fred Sigernes, Lisa Baddeley, Margit Dyrland, Jøran Moen, Pål Brekke, Kjellmar Oksavik, Xiangcai Chen, Silje Holmen, The Kjell Henriksen Observatory – a window into space, Studietur Nord, August, 2014.

D.A. Lorentzen, Space weather and its implications, Studietur Nord, August, 2014.

Baddeley, L. J, Space Physics and Upper Atmospheric Research on Svalbard, Svalbard Science Forum Workshop - New technology for bridging the arctic knowledge gaps, Ven, Sweden, October 2014

Baddeley, L. J., D. A. Lorentzen, K. Oksavik, The Sun's Influence on the Earth's Atmosphere, ConocoPhillips Northern Area Research Program, Stavanger, Norway, June 2014

Baddeley, L. J., A New Radar Facility on Svalbard, Studietur Nord, August 2014

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S.E. Holmen, 2nd ARISE Workshop, 25-27 March 2014, University of Firenze, Italy. Poster: "Case study of a wave event observed in OH airglow emissions over Longyearbyen, Svalbard (78°N), 24 January 2012".