



EarthCARE 2026 Science and Validation workshop

8–12 June 2026 | Rhodes House | Oxford, UK

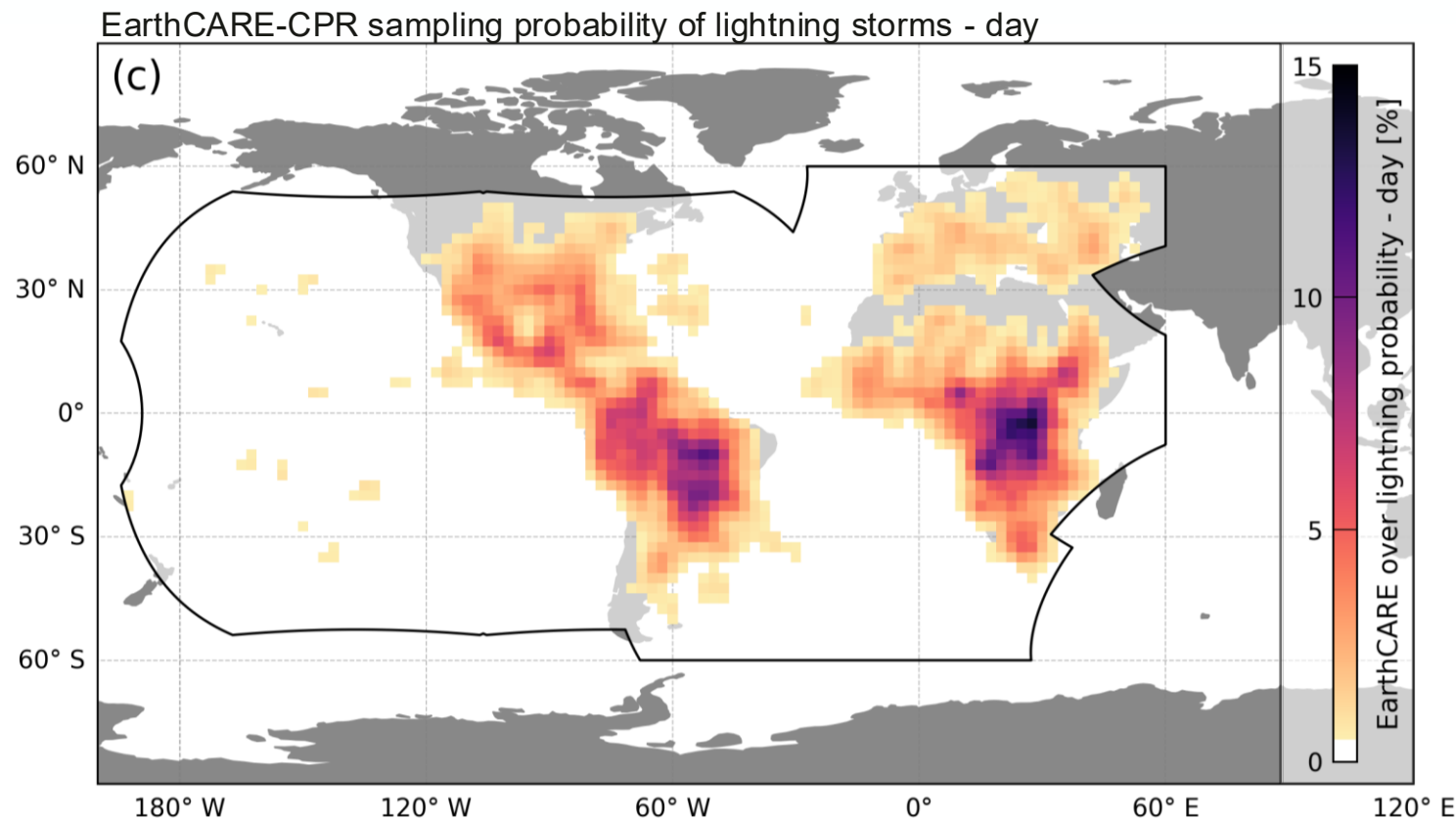
Combined EarthCARE–Geostationary Lightning Observations of Convective Storm Structure and Electrification

Blanka Piskala, Johanna Mayer, Saskia Maria Brose, Edward Malina, Daniele Gasbarra

ESA-ESRIN

Guess the maximum sampling probability:

How often does the EarthCARE nadir track intersect a lightning storm in the most active regions?



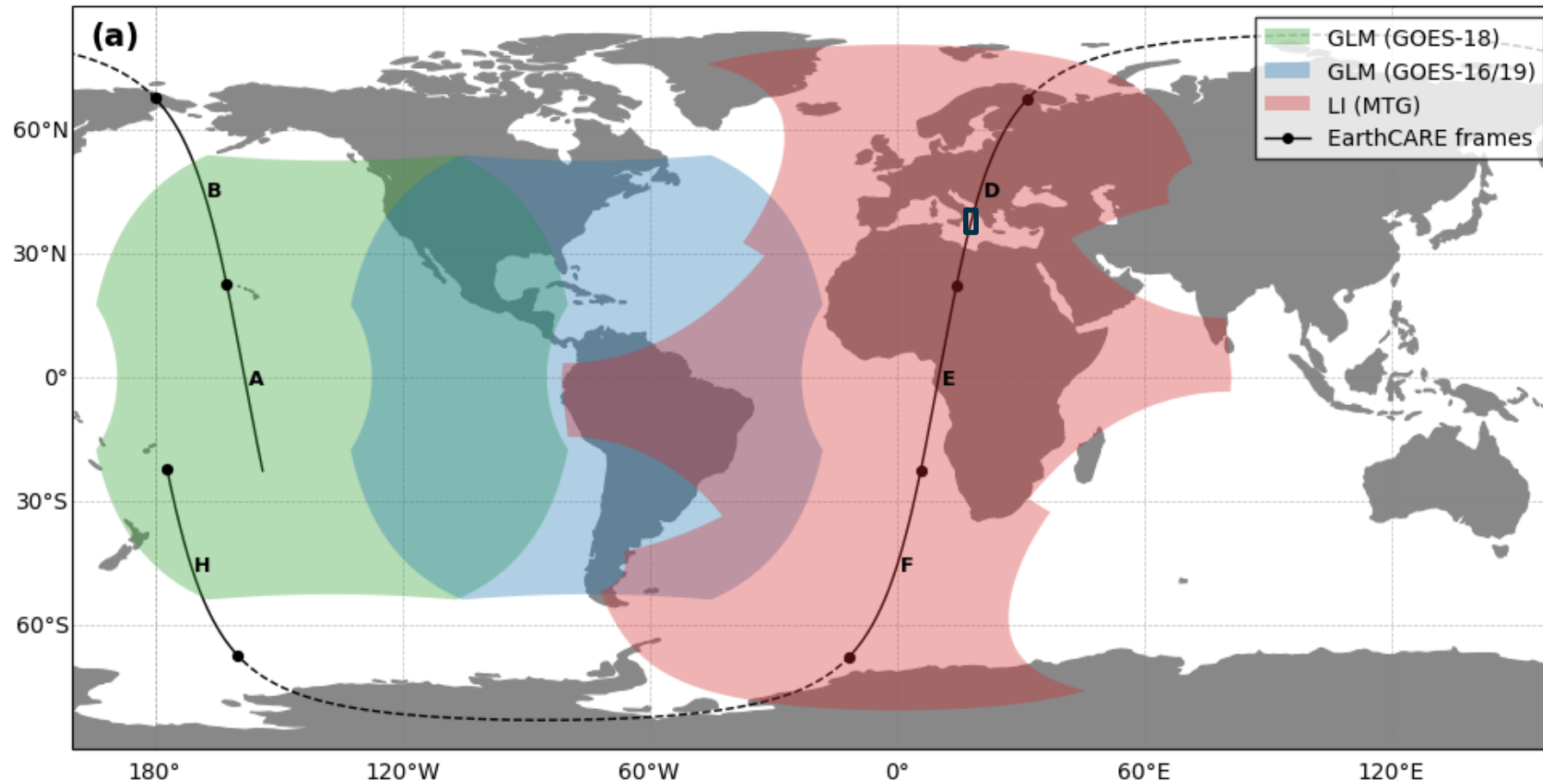
A. 1 %

B. 5 %

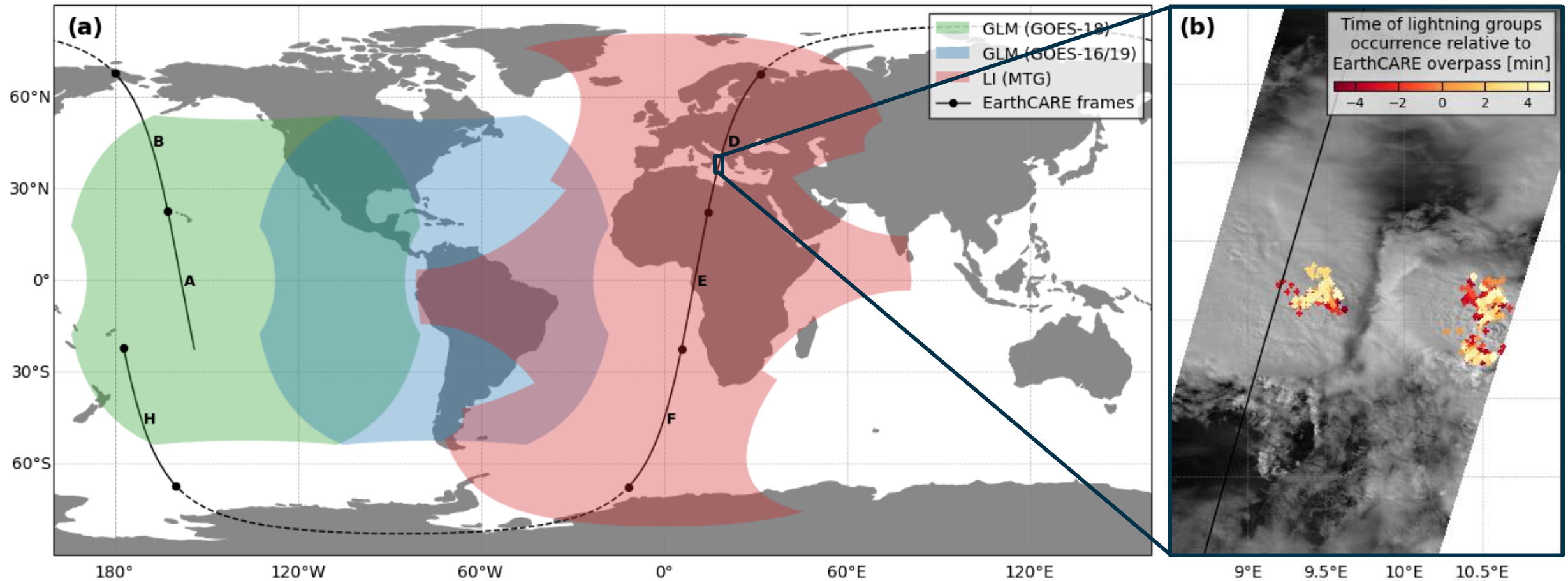
C. 15 %

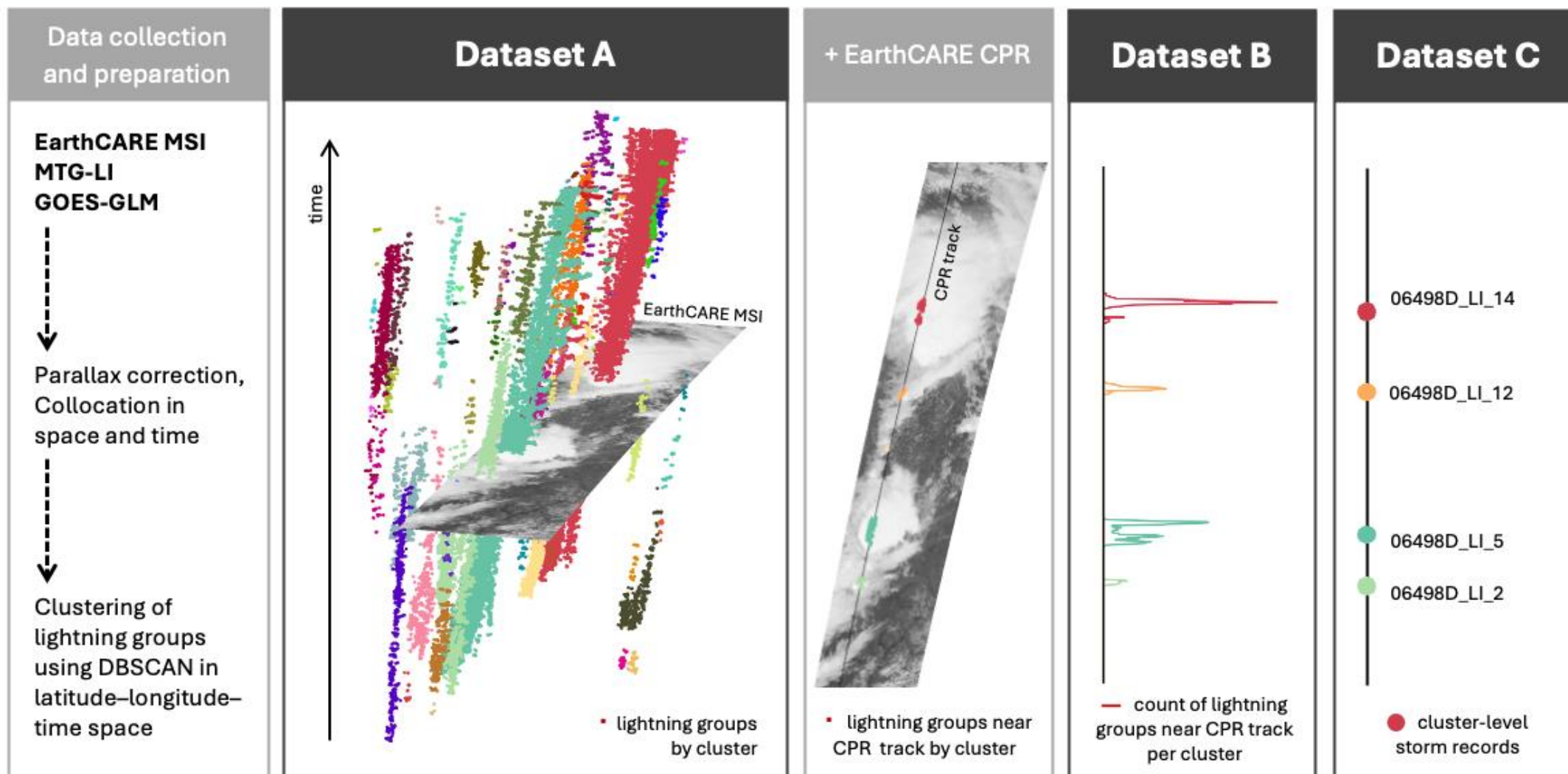
D. 30 %

Geostationary lightning observations from MTG and GOES + EarthCARE



Geostationary lightning observations from MTG and GOES + EarthCARE

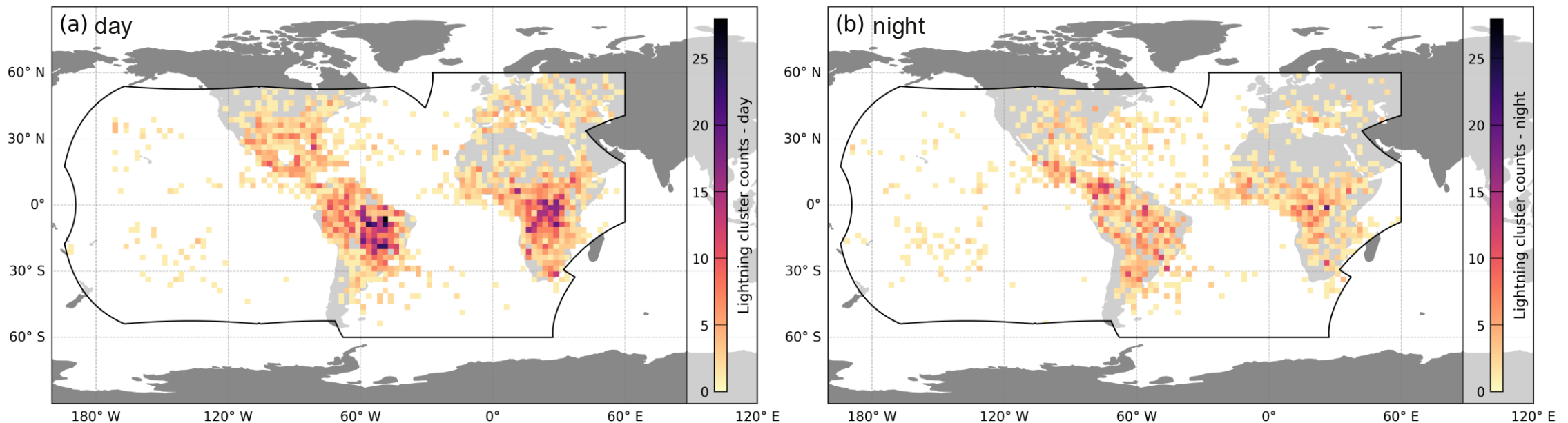




Results



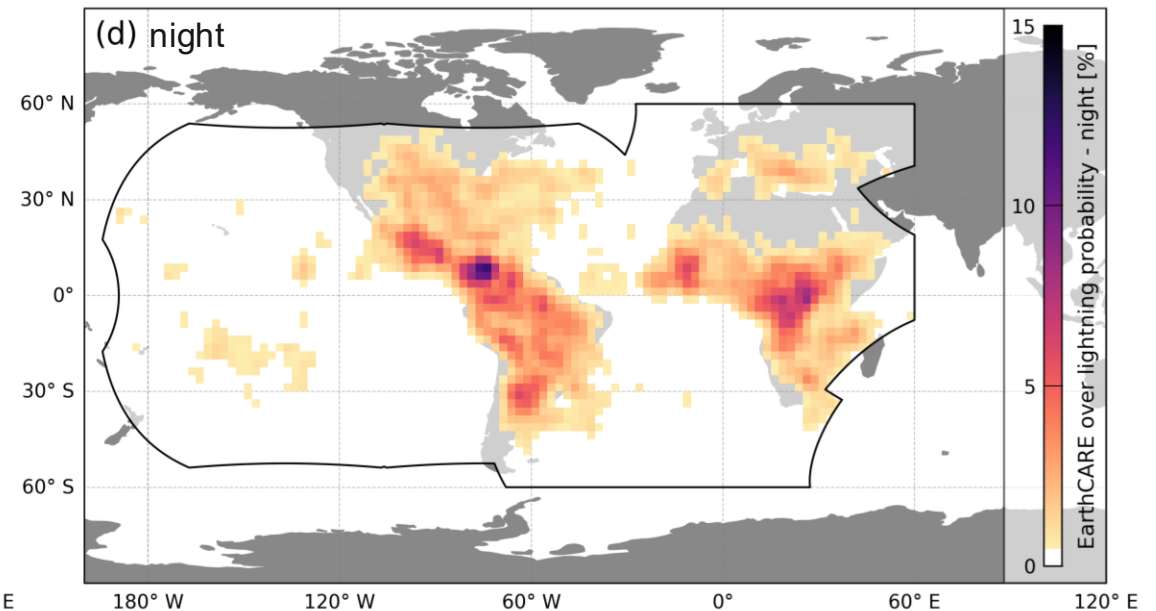
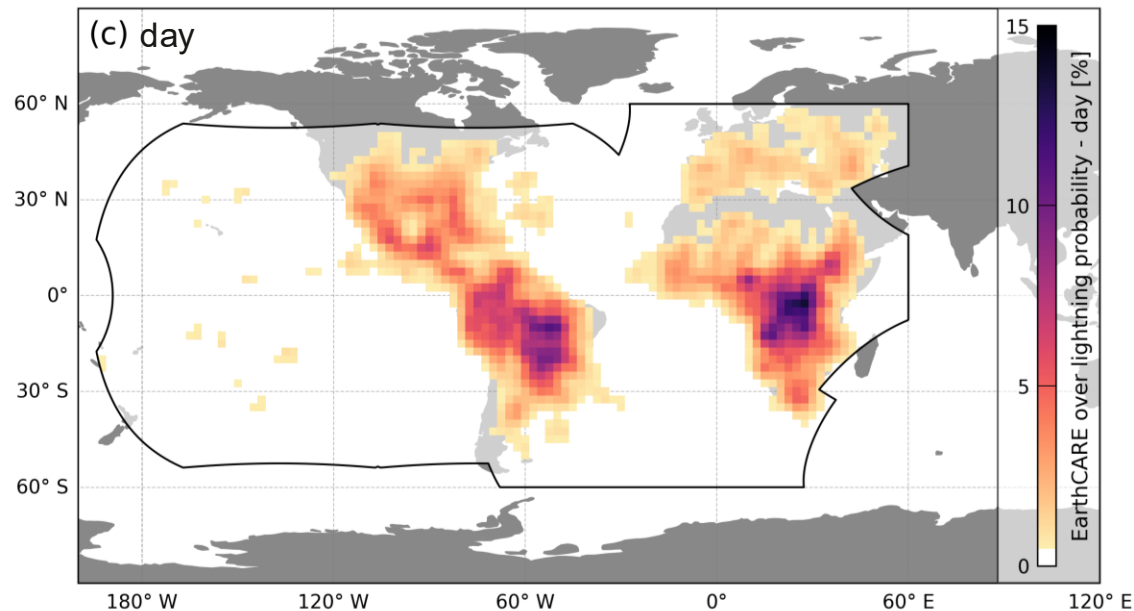
- Three **Lightning2EarthCARE** datasets on (1) **frame-level**, (2) **track-level**, (3) **storm-level**
 - Available at ESA Open Science Catalogue
 - Paper submitted to Earth System Science Data
- 
- Altogether approximately **6 000** lightning storms sampled during EarthCARE's first year and a half of operation



Results



- Three **Lightning2EarthCARE** datasets on (1) **frame-level**, (2) **track-level**, (3) **storm-level**
 - Available at ESA Open Science Catalogue
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- 10-15 % probability that EarthCARE active instruments sample lightning storm in tropical areas

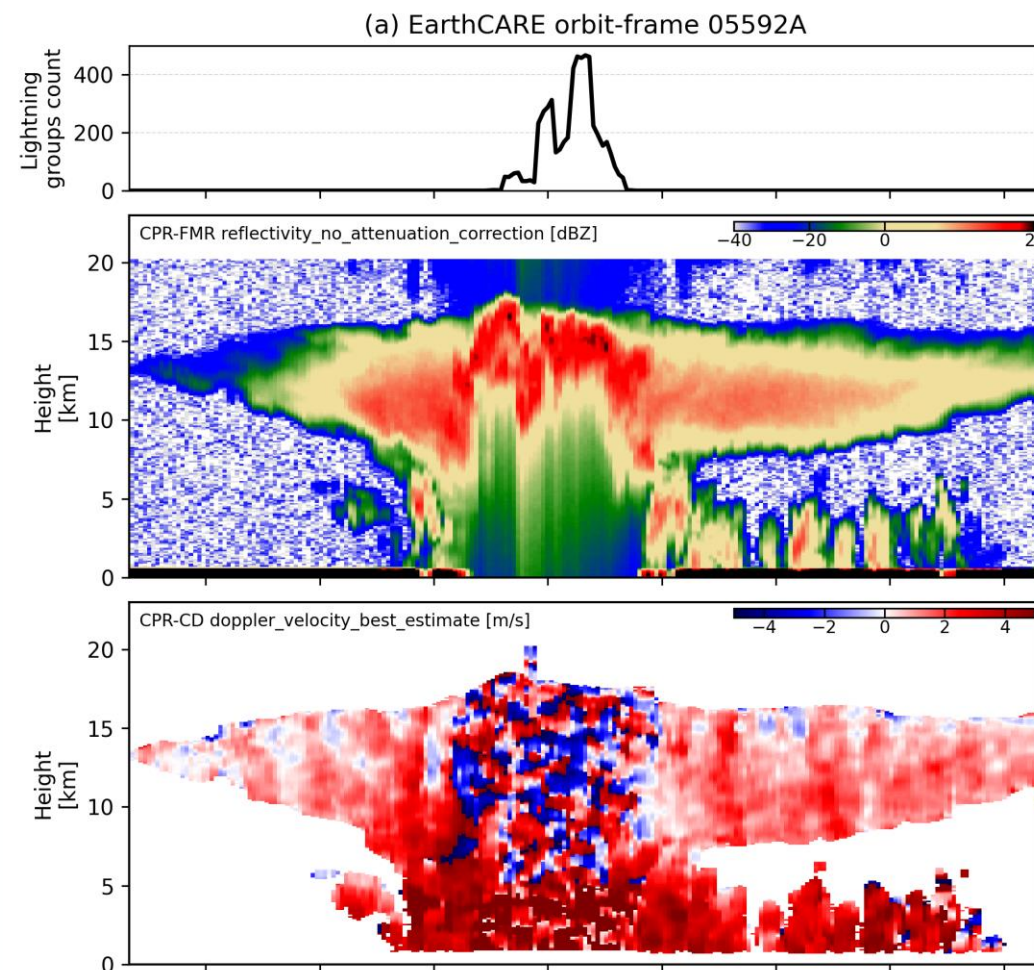


Use case 1: Linking lightning to EarthCARE vertical profiles

- Radar reflectivity profiles of electrified storms
- Multiple scattering signatures in deep convection
- Doppler velocity variability related to strong dynamics

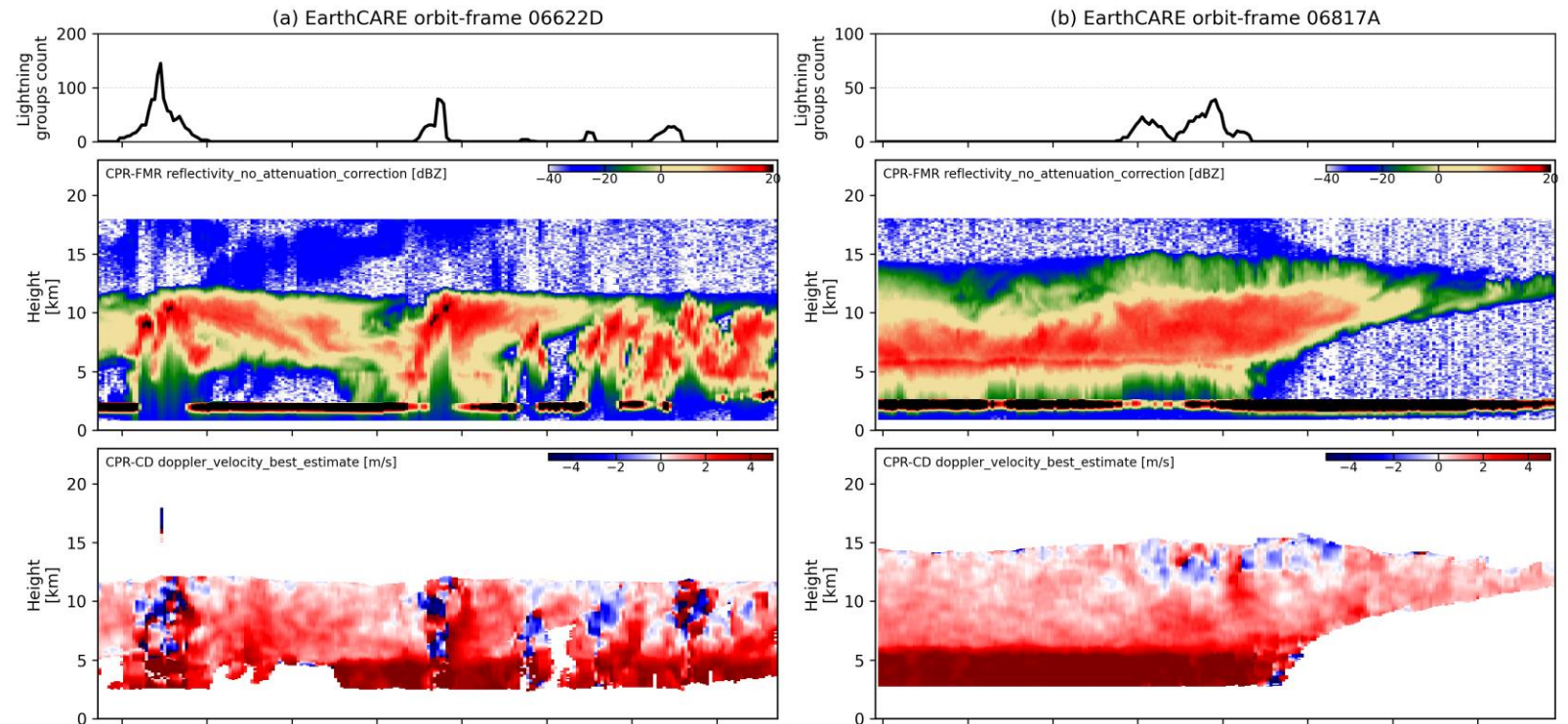
Use case 2: Combining with other datasets

- Aerosol products
- GPM precipitation and microwave observations
- Ground-based radars and lightning networks
- Reanalysis / environmental conditions
- Multi-sensor view of electrified convection



Use case 3: Comparing different types of lightning storms

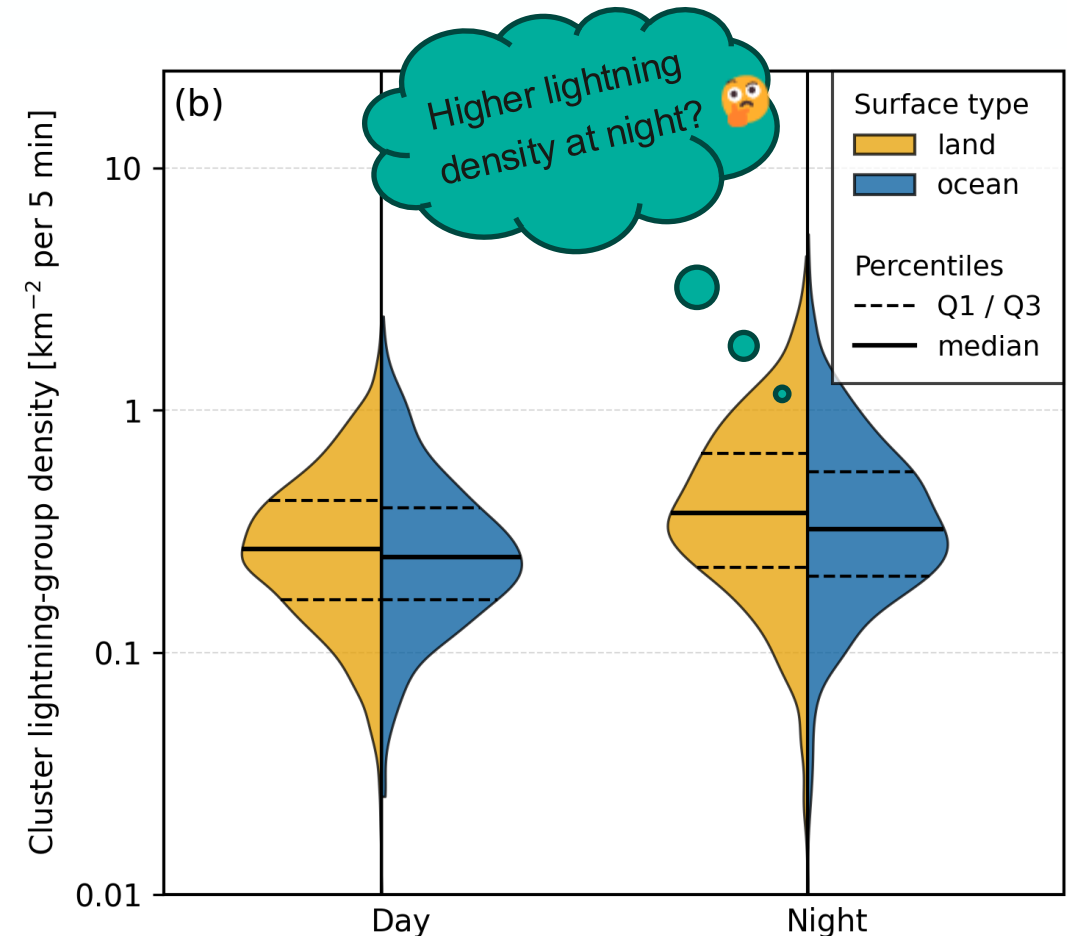
- Land vs ocean
- Day vs night
- Tropics vs midlatitudes
- Initiating, mature, and decaying
- Lightning in cores, anvils, and stratiform regions



Interpretation and recommendations



- The lightning storm catalogue is selective
- Sampling depends on the EarthCARE orbit and local overpass time
- Day/night differences should not be interpreted as a simple lightning climatology
- Separate cases by storm stage when possible





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Thank you!

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