



HVA ER FREMTIDENS NORDLYSPRODUKTER

PÅL BREKKE

NORWEGIAN SPACE CENTRE

Kan oppsummeres kort

- Kvalitet på produktene
- Kunnskapsbasert opplevelse
- Utnytte Nord-Norges - og Svalbards fortrinn

Dagens turister er ikke som før



Dagens turister er ikke som før

- Turistene ønsker i dag kunnskap om fenomenet
- Derfor svært viktig at operatører og guider har basic kunnskap

A vengeful force

- In ancient times, most people were afraid of the lights.
- Children would be brought inside
- Northern lights were a vengeful force which killed those who mocked it. DO NOT WHISTLE TO IT!!!
- Many believed it was a message from the creator.
- An old tale from the Nordic countries said that, "God is angry when the aurora flames".
- An omen of war, or disasters or plagues



Aurora over Nurnberg 5 October 1591



Beliefs of Indigenous Peoples

- The Eskimos in the northernmost parts of Canada believe that the northern lights were created by spirits, which, dressed in the mystical light, are having fun because the Sun is missing.
- Rapidly moving aurora were called the dance of death.
- The Sami people calls it “guovssahas” - the light you can hear



Beliefs of Indigenous Peoples

- The Mandan Indians (North Dakota) explained the northern lights as fires over which the great medicine men and warriors of northern nations simmered their dead enemies in enormous pots.



Myths in Norway



Ulf Dreyer

Children waving with white clothing - intensity of waving increased the motion of the aurora!

The Viking name

- It was the Vikings which christened the aurora northern lights “Norðurljós”.



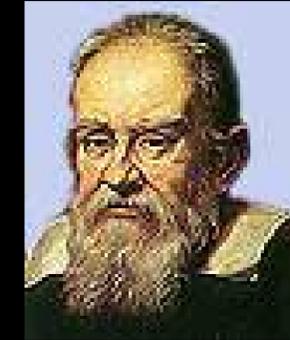
The Name - Aurora Borealis

What does the name mean?



The Name - Aurora Borealis

- The scientific name for the phenomena is Aurora Borealis, which is Latin and translates into “the dawn of the north”.
- It was the Italian scientist Galileo Galilei (1564-1642) who first used the expression. On the latitude where Galileo was living, northern lights consist of mainly red colour.



Galileo Galilei (1564-1642), Italian mathematician, philosopher and astronomer. Among his discoveries are the four Galilean moons around Jupiter. Although he wasn't the first to see northern lights, he gave it its scientific name.

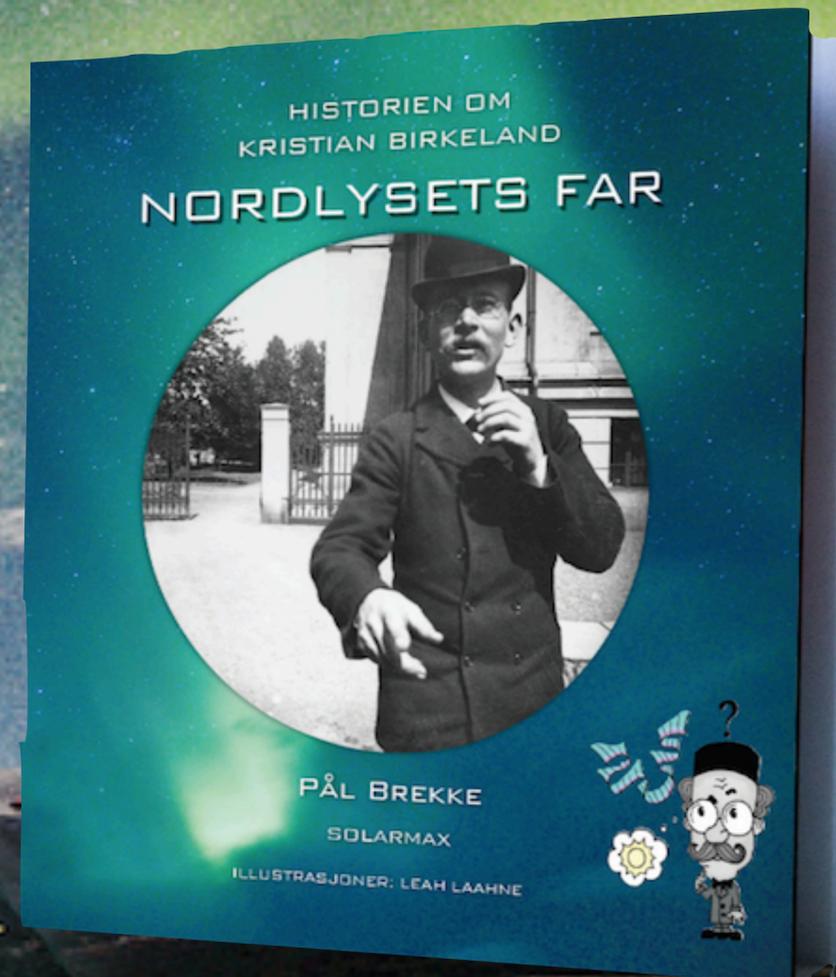


Birkeland- the first space scientist



Birkeland

The Birkeland Anniversary 2017
13 -16 June



Kristian Birkeland (1867 - 1917)

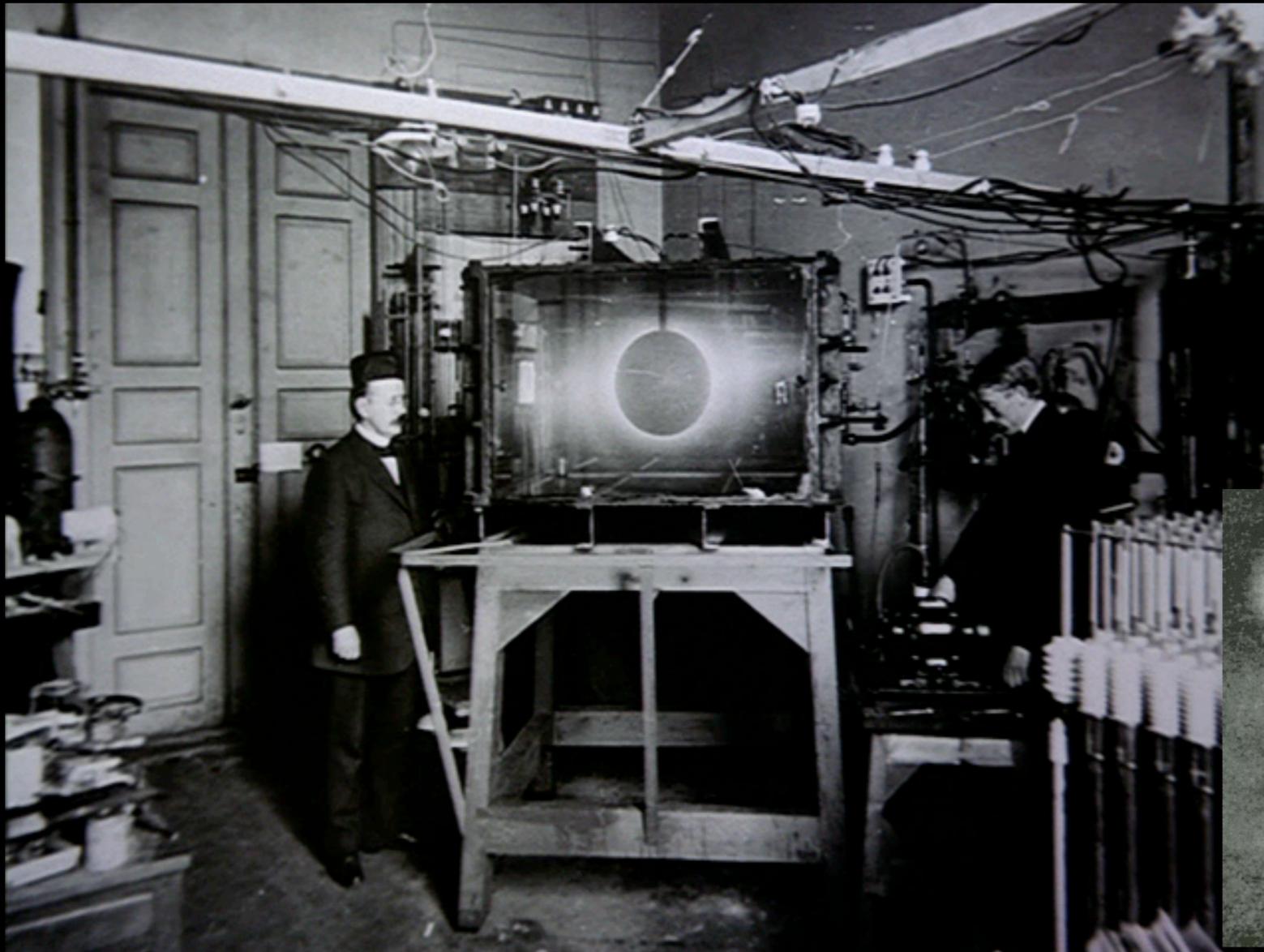
- It was known since 1747 that rapid movements of a compass needle was related to high aurora activity.
- Established a series of magnetic observatories in the Arctic and subsequently determined that the aurora was linked to solar activity.



German documentary about Kristian Birkeland

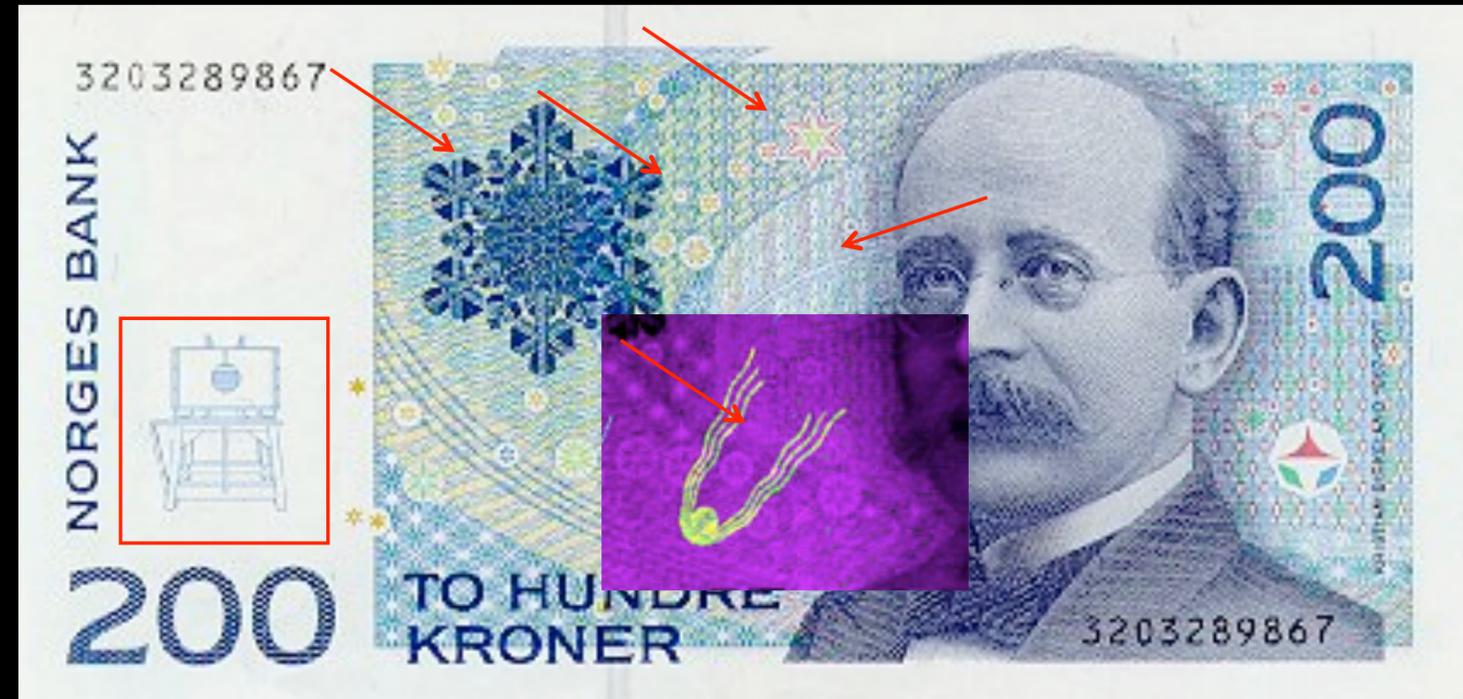
Kristian Birkeland (1867 - 1917)

- The first realistic theory of the aurora: Electrical charged particles travelling with large velocities from sunspots. These were captured by the Earth's magnetic fields and channelled down towards the polar regions.
- He supported his theory by creating artificial aurora in his laboratory in 1896.



Science on a bill

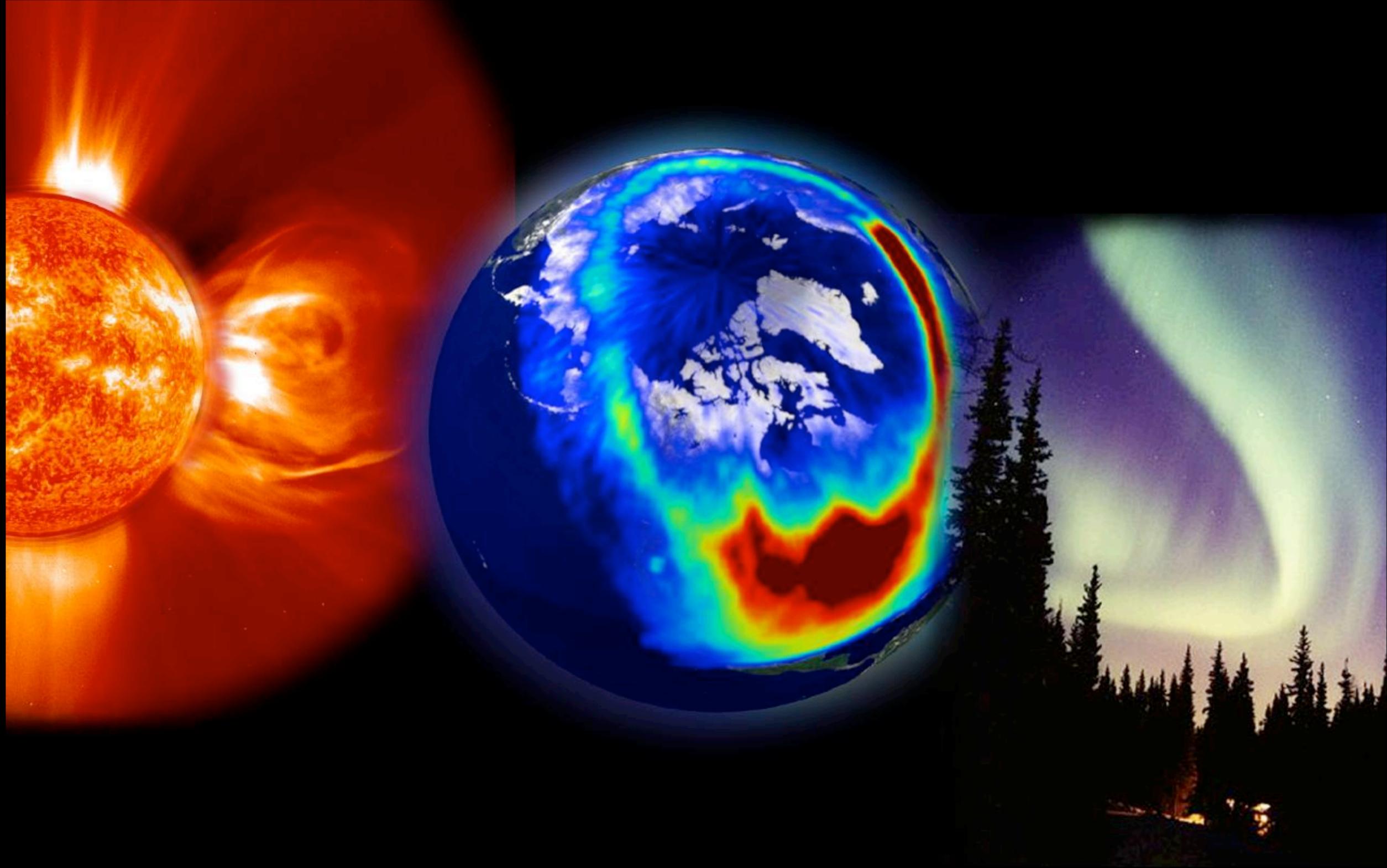
- Aurora seen from below and the Polar star
- Big dipper and Little dipper
- Snow crystal - cold climate
- The Terella-experiment



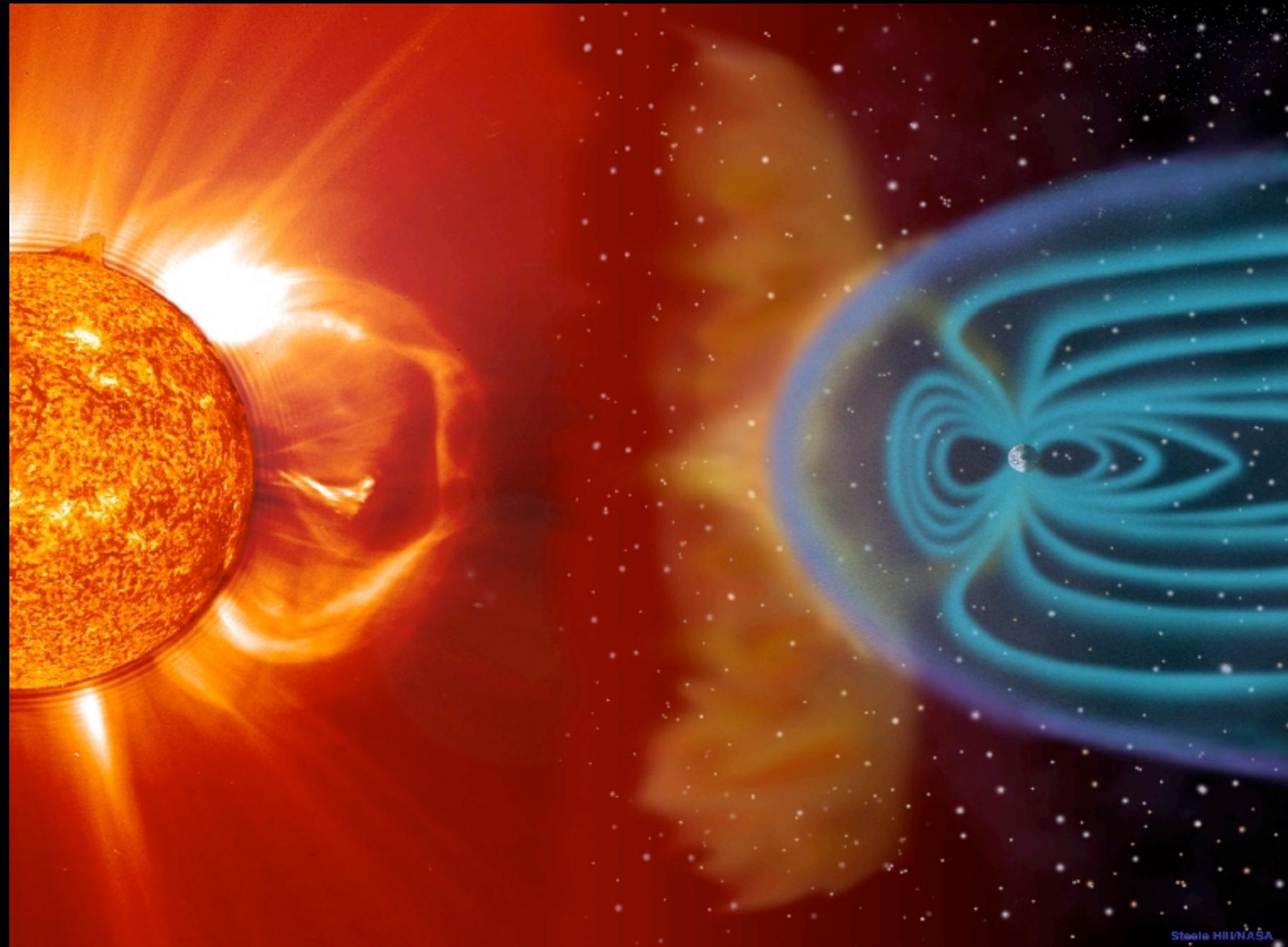
- Map of the Arctic and the magnetic pole
- Aurora-oval
- Birkeland Current
- “Invisible” comet



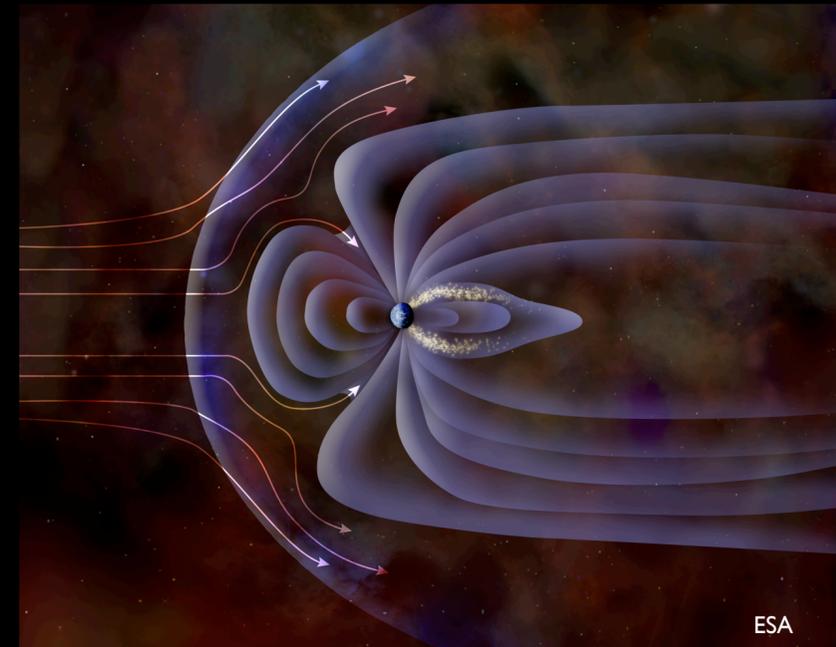
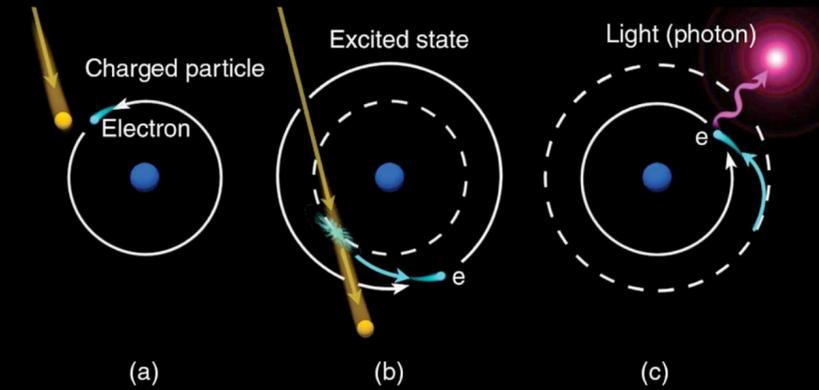
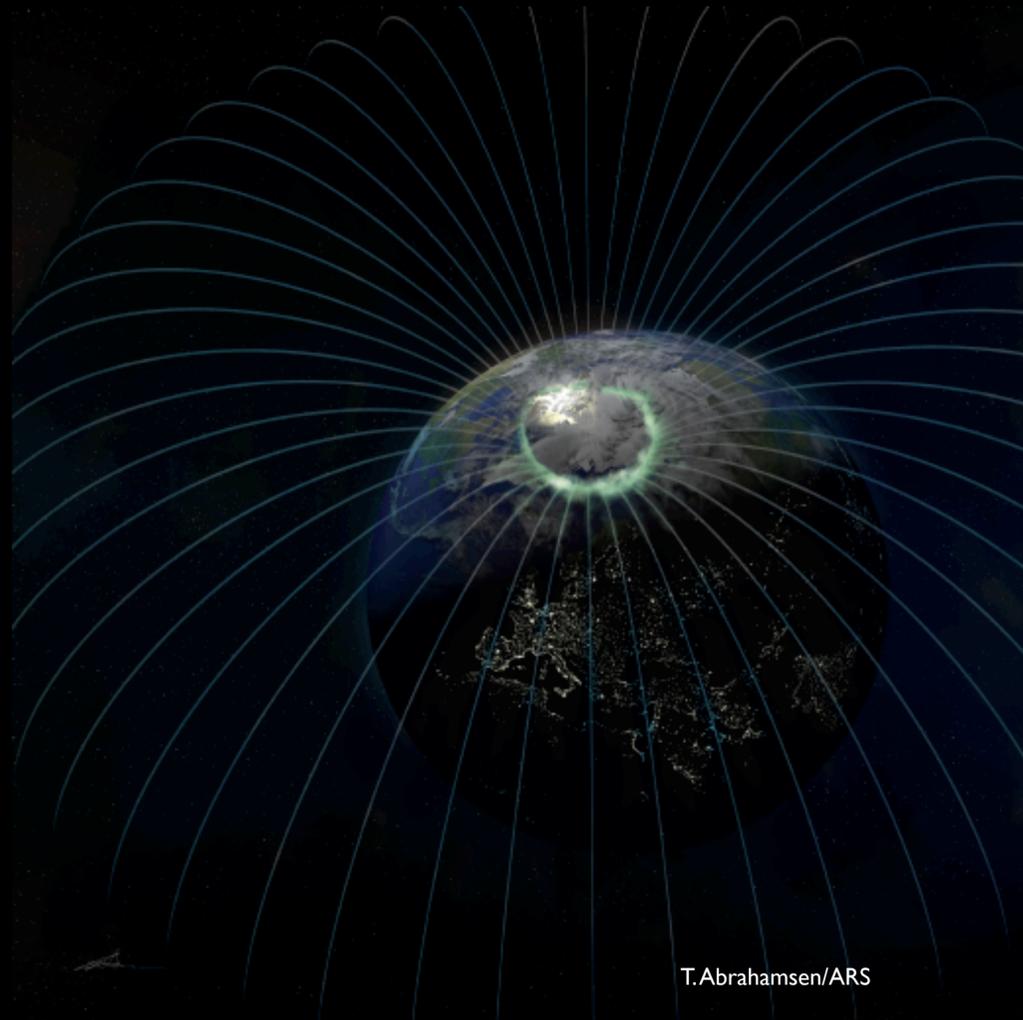
The Sun - The Aurora Engine



What causes the Northern Lights



HOW ARE THE NORTHERN LIGHTS CREATED?

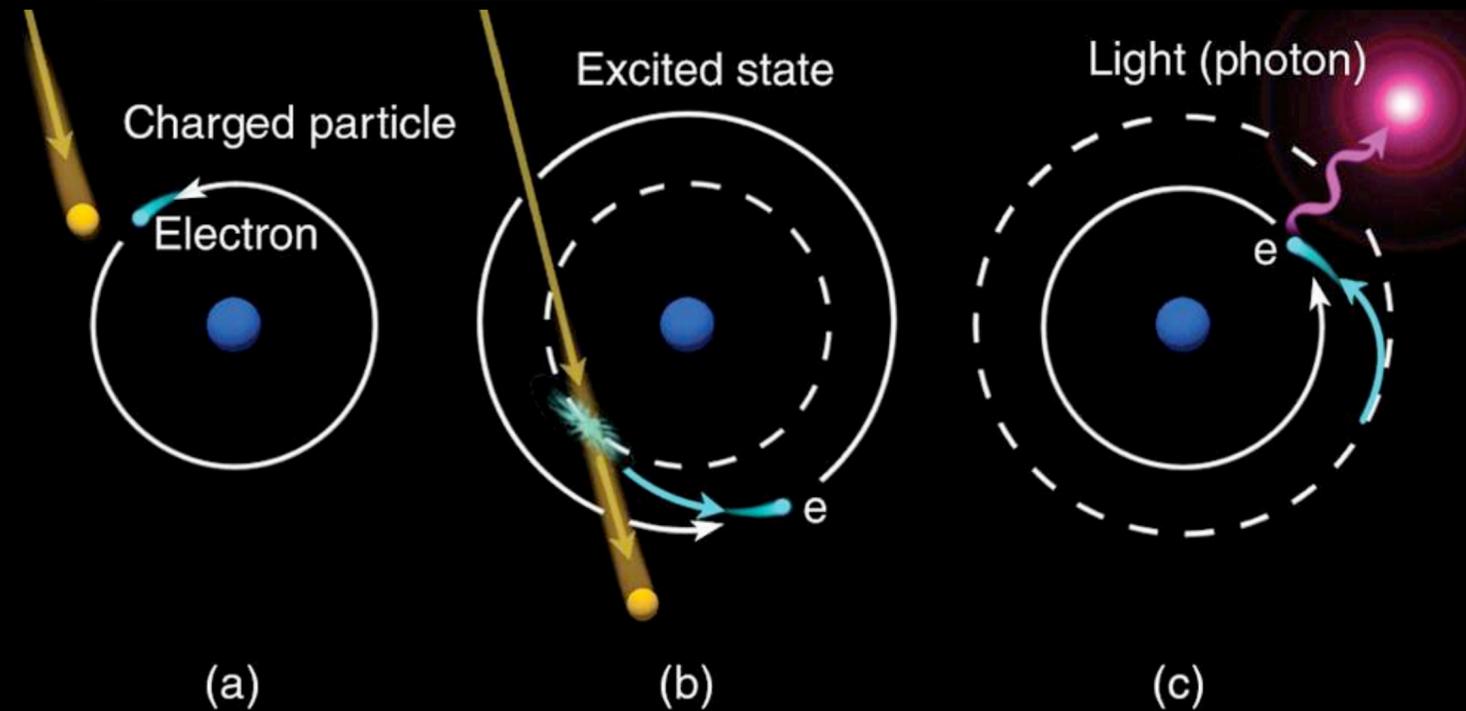
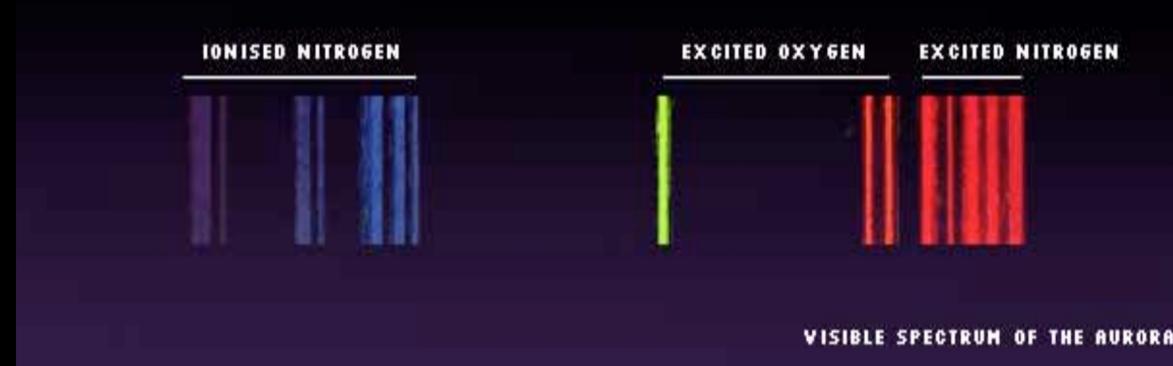


The aurora is formed when particles from the Sun interfere with our magnetosphere. Some particles manage to penetrate the magnetosphere on the night side (tail). When solar storms shake up the magnetosphere particles inside this magnetic cocoon will be ejected back towards the Earth along the magnetic field lines. They are guided down towards the Polar Regions.

When they hit Earth's atmosphere they collide with oxygen and nitrogen. These collisions, which typically occur at altitudes between 80 to 300 km, transfer some energy to these atoms (they get excited), and immediately send out light on a certain frequency or color.

The Colors of the Aurora

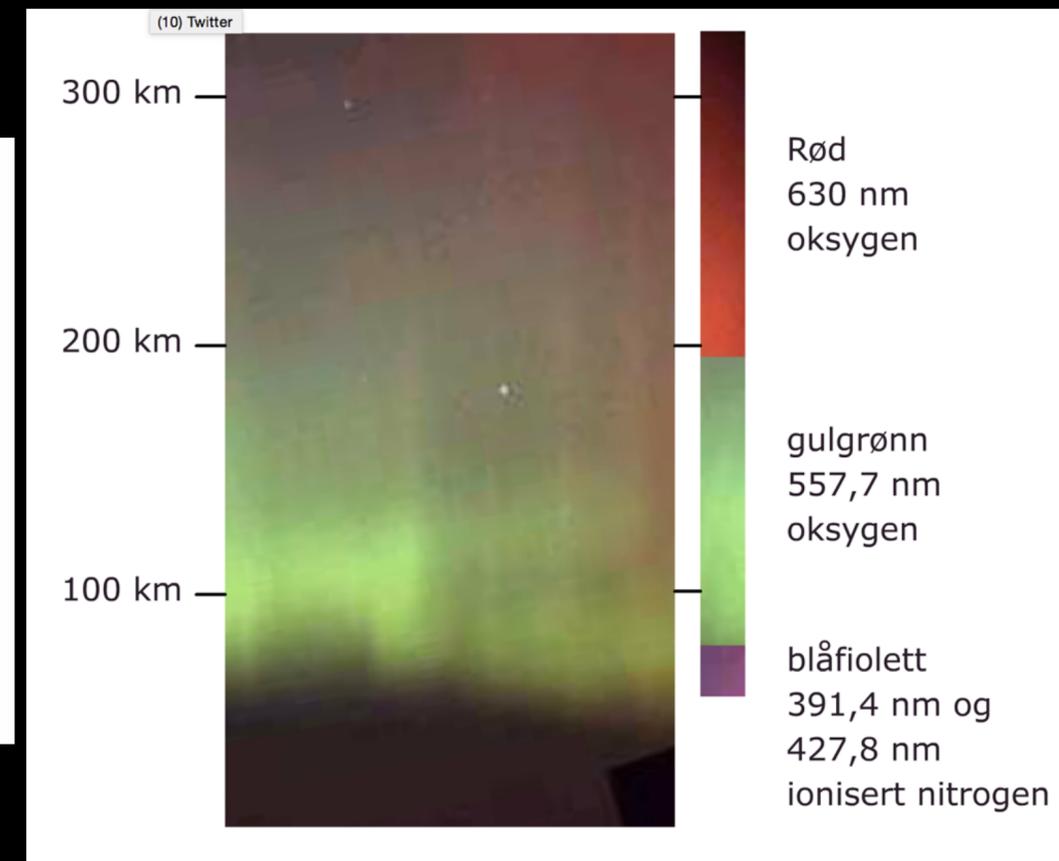
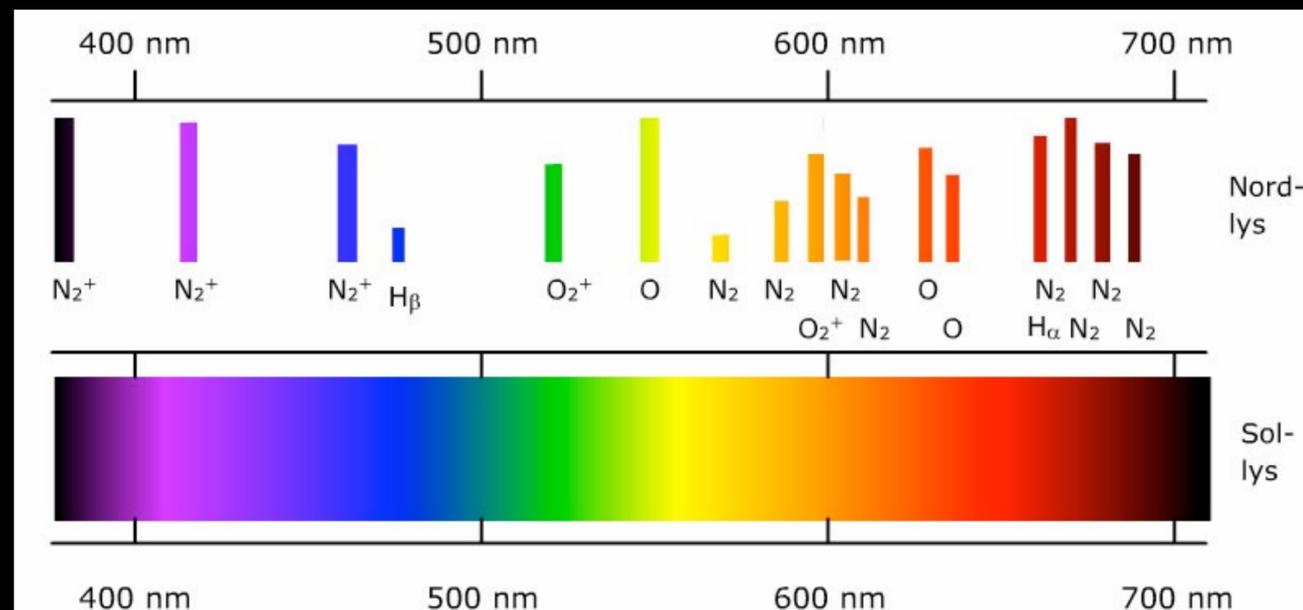
- The light from the Sun appears white but consist of all colors (e.g rainbow)
- The aurora light is composed of distinct colors that comes from certain gases in the Earths atmosphere.
- The colour composition of the aurora is the atmosphere's fingerprint.



The Colors of the Aurora

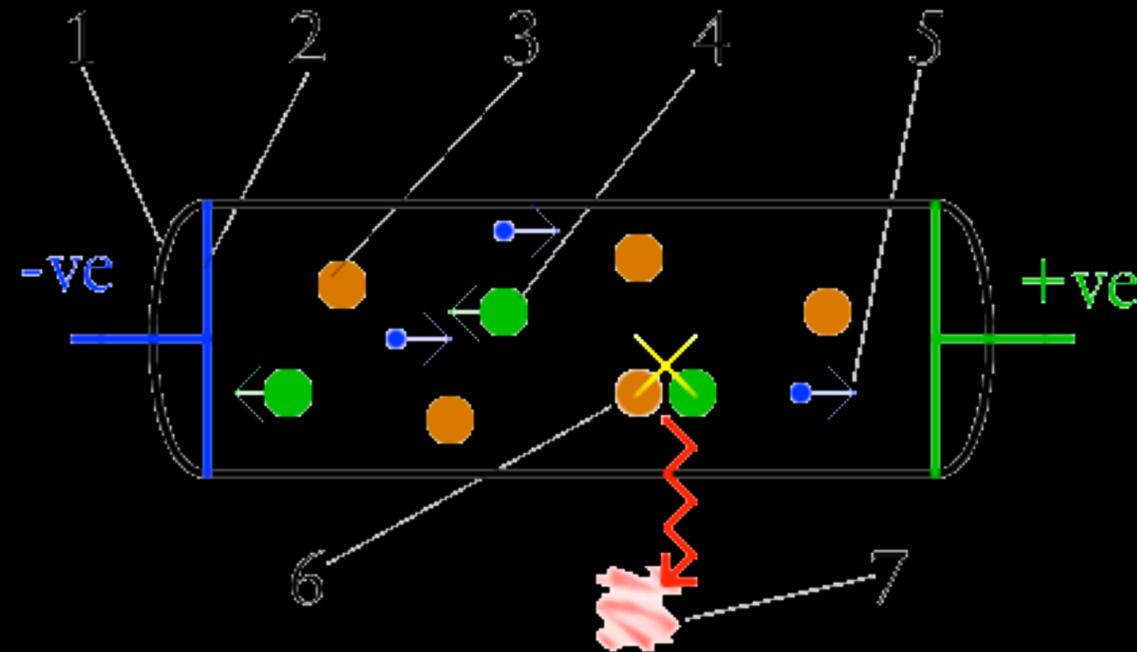
The color of the aurora depends on the wavelength of the light emitted. This is determined by the specific atmospheric gas and its electrical state, and the energy of the particle that hits the atmospheric gas. The atmosphere consists mainly of nitrogen and oxygen, which emit the characteristic colors of their respective line spectra. Atomic oxygen is responsible for the two main colors of green (wavelength of 557.7 nm) and red (630.0 nm). Nitrogen causes blue and deep red hues.

Most of the auroral features are greenish-yellow, but sometimes the tall rays will turn red at their tops and along their lower edges. On rare occasions, sunlight will hit the top part of the auroral rays to create a faint blue color. Pink hues may also be seen in the lower area of the aurora



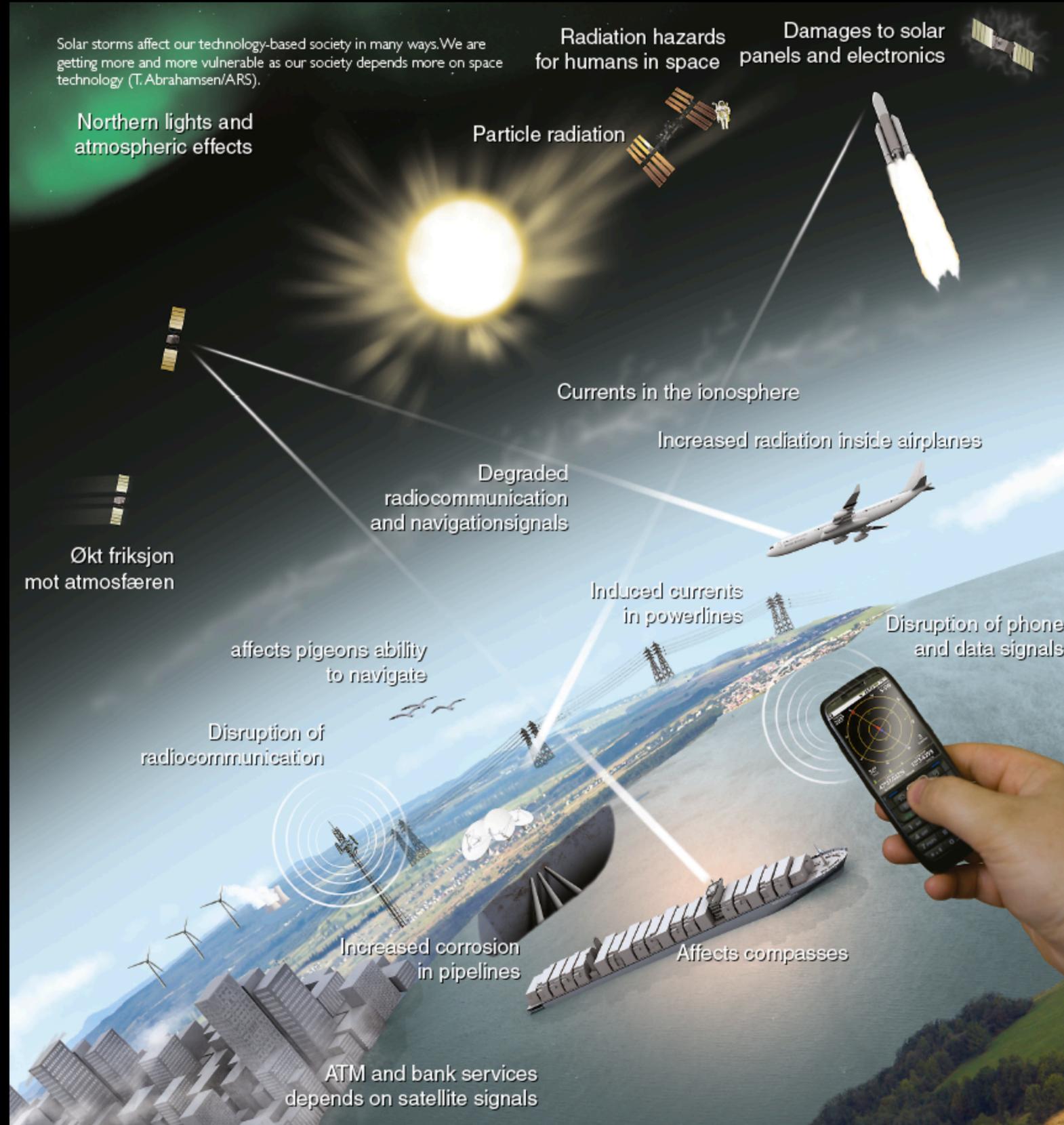
The aurora - A gigantic neon sign

- Same effects as in a neon sign

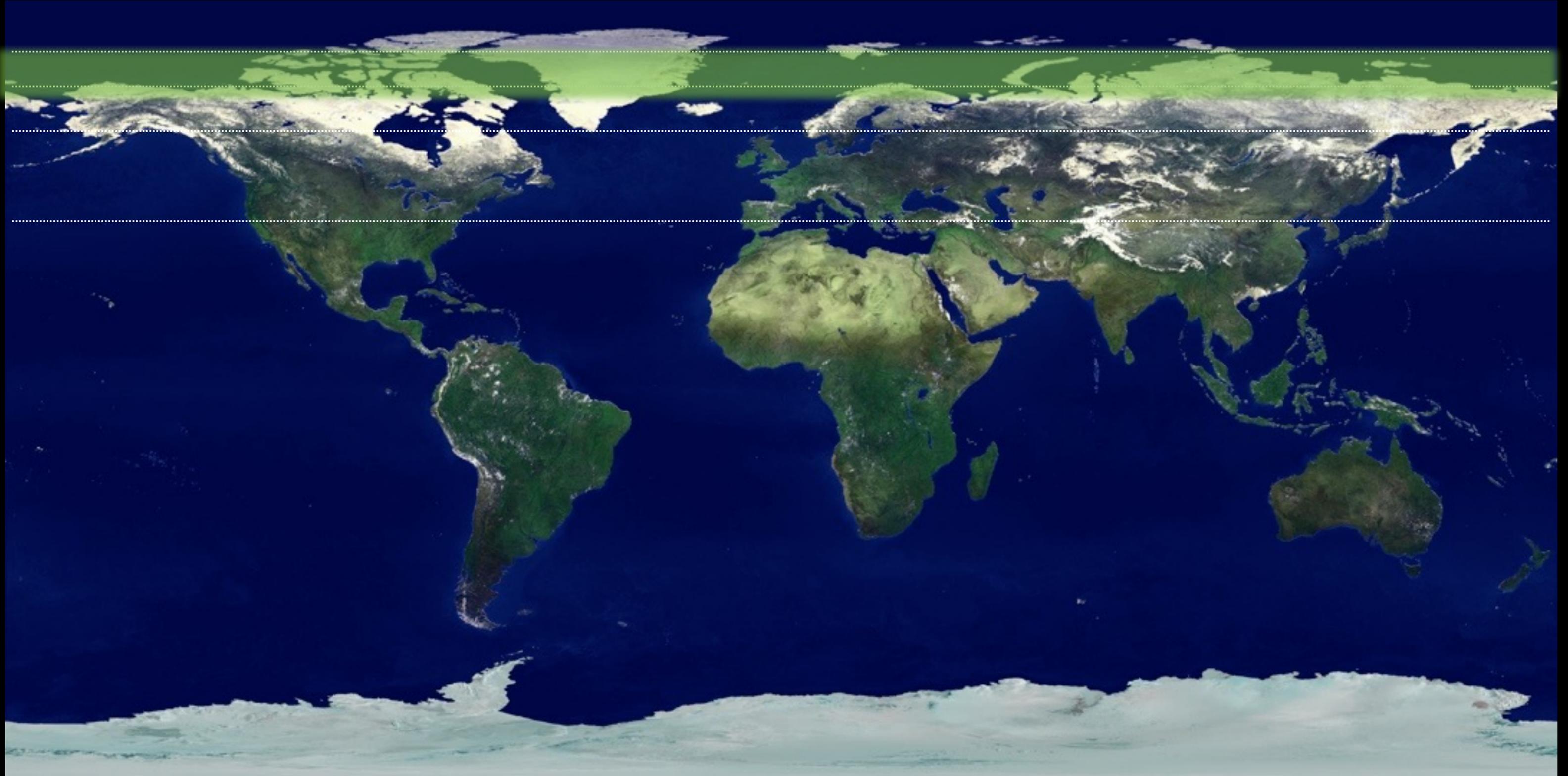


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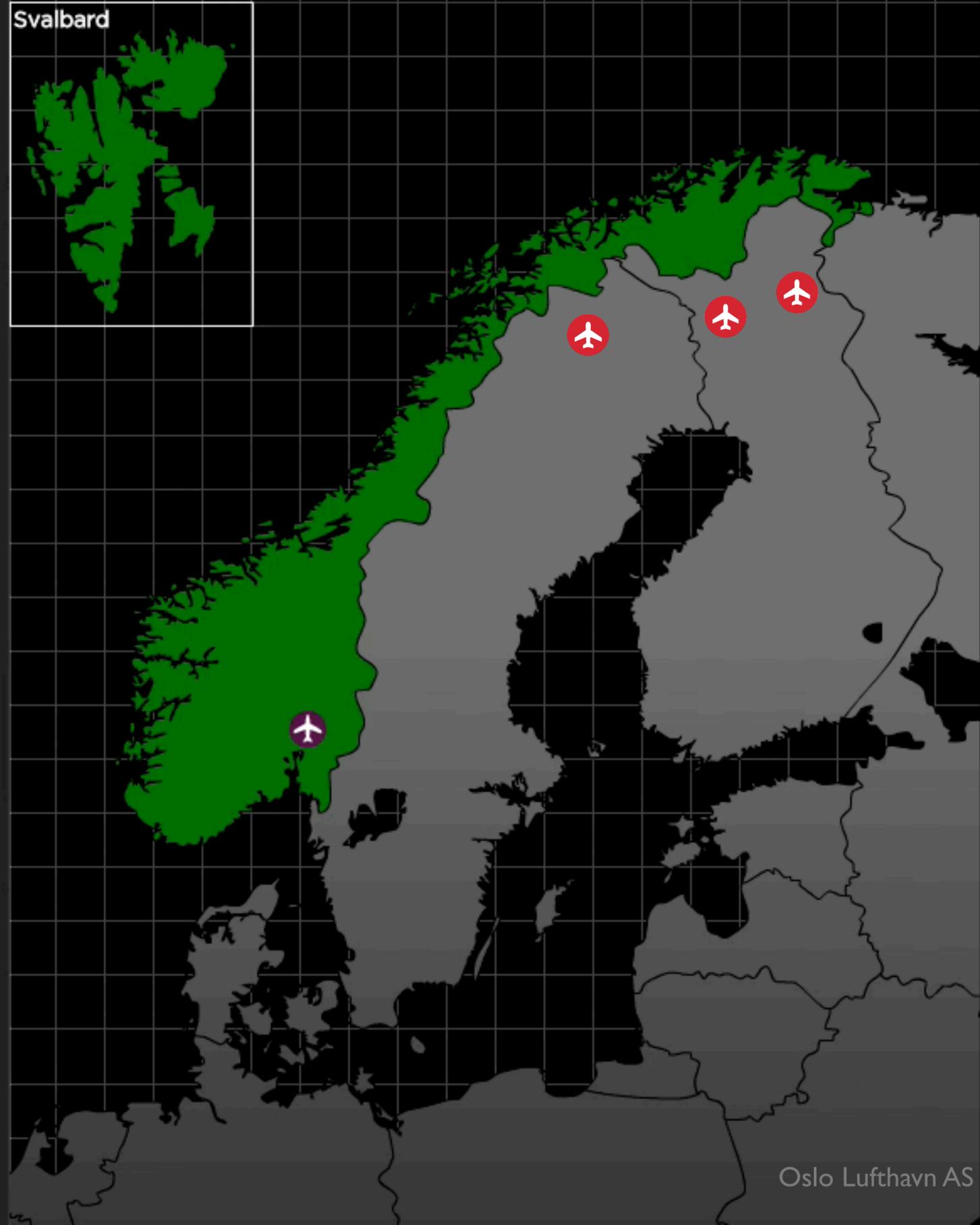
Space Weather



Why Norway is the best place to see the Aurora



Svalbard



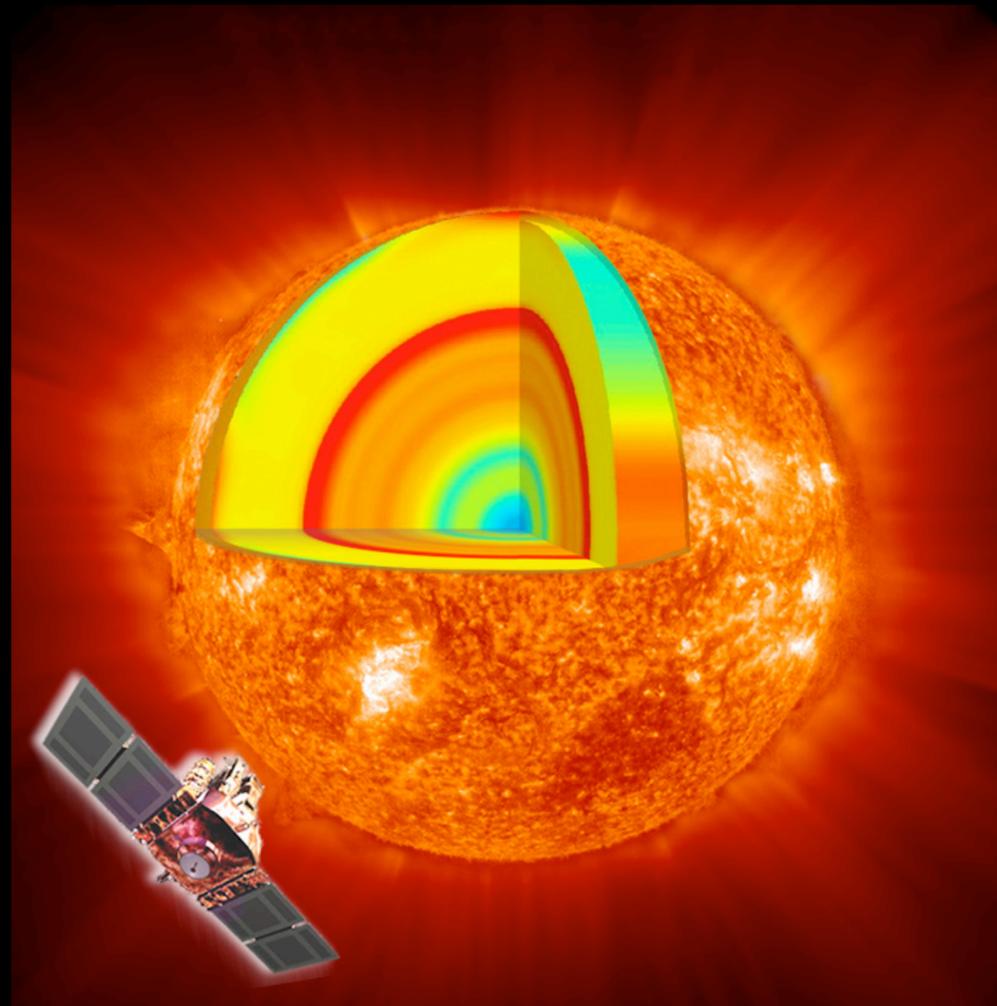
Oslo Lufthavn AS

*hunting
the
light*

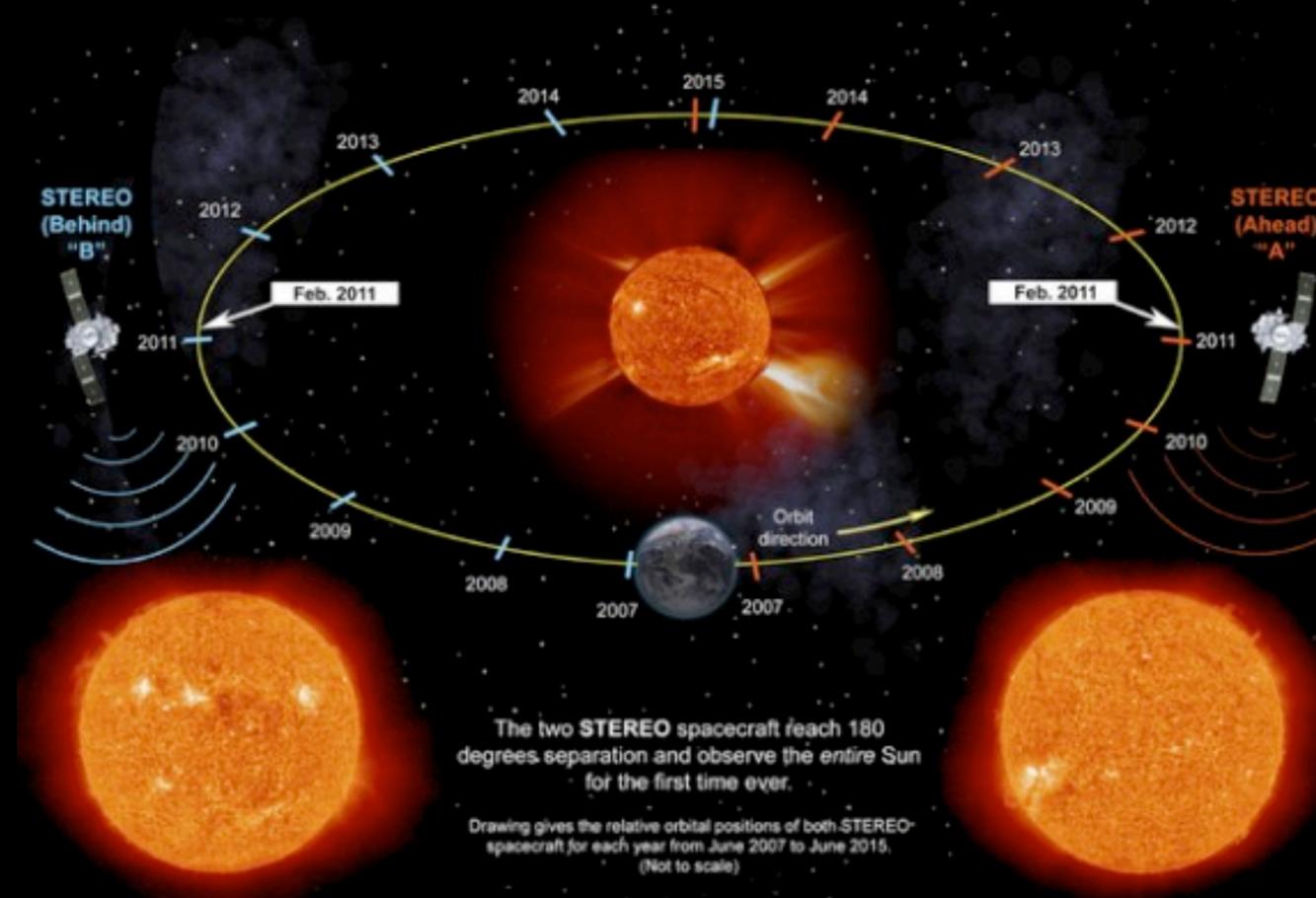


Aurora forecast: Monitoring the Sun

<http://soho.nascom.nasa.gov/data/realtime-images.html>



NASA's STEREO Sees the Entire Sun



Aurora forecaster in Norway

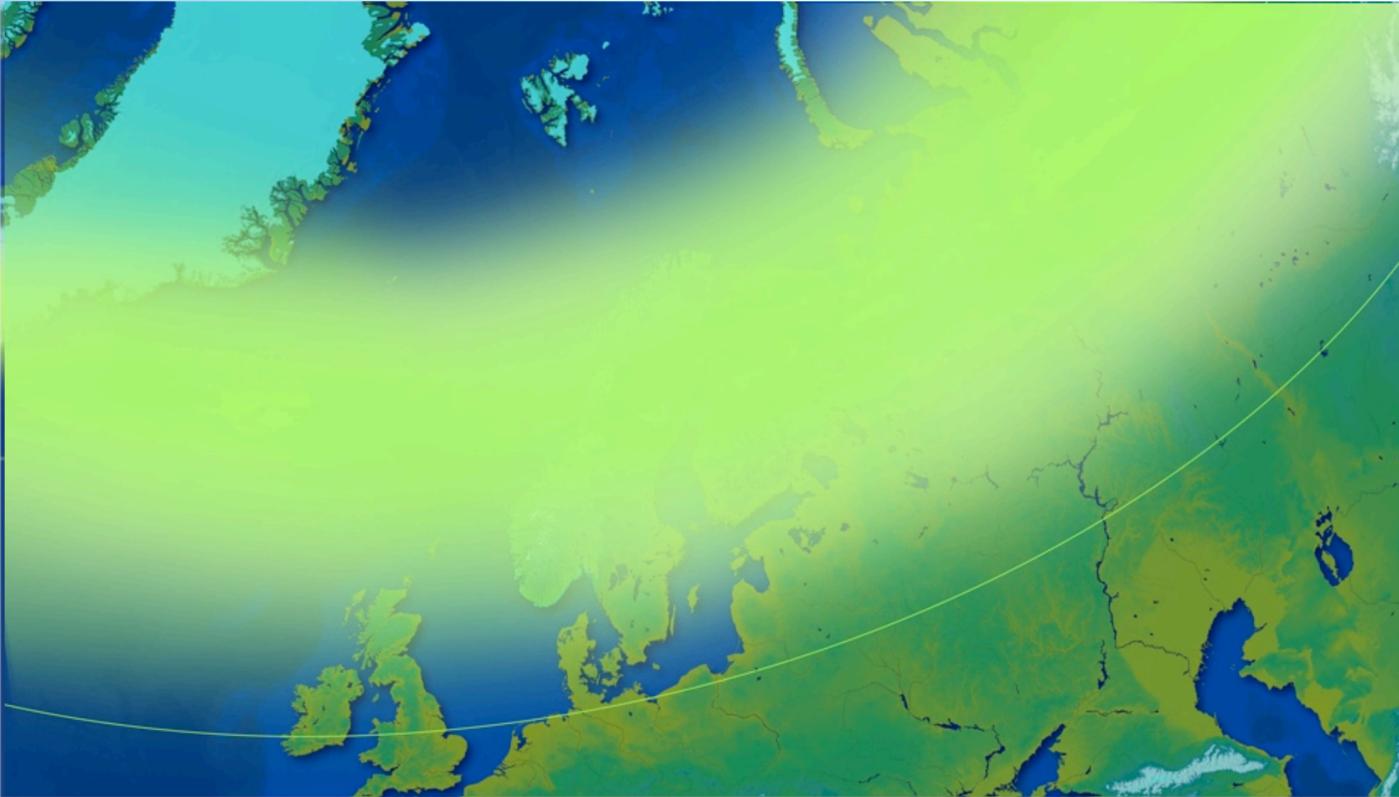
<http://www.storm.no/nordlys/>

I samarbeid med **Storm** WEATHER CENTER

 **VÆRET**

Hvordan er været . **SØK**

Aurora Borealis - forecast for 10pm tonight



Forecast for tonight - updated 11:00

Auroral activity will be quiet. Quiet displays will be visible directly overhead in northern Iceland and Norway, and visible low on the horizon as far south as Rovaniemi, Finland and Mo i Rana, Norway.

What is really forecasted here?

Information about where the aurora will be located in the near future and from where one could observe it. The forecast is based on observations of solar and geophysical disturbances - what has happened on the Sun and what we expect will happen the next few days.

Read more about aurora borealis: www.northern-lights.no

Samarbeidspartnere: [Norsk Romsenter](#) [UNIS](#) [University of Alaska](#)

Basert på data fra: [NASA/NOAA/SEC](#)

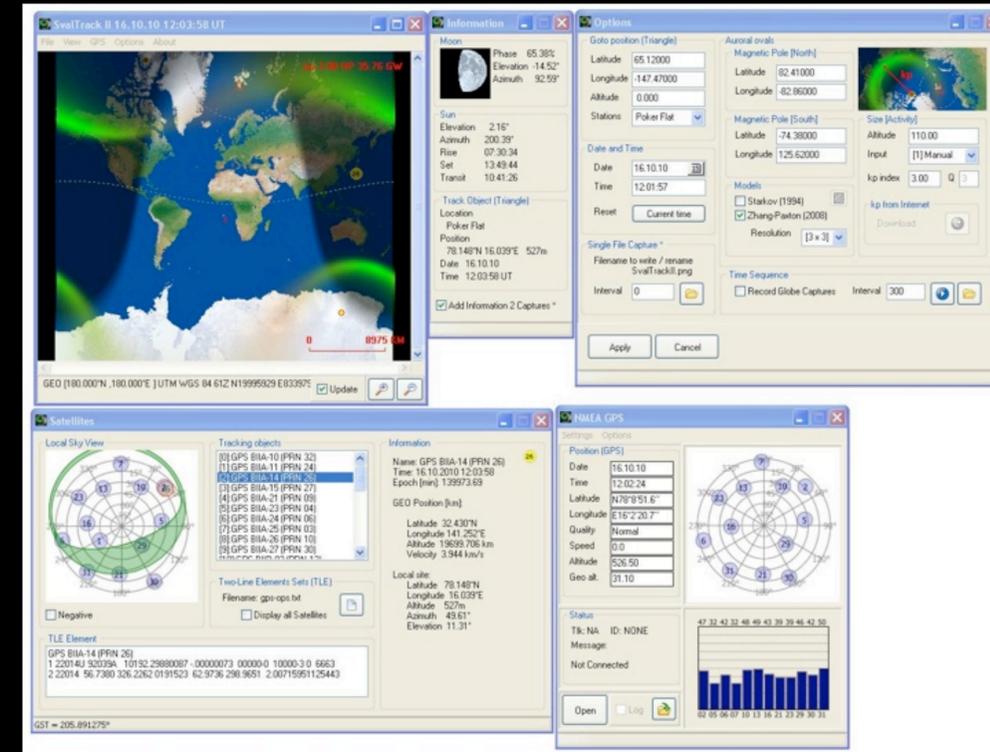
The UNIS Aurora forecaster

Real time aurora oval forecasting - SvalTrackII

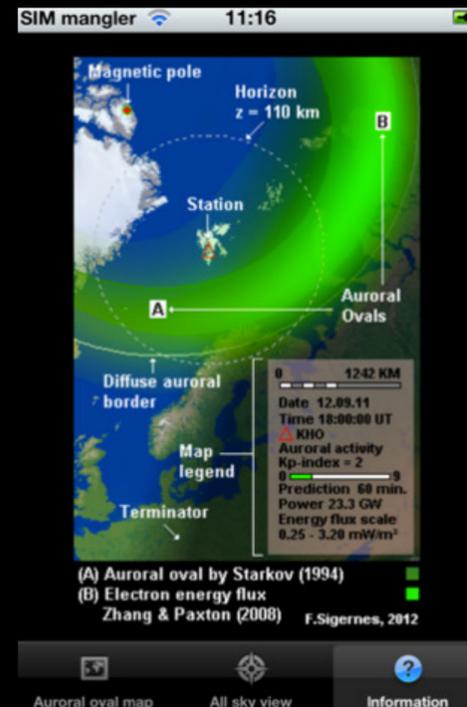
F. Sigernes ⁽¹⁾, M. Dyrland ⁽¹⁾, P. Brekke ⁽²⁾, E. K. Gjengedal ⁽³⁾, S. Chernouss ⁽⁴⁾,
D. A. Lorentzen ⁽¹⁾, K. Oksavik ⁽¹⁾ and C. S. Deehr ⁽⁵⁾

The 37th Annual European Meeting on Atmospheric by Optical Methods, Valladolid, Spain, 23 - 27 August 2010.

Download at: <http://kho.unis.no/>



«Auroral Forecast» - an iPhone/Android App



Where best to view it in the high north

- Away from city lights
- On a summit or open country
- With a clear view of the horizon, especially to North
- Avoid the full moon
- Best time is before midnight.



How to take pictures of the Aurora



How to take pictures of the Aurora

- DSLR camera (Manual mode)
- Tripod
- Fast wide angle lens 10-35mm (f/2.8, or lower)
- ISO ca 800-1600
- exposure time 8-30 seconds



Fredrik Broms

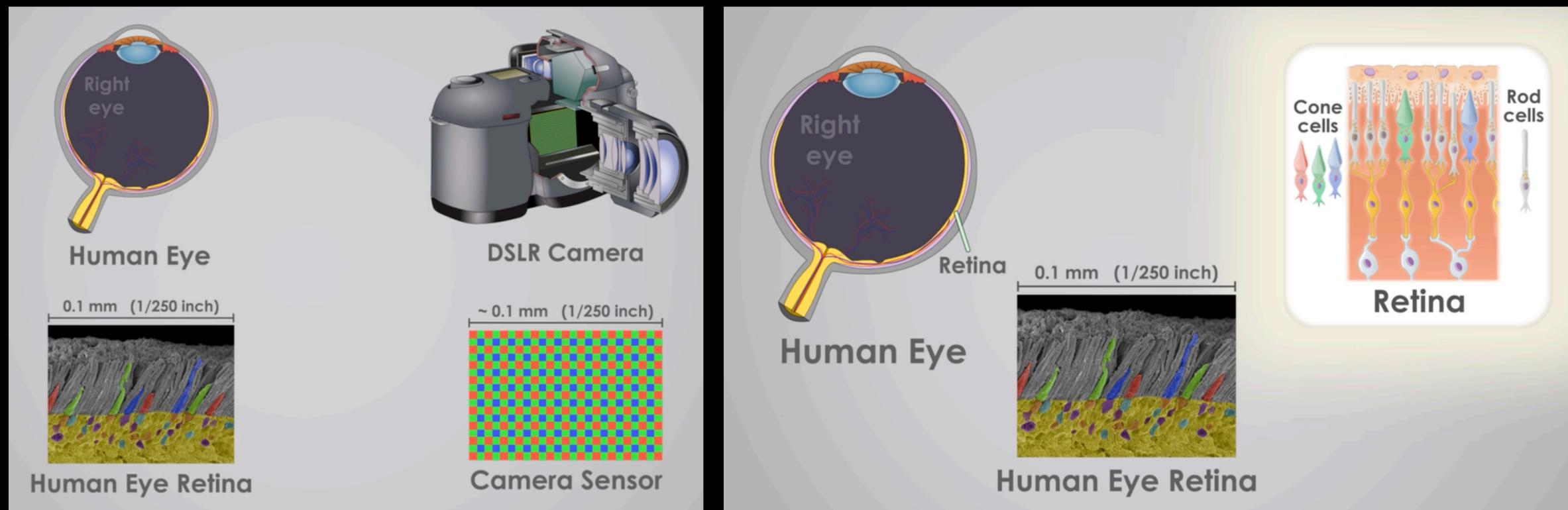
Human eyes vs cameras

Many people will be somewhat dissatisfied when they see the Northern light - with less bright green colors compared to the postcards and images online. Some photographers tweak the colors too much, but the main reason is that our eyes are not designed for night vision and low light conditions.

Human eyes have many rod cells that give good night vision but no colors. We have fewer of the cone cells that provide color vision. That is why we see less colors in dark conditions - and why the northern lights often look more whitish than bright green.

Cameras also have the advantage of being able to accumulate light for a long time (long exposures) in addition to being more sensitive to colors.

Some people can see more colors in dark conditions than others - but during very strong northern lights activity most people can see many colors - like purple, blue and red.



Vil Nordlyset forsvinne?

SCIENCE WORLD REPORT sciencewr.com

HOME SPACE NATURE & ENVIRONMENT HEALTH & MEDICINE TECH PHYSICS HUMAN

Ditt nye eventyr begynner **ØVERST PÅ HAFJELLOPPEN**
Byggingen har startet! [LES MER](#)



Solar Minimum May Cause Northern Lights To 'Disappear'

Leon Lamb



The Aurora Borealis glows over a lake on Sep. 02, 2007, near the Greenland town of Kangerlussuaq. The Northern Lights most often occurs from September to October and from March to April and are a popular tourist attraction. (Photo : Uriel Sinai/Getty Images)

Scientists predict disappear in man

BBC reported that has been predicted to famous places. Solar activity will be at natural light spots Norway, Canada, as in the southern be confined to the

The stunning aur caused by the in

also known as the solar wind, with the Earth's magnetic field. Solar minimum, the appearance of the aurora would apparently be at its w

TRAVEL+LEISURE

See the Northern Lights Now Before They Fade Away



Getty Images/Moment Open

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Chances of seeing Aurora Borealis from UK 'may disappear'

1 February 2017 | Highlands & Islands



Displays of the Aurora Borealis are linked to activity on the sun

Nyheter Sport TV Radio Distrikt Søk

Nordland Tips oss! Fordypning TV Radio Trafikk Vær

Tror dette blir den siste sesongen med «enorm» nordlysaktivitet

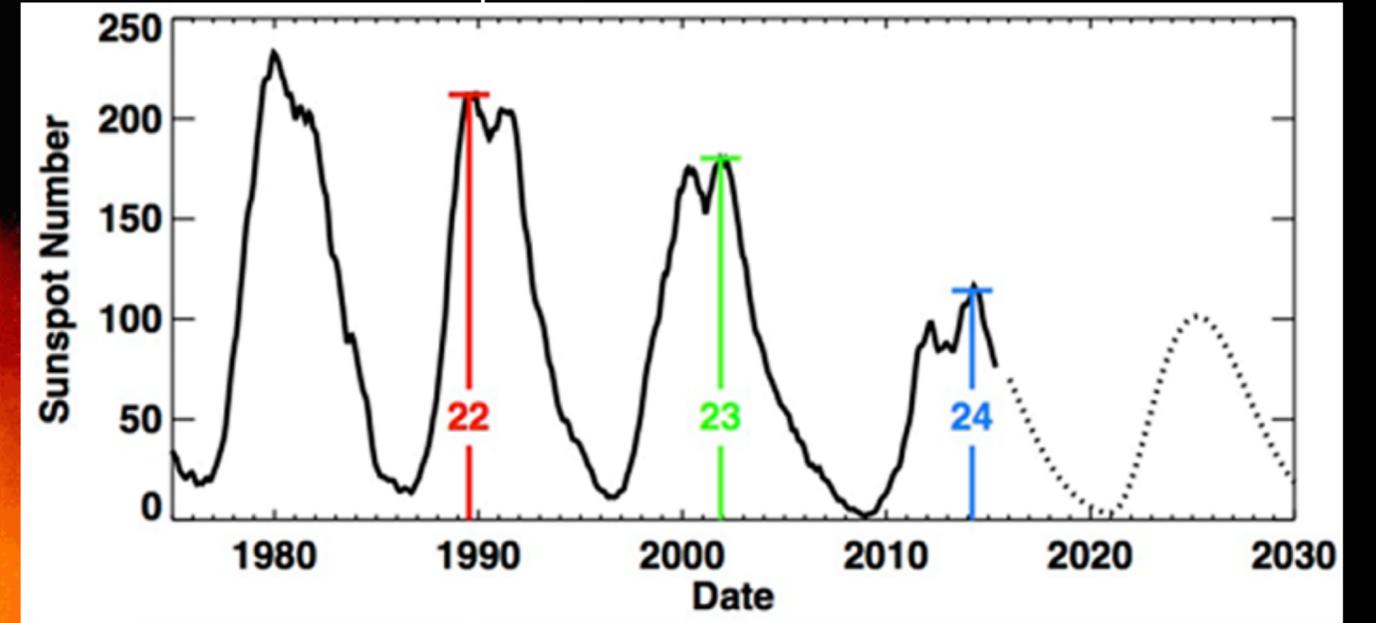
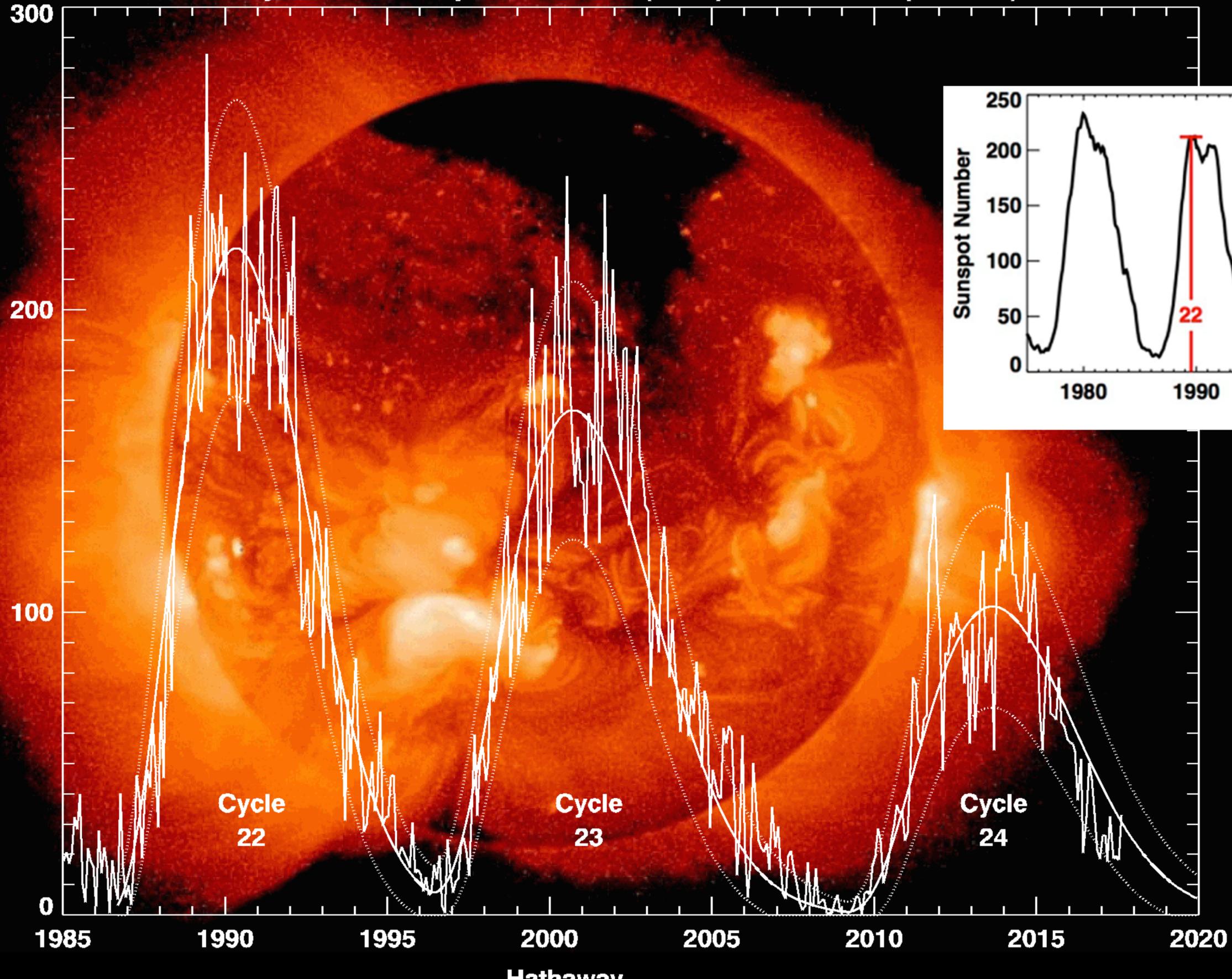
Årets nordlyssesong kan bli den siste i rekken av ekstremt gode sesonger, tror solforsker.



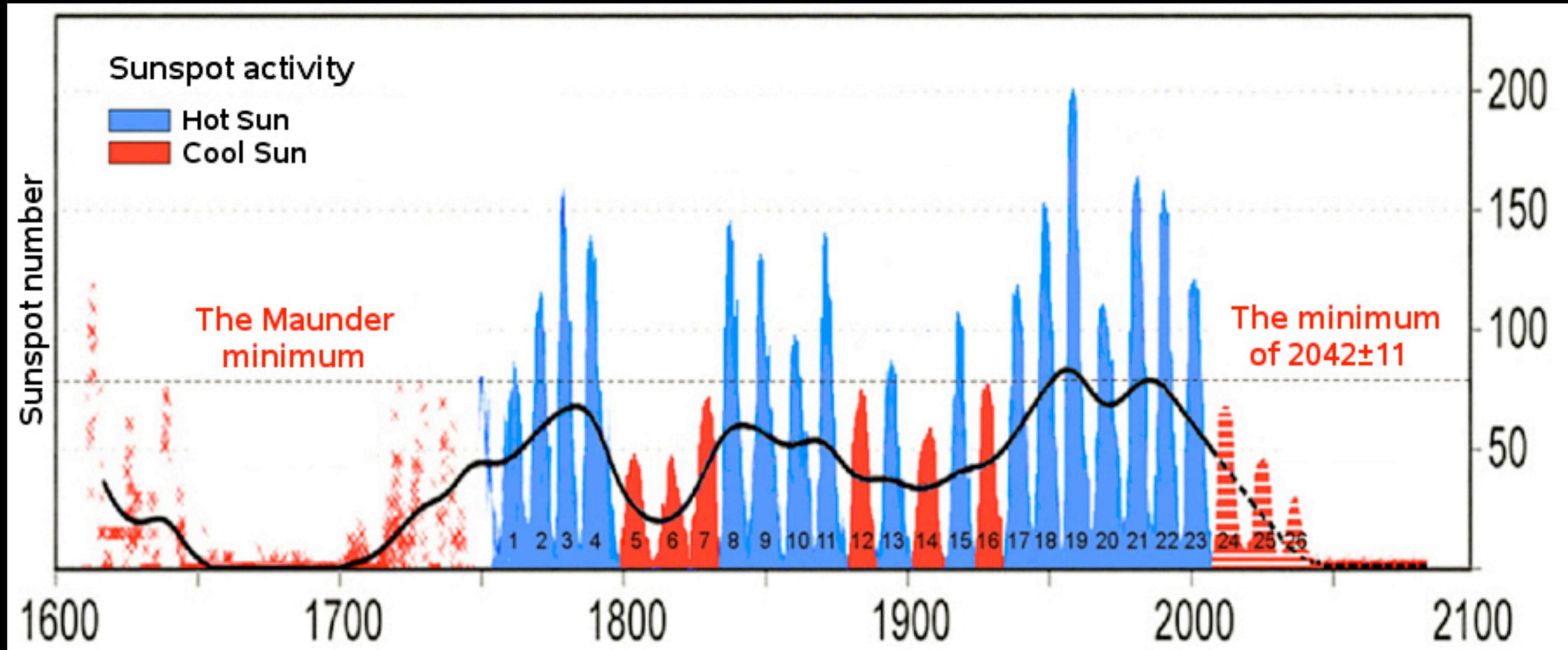
Markus Thonhaugen
@markustee
Journalist

Publisert 01.10.2017, kl. 12:41

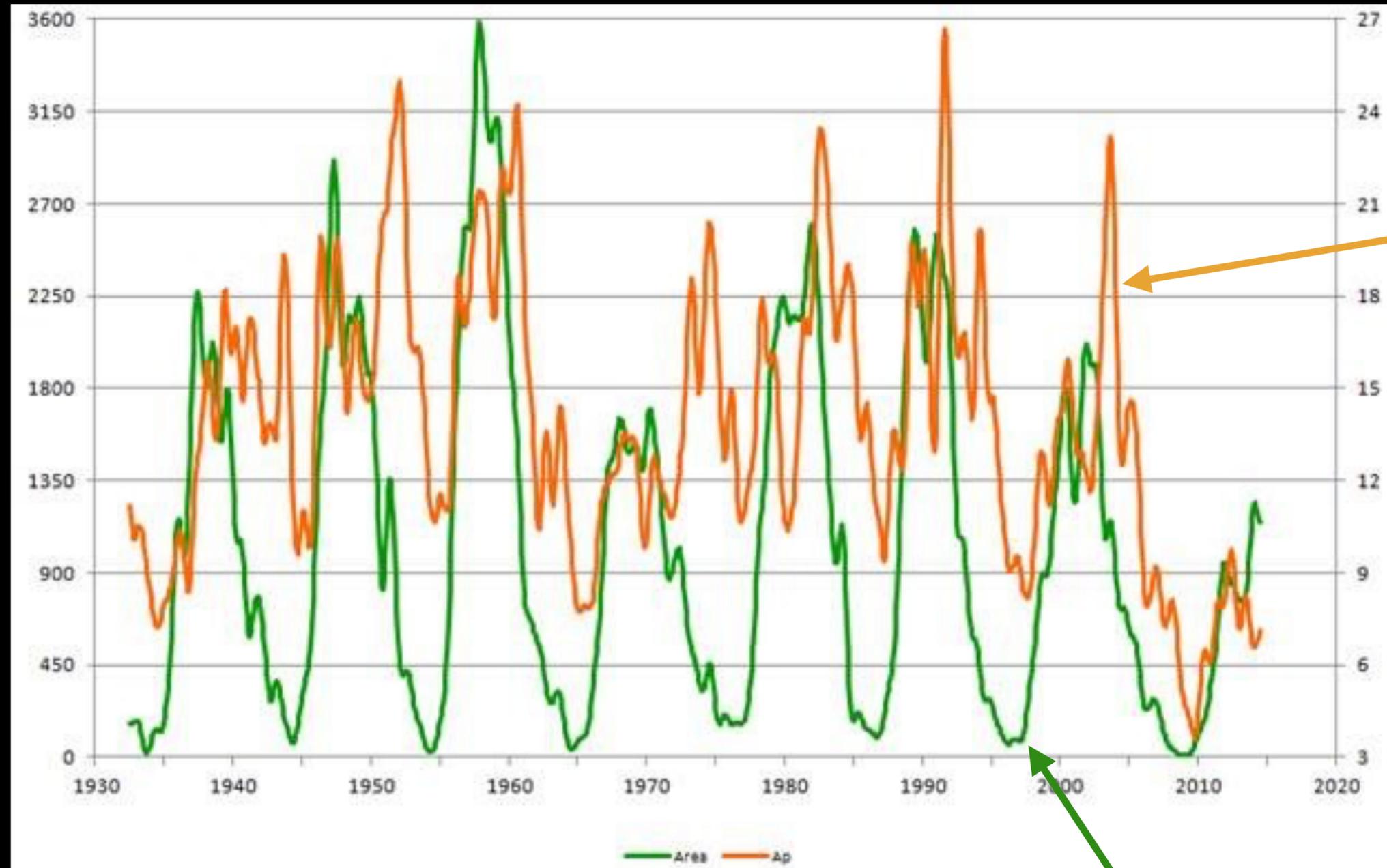
Cycle 24 Sunspot Number (V2.0) Prediction (2017/9)



Vil Nordlyset forsvinne?

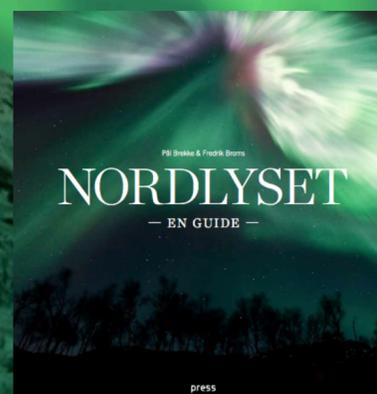
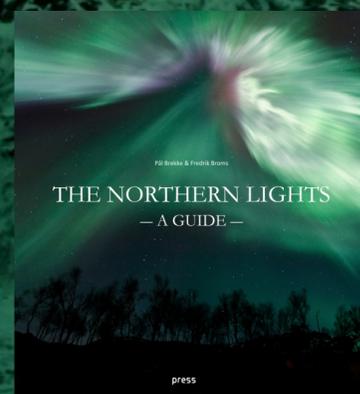
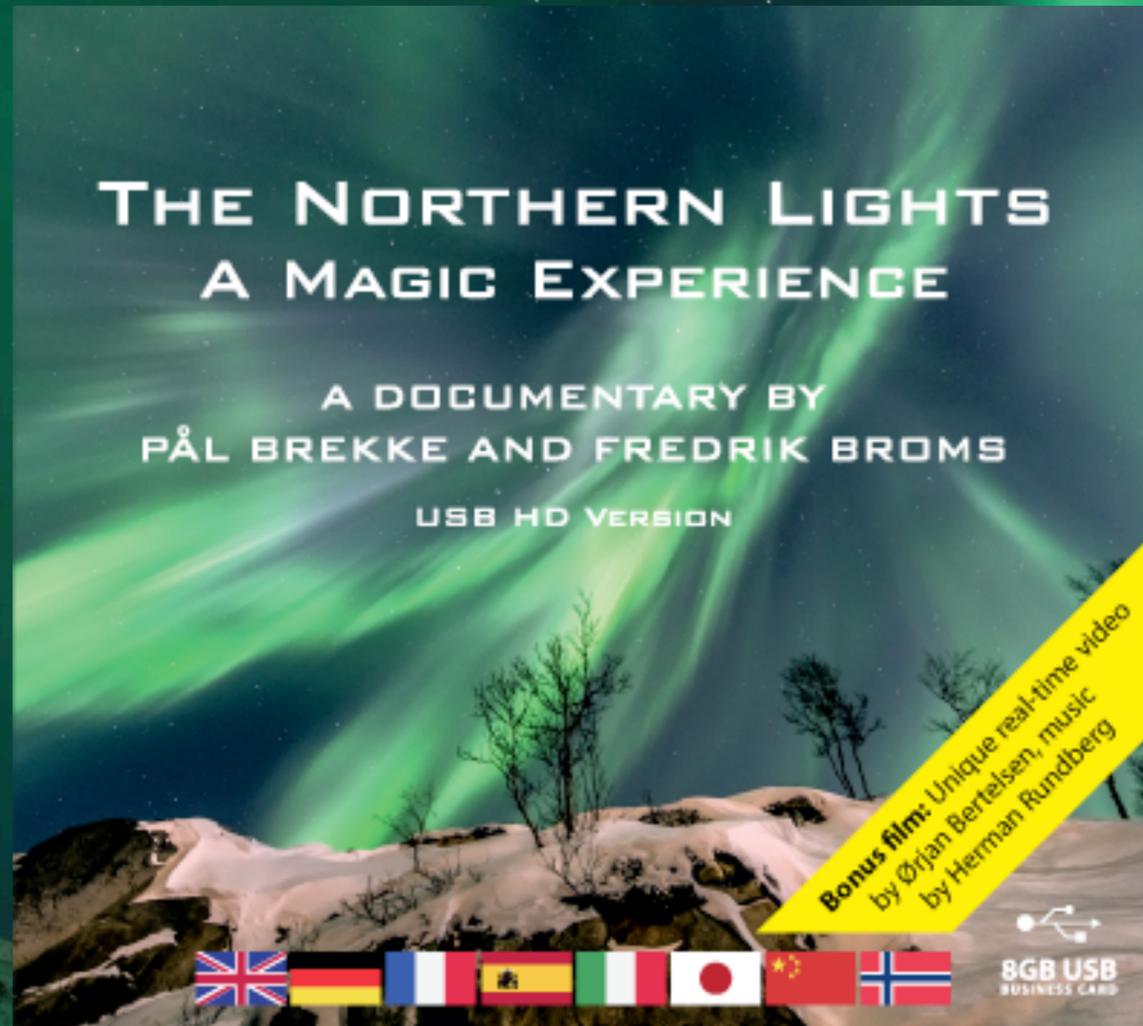


Mye nordlys også ved solminimum



Mengden nordlys

Solaktivitet/solsyklusen



Info: www.solarmax.no/Aurora/

paal@spacecentre.no

The 25 minute documentary takes you on a breathtaking journey through space.

By using pedagogic top-quality animations and spectacular solar imagery from NASA satellites it tells the full story of the northern lights from myth to science. It includes the best photography and time lapse sequences and includes tips about how to take your own stunning aurora photos.

The documentary is produced by Pål Brekke, an international recognized solar physicist and public outreach expert with many years at ESA and NASA. Co-producer is the internationally renowned award-winning aurora photographer Fredrik Broms.

© Hurtigruten and www.solarmax.no

Front page picture: Hurtigruten/Ole C. Salomonsen (arcticlightphoto.no)
Back page picture: Ørjan Bertelsen (Bertelsenfoto.no)

Languages: English, German, French, Spanish, Italian, Japanese, Chinese and Norwegian



Duration: 27+25+5+4 min Widescreen 16:9 Age limit: All

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Bonus films:
1) Hurtigruten highlights from Norway, Spitsbergen and Antarctica (25 min)

2) A 5 minute video by photographer Ørjan Bertelsen using new super-sensitive camera equipment (5 min)

3) Highlights from the NASA Solar Dynamics Observatory's five years of watching the sun (4 min)

THE NORTHERN LIGHTS A MAGIC EXPERIENCE

THE NORTHERN LIGHTS A MAGIC EXPERIENCE

A Documentary by Pål Brekke and Fredrik Broms
USB Full HD Version



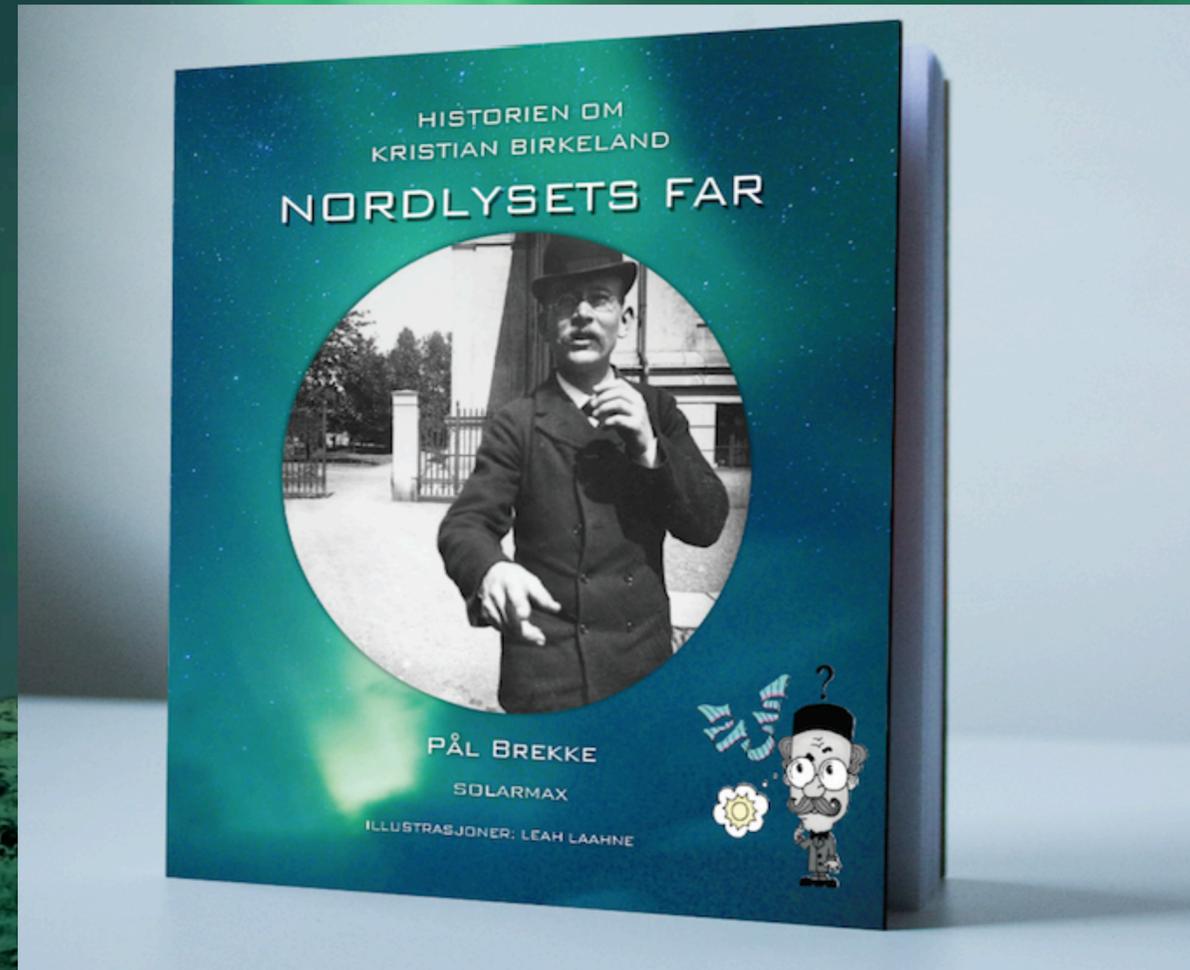
Bonus Tracks: Hurtigruten highlights film
+ Unique real-time video by Ørjan Bertelsen
+ NASA SDO highlights



Info: www.solarmax.no/Aurora/

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Ny bok om Birkeland



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