

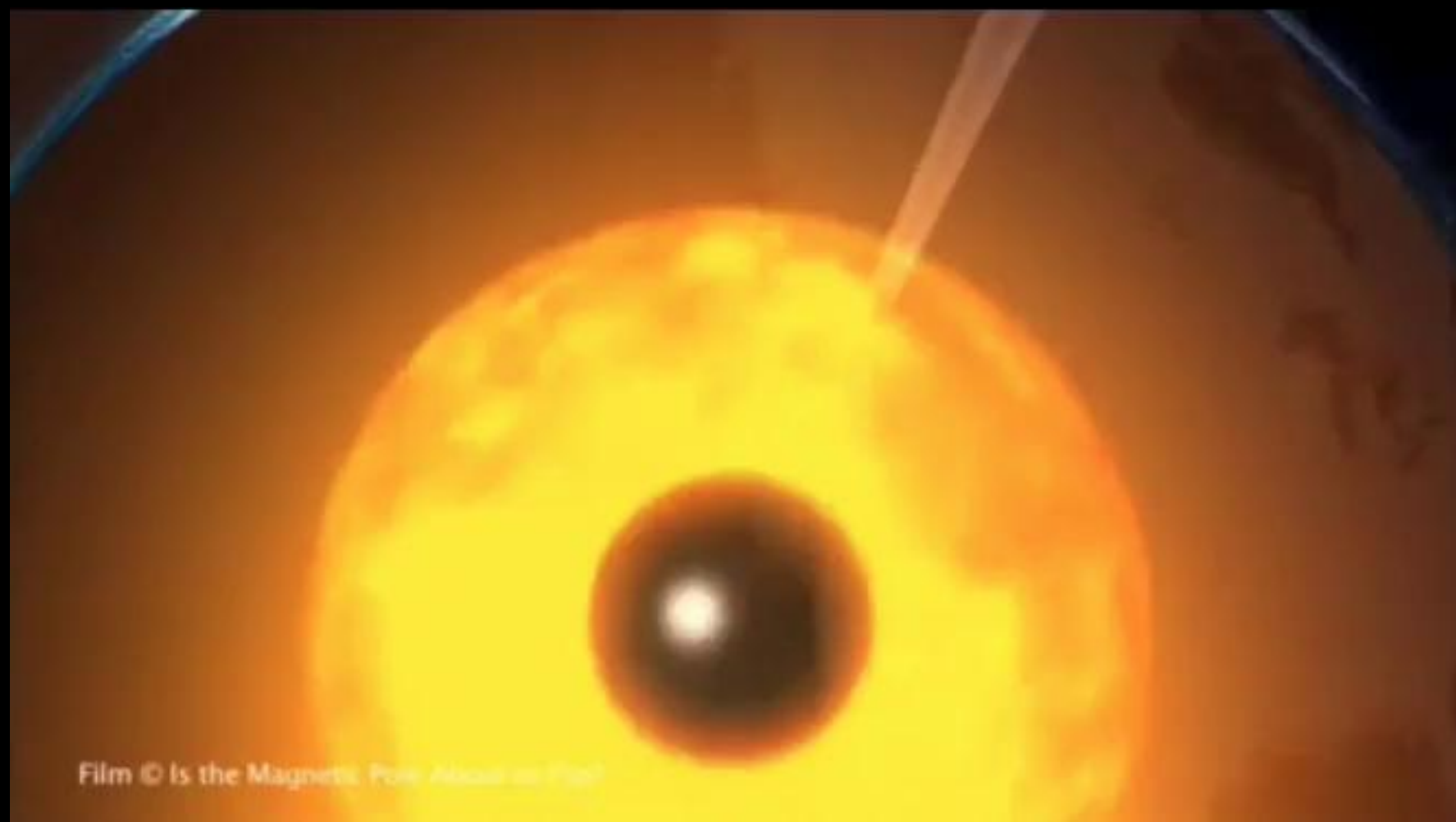
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The PITHIA
EISCAT / Polarisation mission

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Film © Is the Magnetic Pole About to Flip?

- ❖ Around 110 km d'altitude, O emits a green line: 557,7 nm (S^1 to D^1 transition)
- ❖ Around 220 km of altitude, O emits a red triplet: 630.0, 636.4, 639.2 nm (D^1 to P^3 transition)
- ❖ Between 85 et 90 km, N_2^+ emits a blue line: 427,8 nm (B to X(0, 1) transition of the 1st N_2^+ negative band)
- ❖ Between 85 et 90 km, N_2^+ emits a purple line: 391,4 nm (B to X(0, 0) transition of the 1st N_2^+ negative band)

Solar wind + Magnetic
field: I had the
intuition that the
auroral emissions could
be polarized

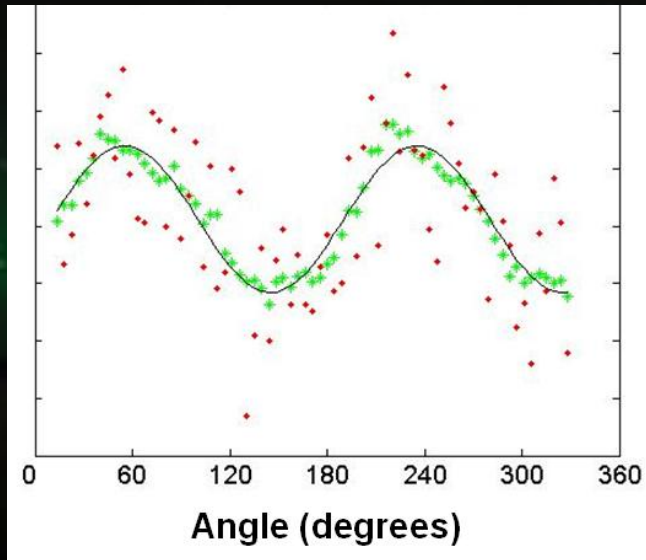






I invented a series of polarimeters

2008: discovery



A harvest of results

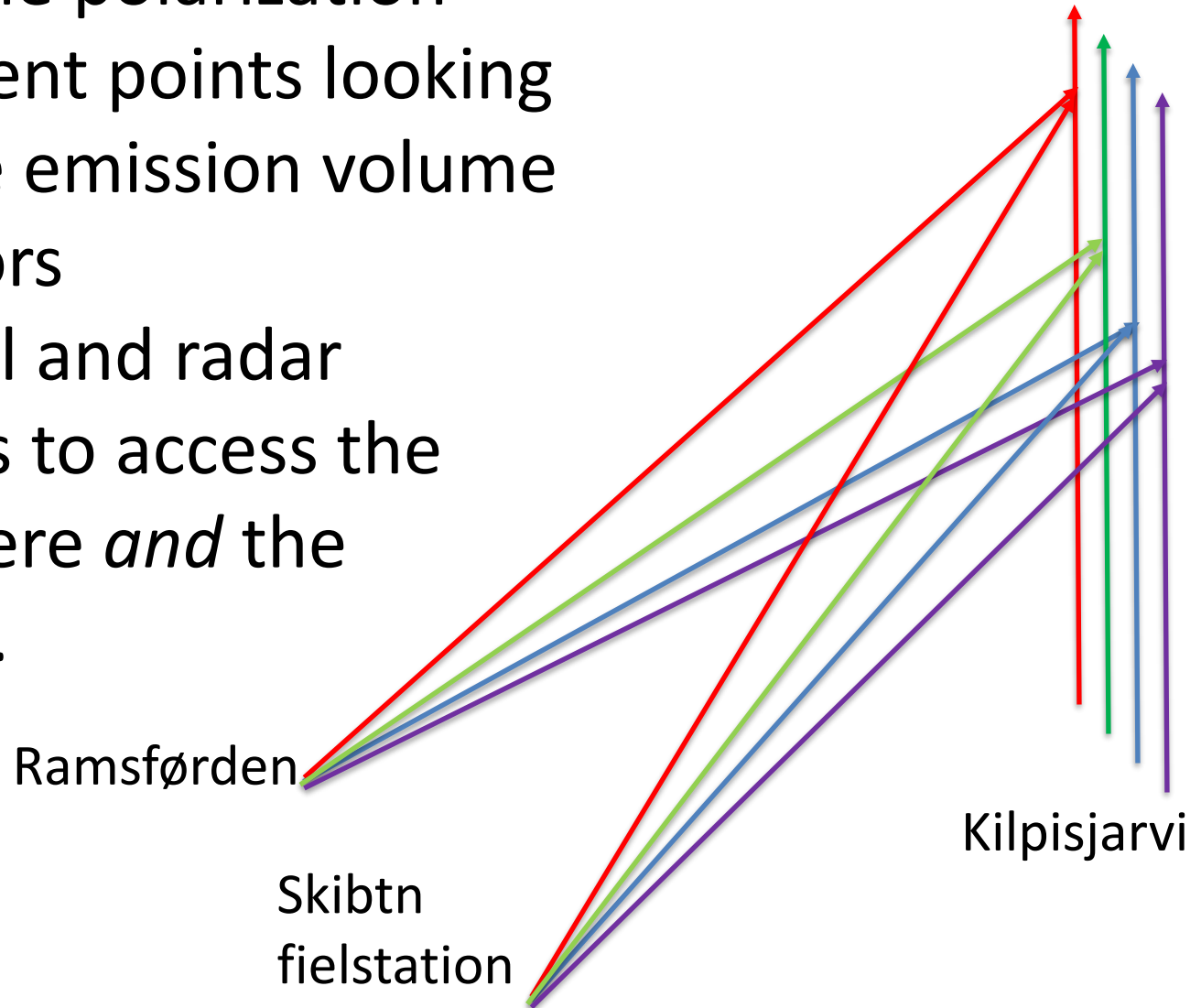
Amongst which:

- A series of observations in Senegal shows that the ionospheric nightglow is also polarised. This is a global mechanism, a new window on our space environment.
- This also exists at Jupiter: a new window on planetary space environments
 - **The AoLP follows the ionospheric currents**

The Pithia campaign objectives

To measure the polarization

- From different points looking at the same emission volume to get vectors
- With optical and radar instruments to access the thermosphere *and* the ionosphere.



Maxwell Equations

$$\operatorname{div}(\vec{E}) = \frac{\rho}{\epsilon_0} \quad \operatorname{rot}(\vec{E}) = -\frac{\partial \vec{B}}{\partial t}$$

(Maxwell-Gauss) (Maxwell-Faraday)

$$\operatorname{div}(\vec{B}) = 0 \quad \operatorname{rot}(\vec{B}) = \mu_0 \vec{J} + \frac{1}{c^2} \frac{\partial \vec{E}}{\partial t}$$

(Maxwell-Flux) (Maxwell-Ampère)

Therefore a large team



What we learned is how to proceed.
The results were not secured (and not publishable)

- How to get rid of the light pollution
→ **Need for a radiative transfer code (Bosse et al., 2023) now operational**
- Problems with the antenna : slow moves, power failures
→ **Need to wait for EISCAT 3D**

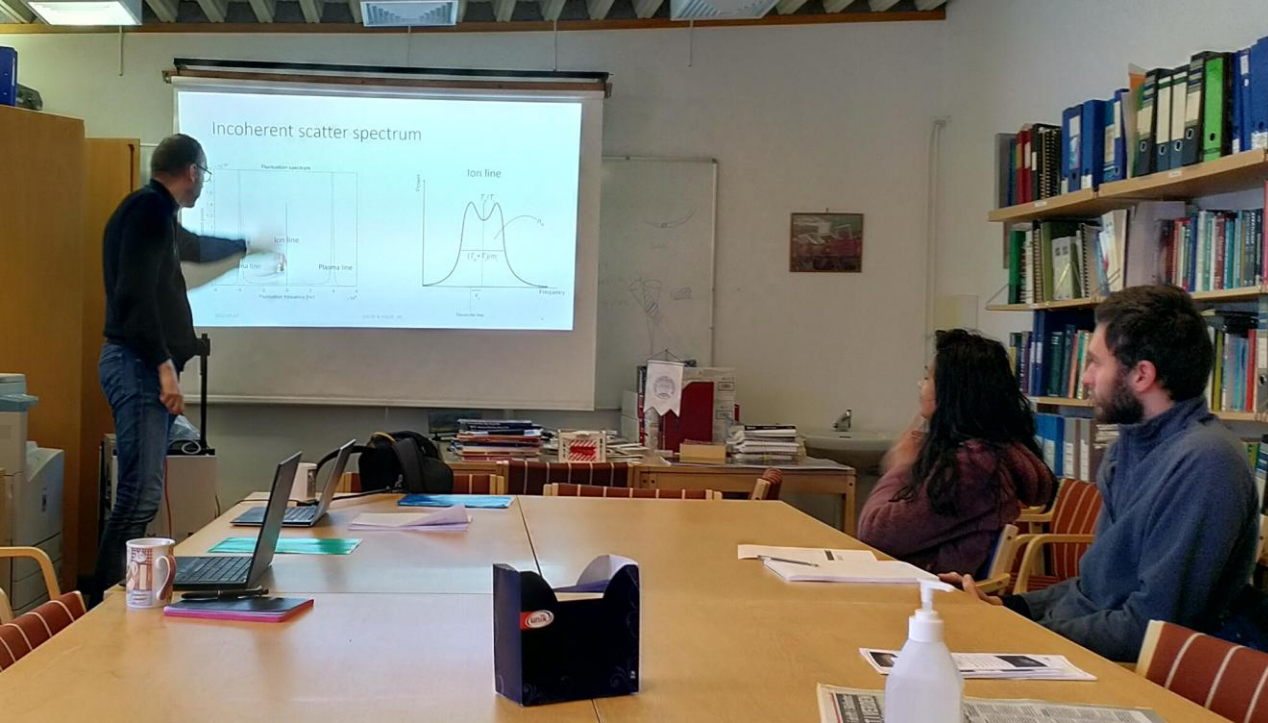


The Pithia campaign was successful
although not as expected...

It allowed to learn how to
proceed to get stronger
(proof of concept)

**Next campaign,
based on this
experience: Feb. 17,
2026!!!**





It also allowed to
train 3 young
scientists. This is
unvaluable.



Thank you, thanks to Pithia, thanks for
having selected and funded my program.

