

# ESWW16 18/11/2019

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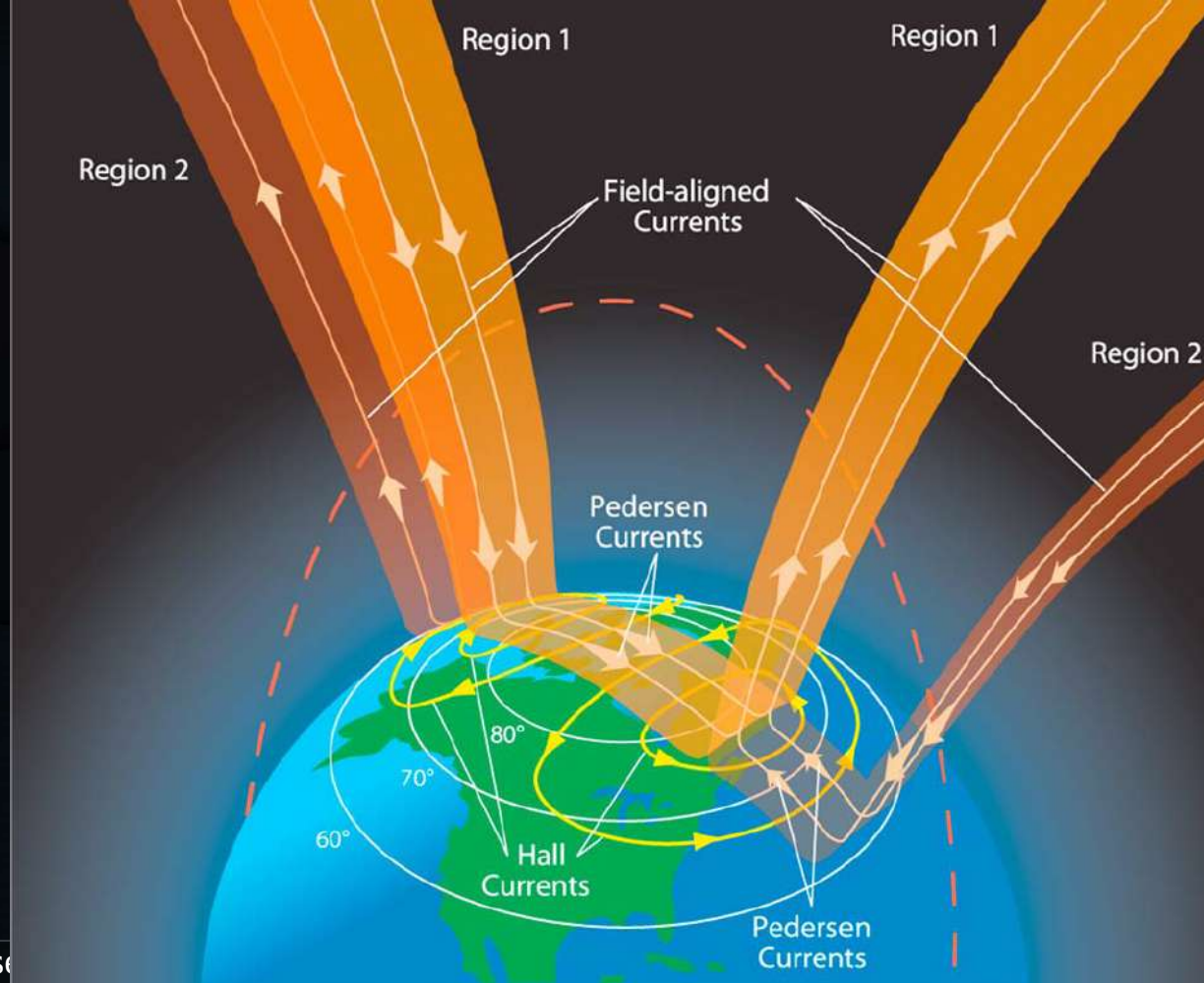
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## On the nightglow polarisation: a new window for space weather observations?



# Electrons entry in the upper atmosphere

- Electromagnetic fields guiding electrons
- Excitation of upper atmosphere
- Radiative desexcitation



# Transitions

## Atomic oxygen:

- **Red** (630 nm) ~200km
- **Green** (557.7 nm) ~110km

## Nitrogen $N_2^+$ :

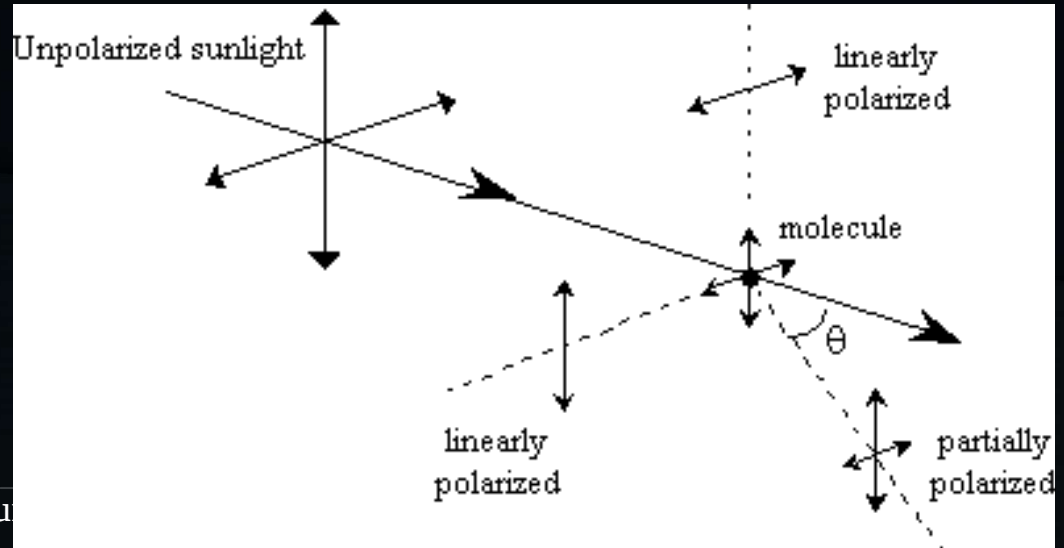
- **Blue** (427.8 nm) ~85km
- **Purple** (391.4 nm) ~85km



Credits: NASA

# Polarization processes

- **Aurora polarization** (Bommier et al., 2011)  
parallel to electron's incoming direction  
(theoretically possible in the red, not in the green)
- **Rayleigh scattering**  
in lower atmosphere

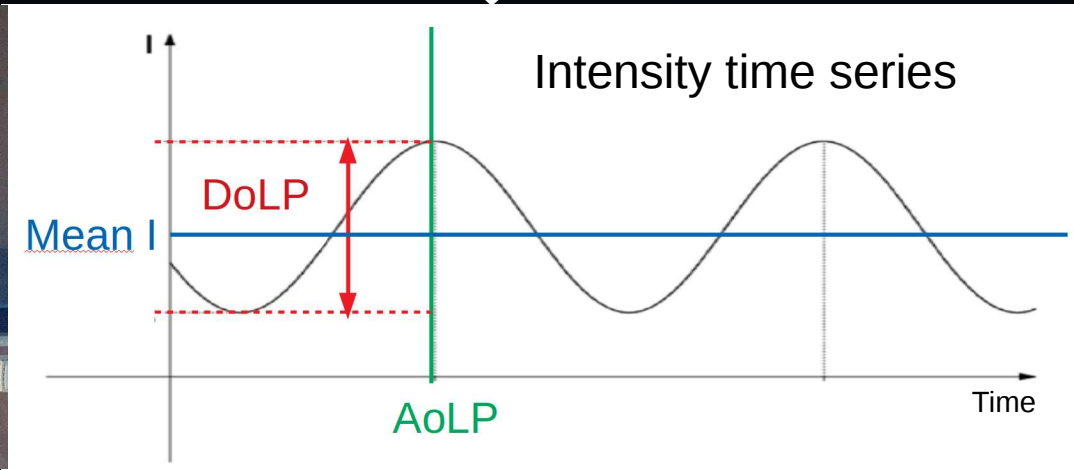
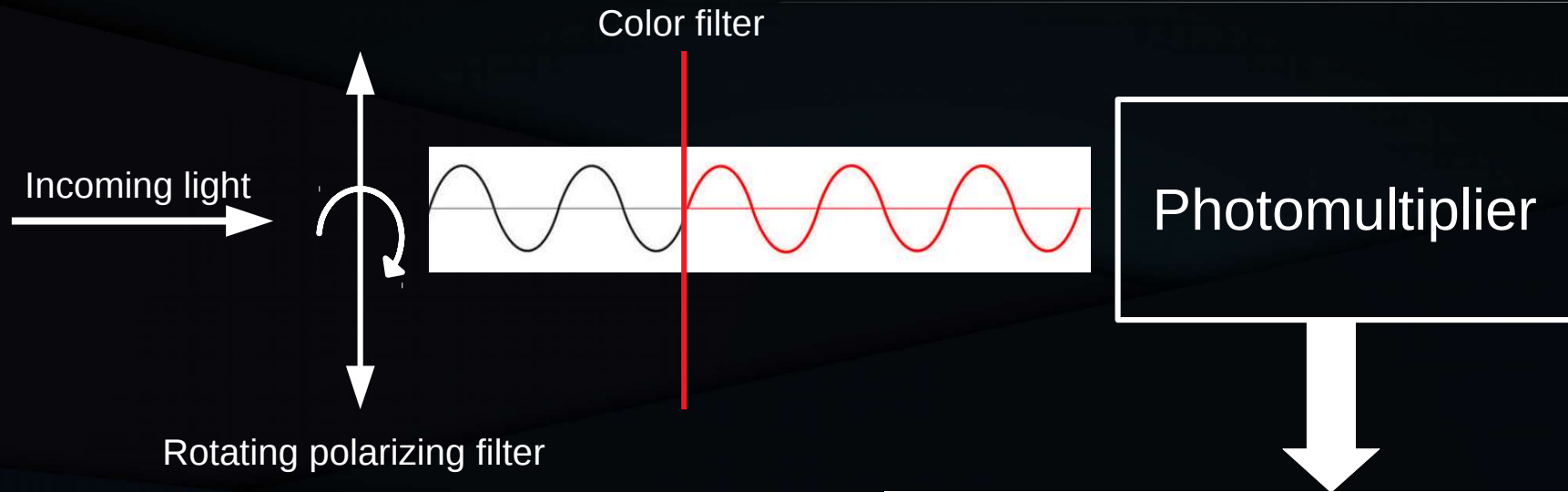


# Interests and applications

- **Discovery** of auroral emissions polarization (Lilensten et al. 2008, 2013, 2015, 2016)
- **Indirect and real-time monitoring** of electromagnetic field in the transition region between internal and external magnetic field
  - Satellites too high
  - Balloons too low



# Instrument: Petit Cru



# Q1: Where does it come from?

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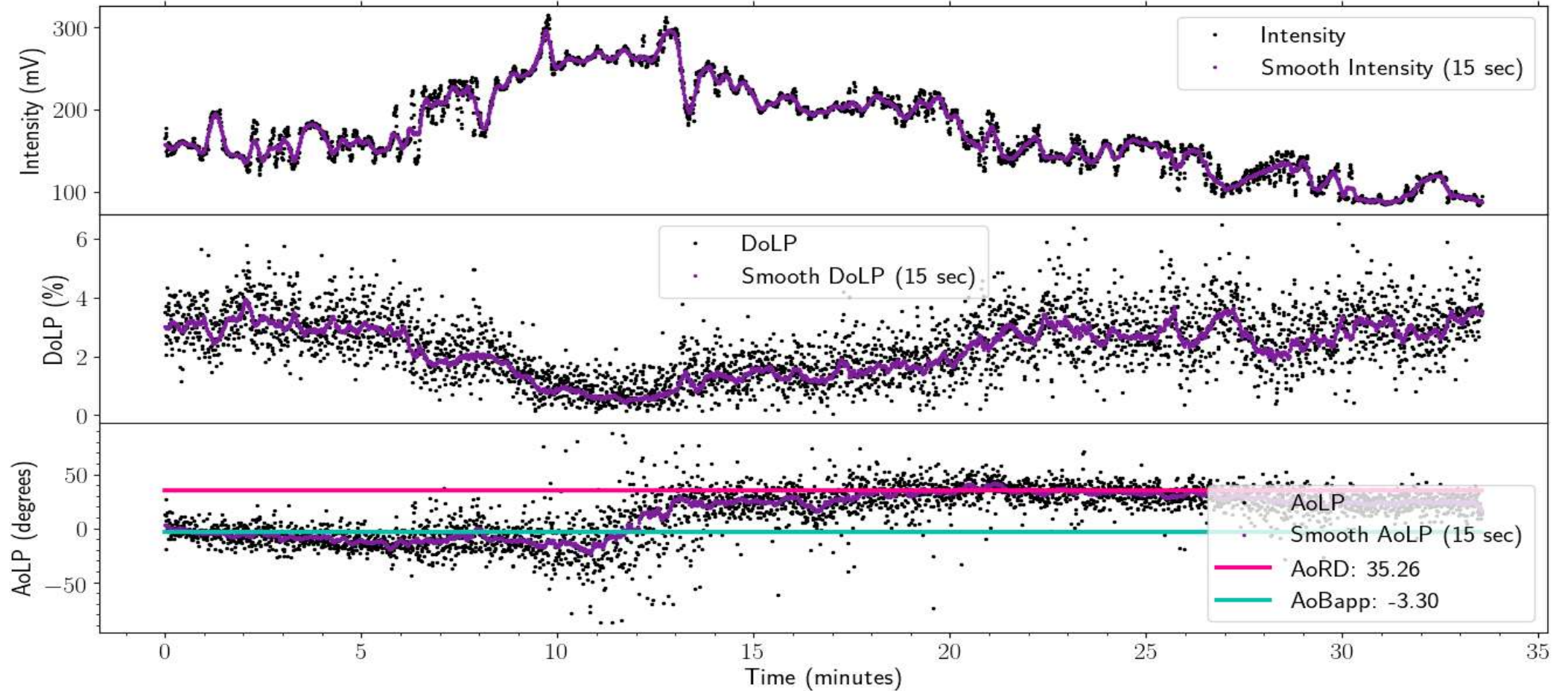
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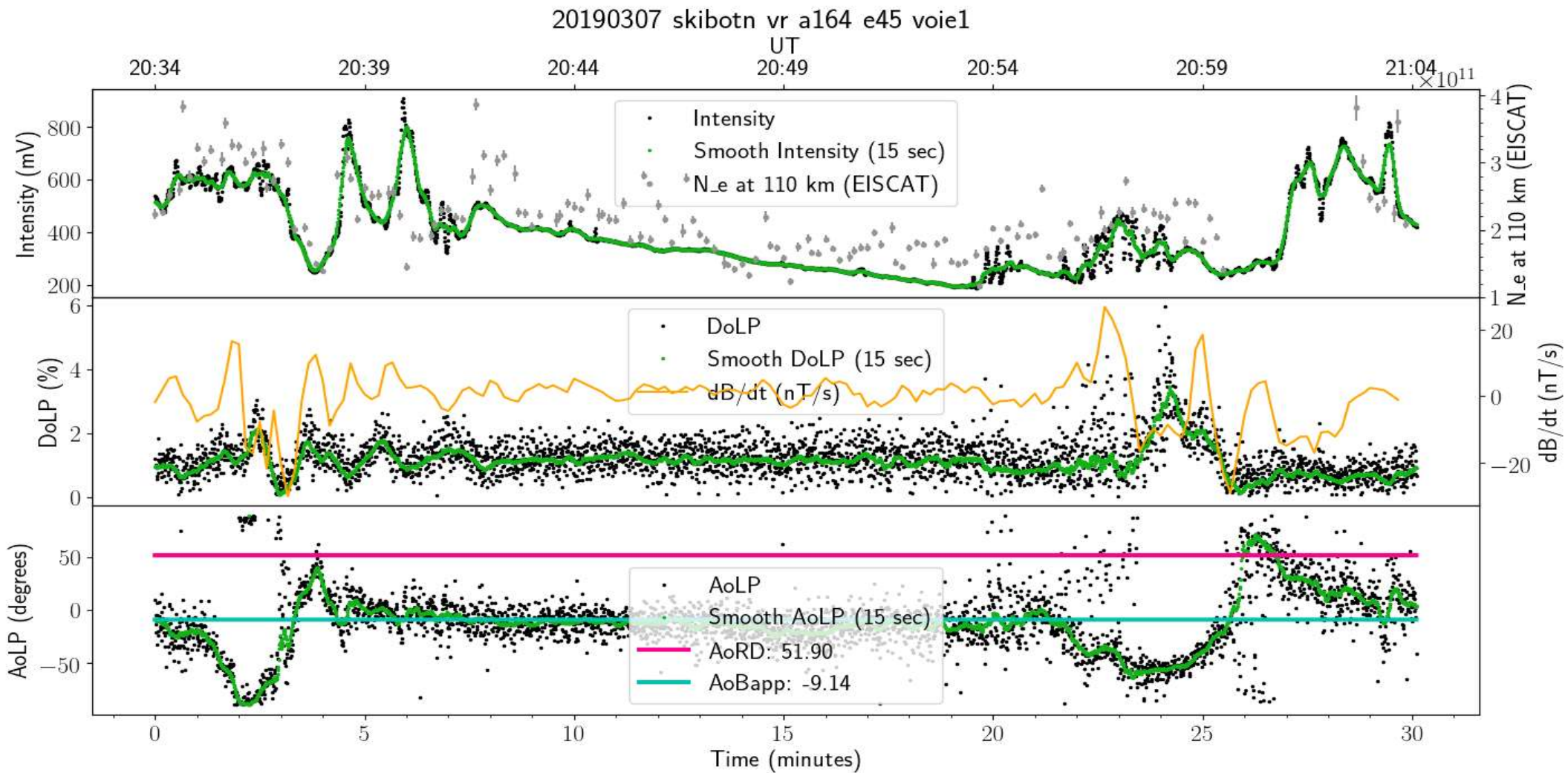
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# Q2: How is the green line polarized?





# Conclusion

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- **The night sky is polarized**
- 2 possible sources of polarization:
  - Upper atmosphere: **Aurora / night-glow**
  - Lower atmosphere:
    - **Rayleigh scattering**: From aurora / city lights
    - Aerosols
- New space weather proxy once disentangled
- Radiative transfer model and controlled environment to help us discriminate

# Q3: Can we model RS contribution?

