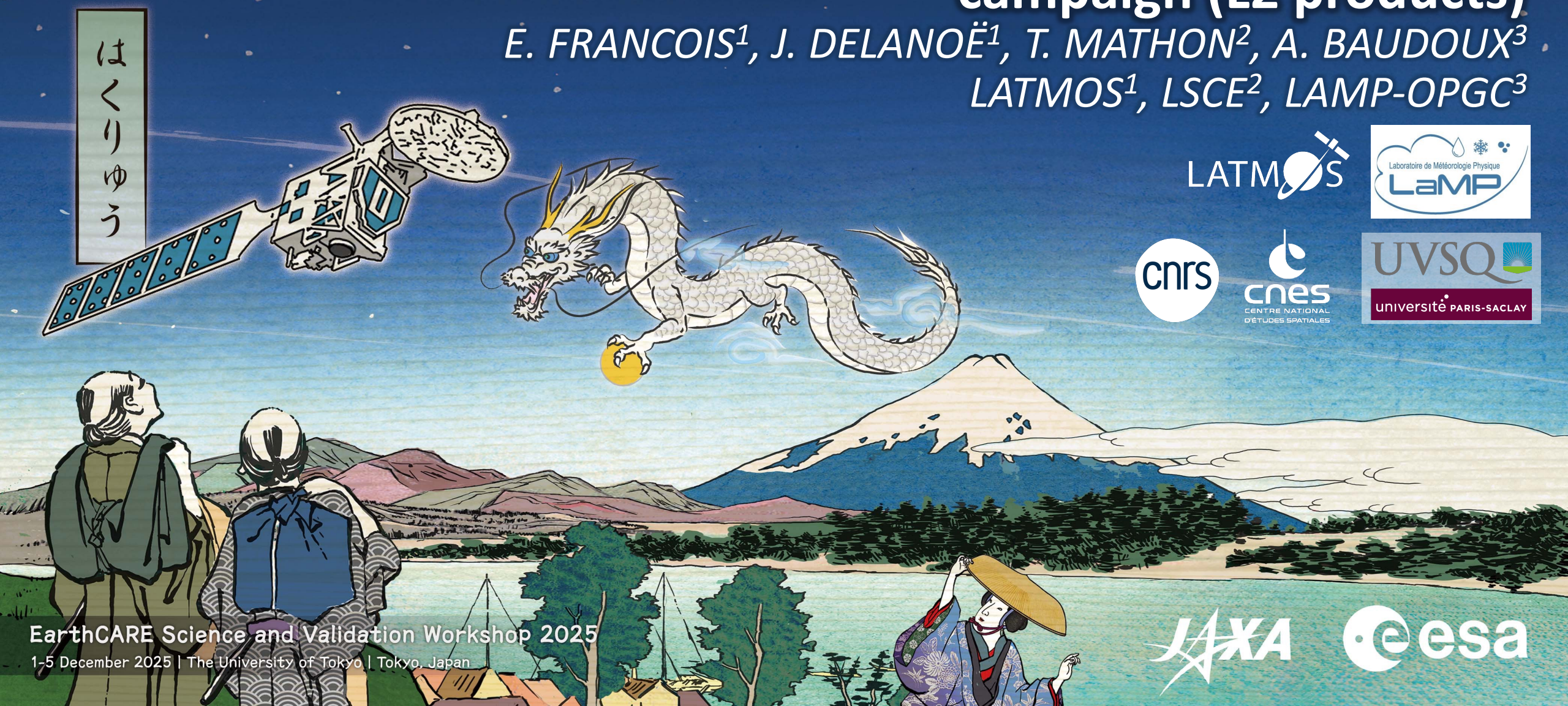
Comparison between EarthCARE and airborne measurements and products during the MORECALVAL field campaign (L2 products)

E. FRANCOIS[1], J. DELANOË[1], T. MATHON[2], A. BAUDOUX[3]

LATMOS[1], LSCE[2], LAMP-OPGC[3]



EarthCARE Science and Validation Workshop 2025

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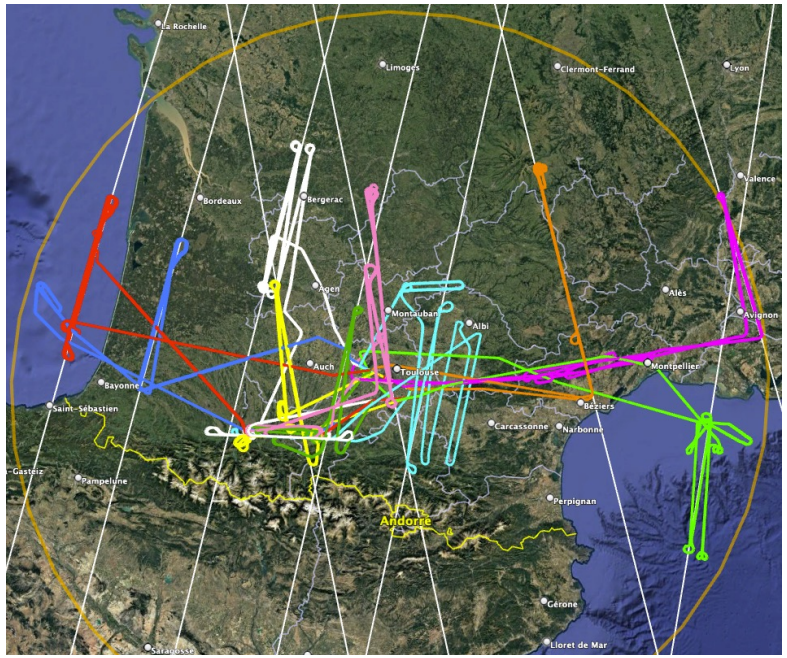
Introduction : Airborne campaign, payload and EarthCARE data used

MORECALVAL campaign :
EarthCARE CalVal + characterization of cloud structures at mid-latitudes (following MAESTRO), *PI : J. Delanoë*

- Toulouse from March 13 to April 4, 2025
- Installation of a BASTA at the Atmospheric Research Center (CRA Lannemezan) and at the Francazal airport



10 flights :
- 6 daytime
- 4 nightime

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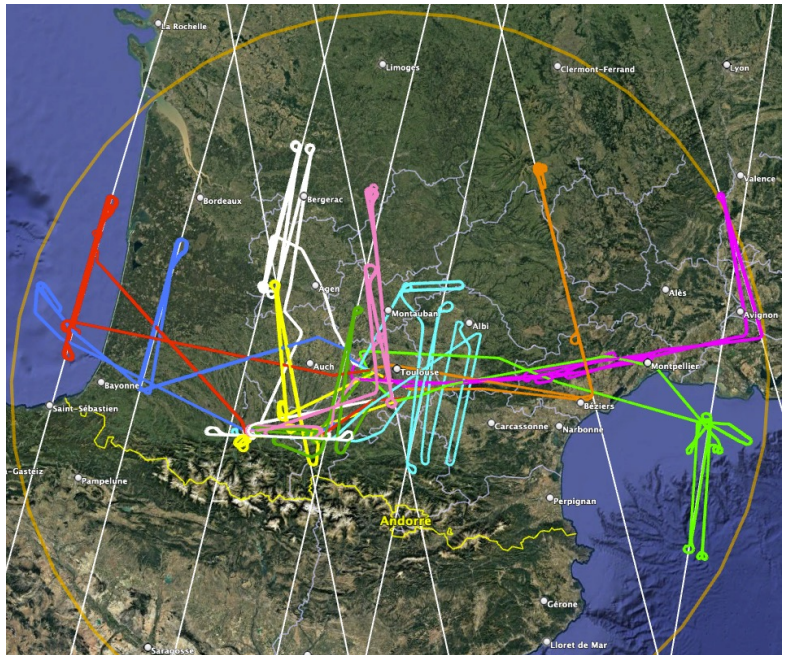

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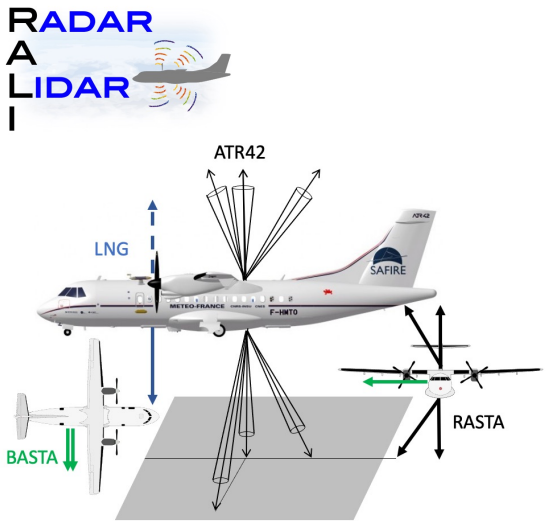
Aircraft payload :

- **RASTA,** looking up and down 6 antennas (Doppler W-band)
- **BASTAir**, sideward looking Doppler W-band
- **LNG**, **HSRL 355nm** and backscatter 532 & 1064 nm, 2 pointing directions
- **ALIAS** simple backscattering and polarization
- Large **in-situ** payload



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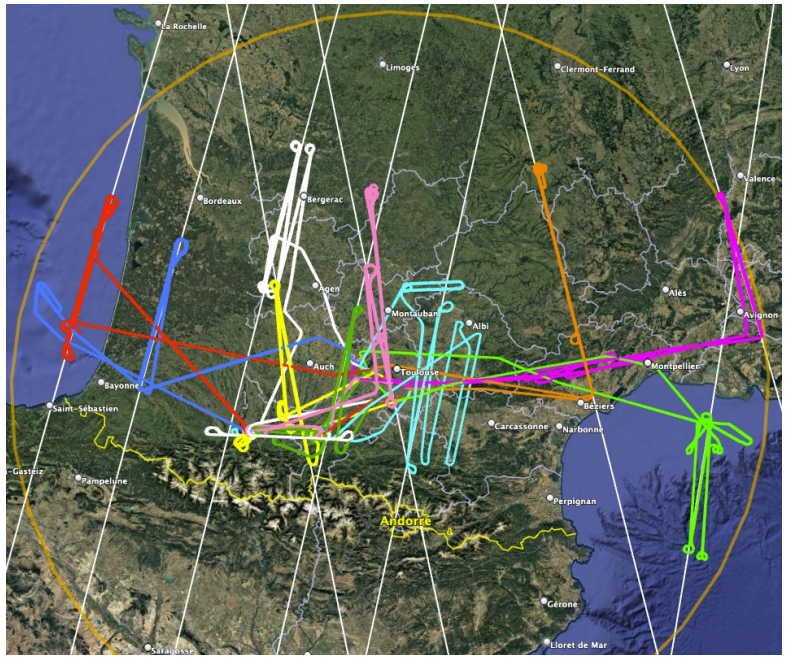

10 flights :
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RASTA →

RASTA + insitu ↔

Data used :

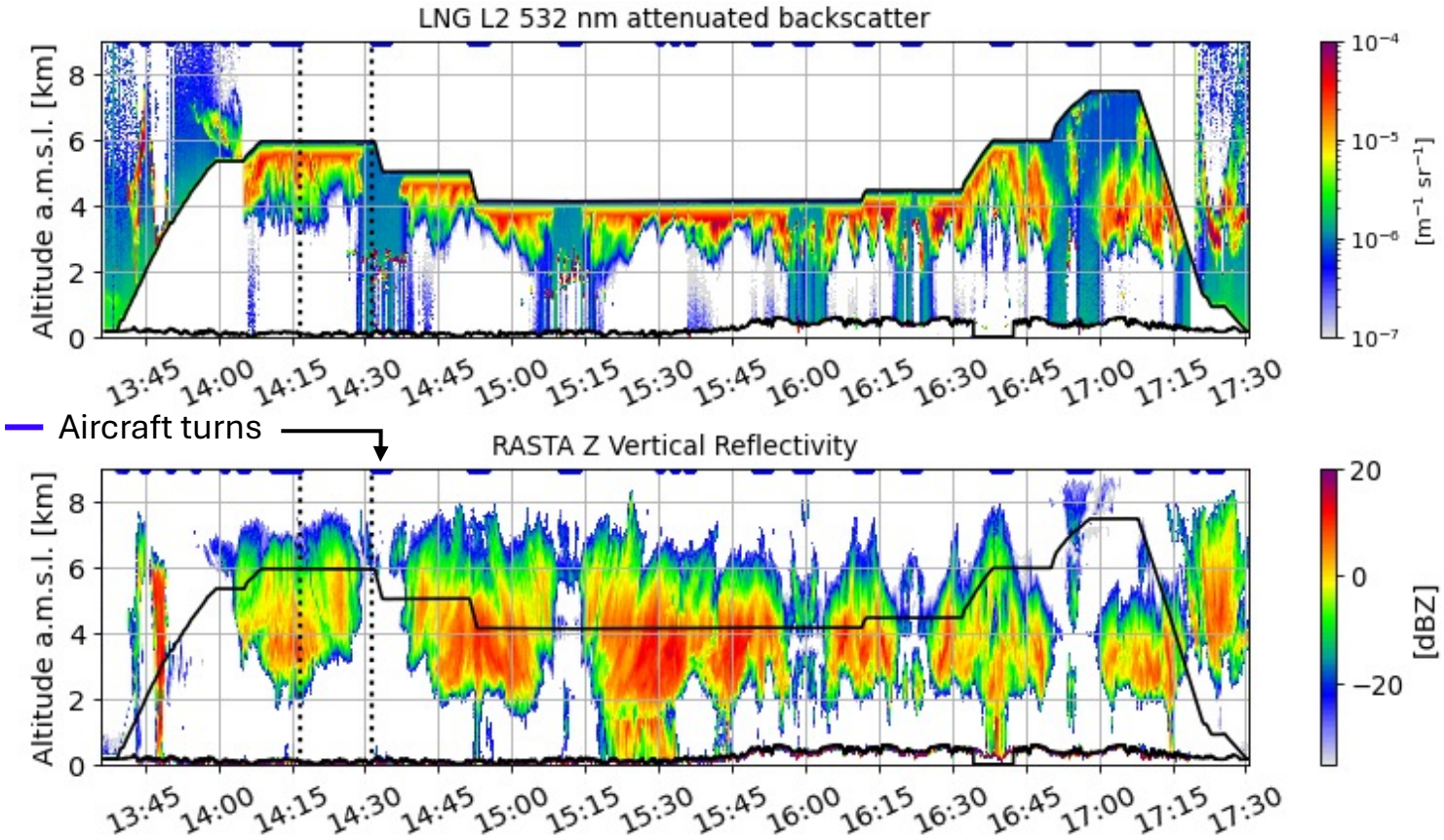
Corrected Doppler velocity : ECA_EX**BA**_CPR_CD__2A

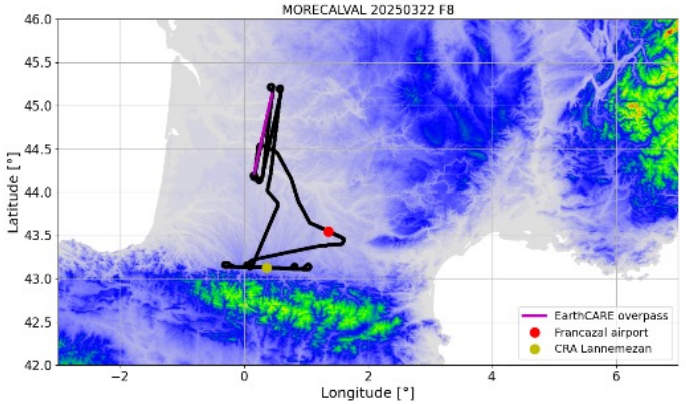
Reflectivity : ECA_EX**BA**_CPR_FMR_2A

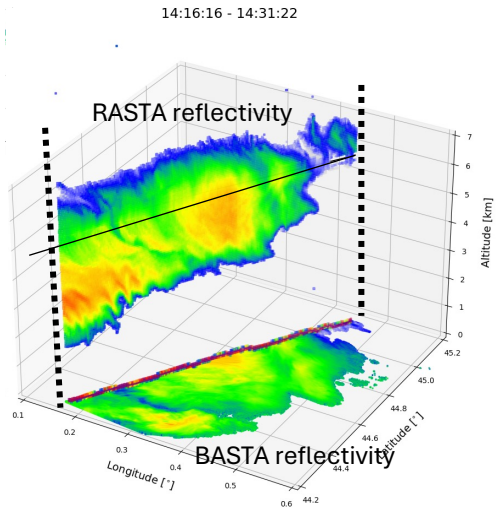
IWC : ECA_EX**BA**_CPR_CLD_2A / ECA_EX**BB**_CPR_CLD_2A

MORECALVAL – F8 2025/03/22

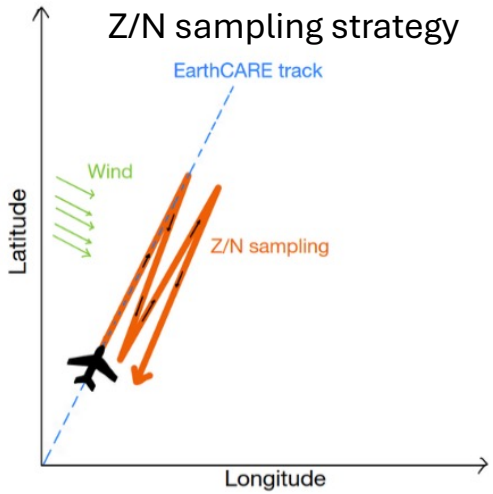
- **Golden case of MORECALVAL**
- 3D sampling of the ice-cloud system with radar-lidar and in-situ synergies during the EarthCARE overpass and the whole flight
- **Z/N sampling strategy** ➔ sampling of the system at several altitudes





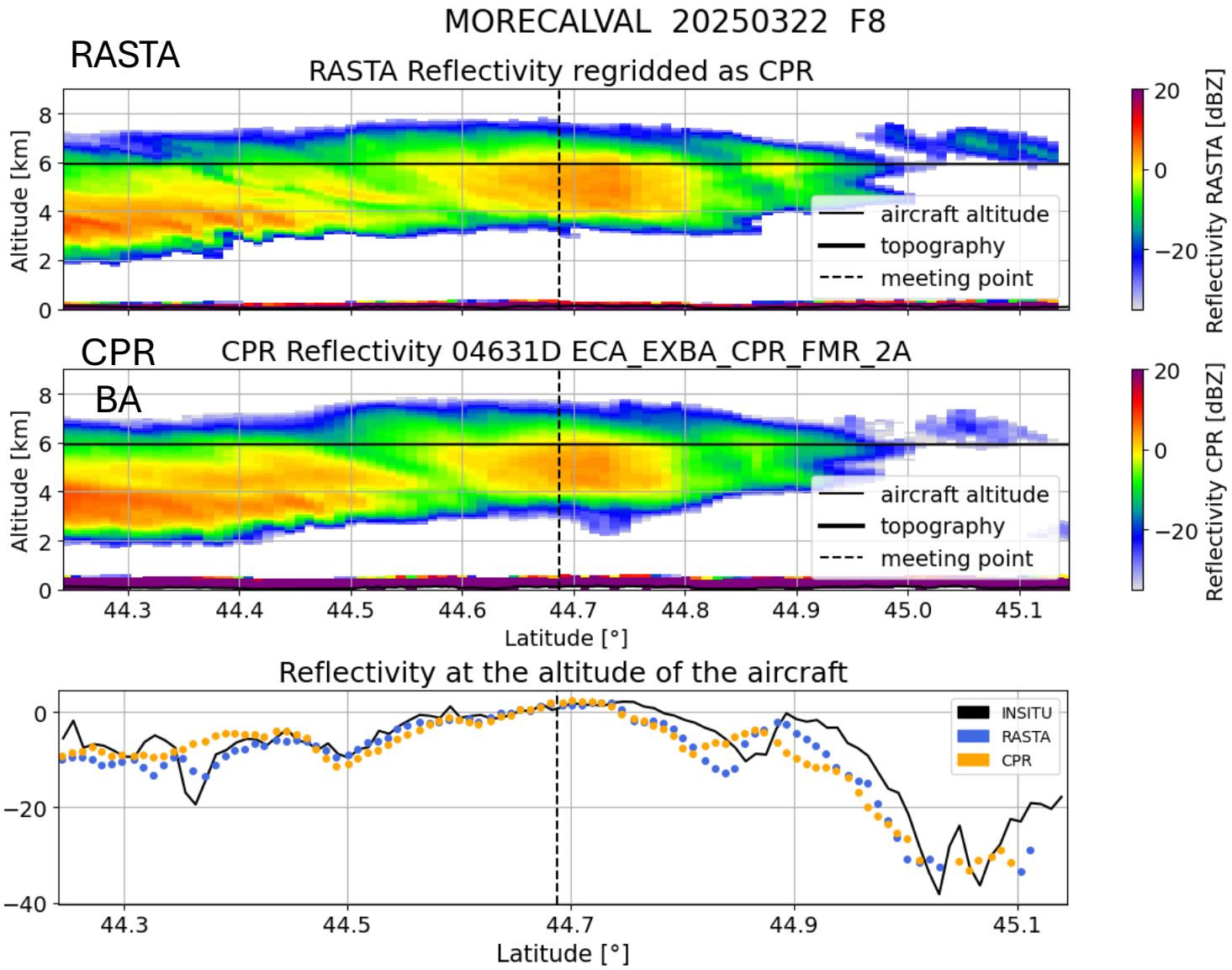


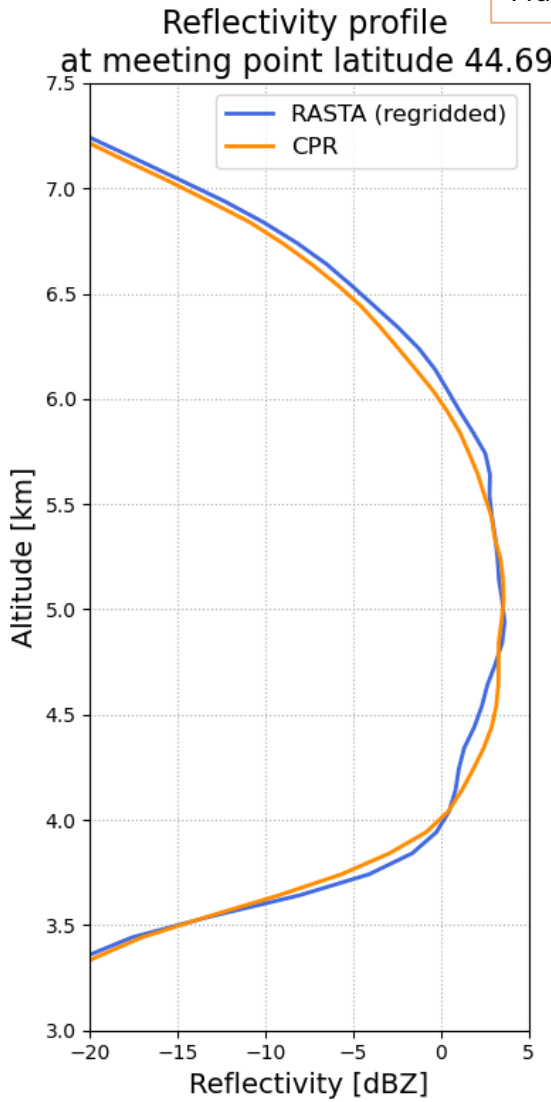
Common transect
↳ Frame **4631D**



F8 RASTA/CPR comparisons
→ Reflectivity comparisons

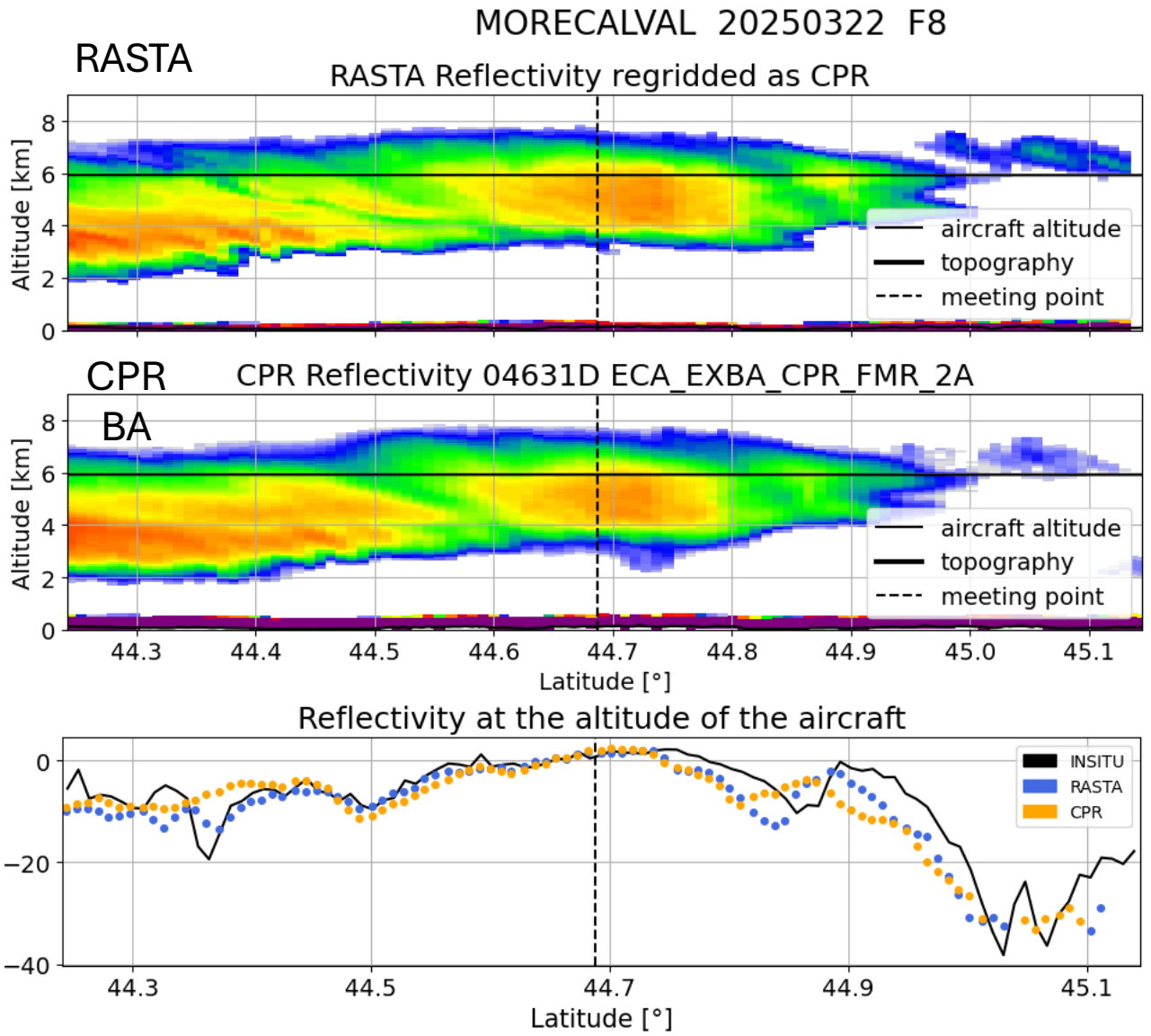
Baseline CPR : **BA_FMR_2A**
Frame **4631D**

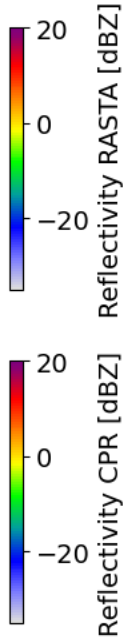


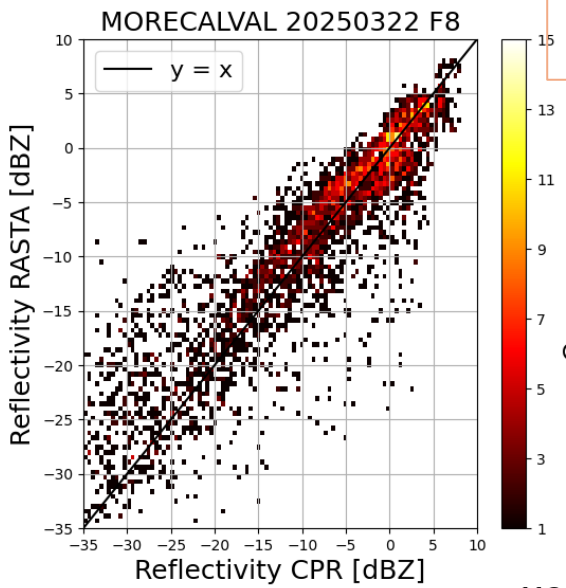


⇐ Mean profile around the meeting point

F8 RASTA/CPR comparisons
→ Reflectivity comparisons



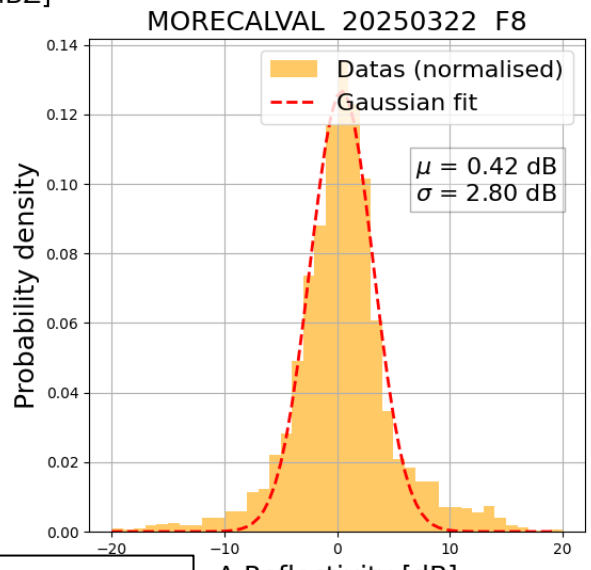




Baseline CPR : **BA_FMR_2A**
Frame **4631D**

⇐ Good co-location of RASTA and CPR data

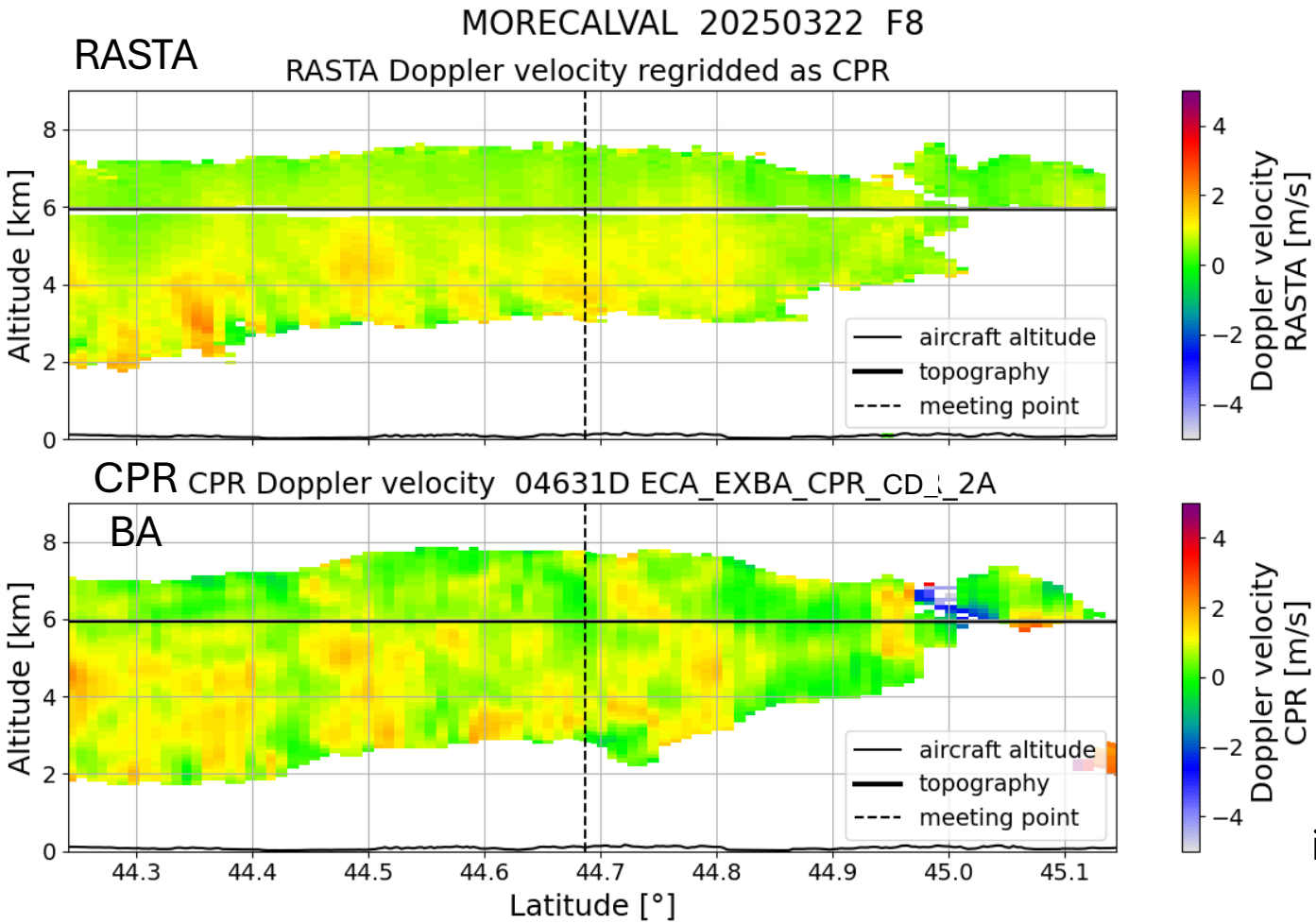
Average difference between the measurements of the two instruments <1dBZ (instrument calibration accuracy RASTA) ⟹

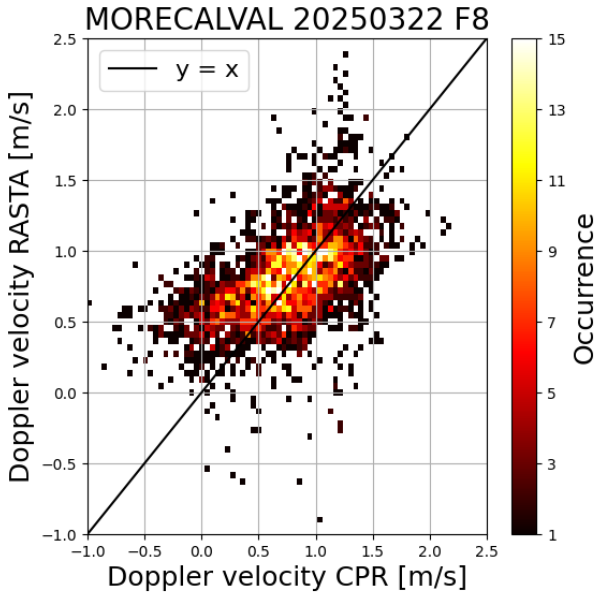


Δ = RASTA - CPR

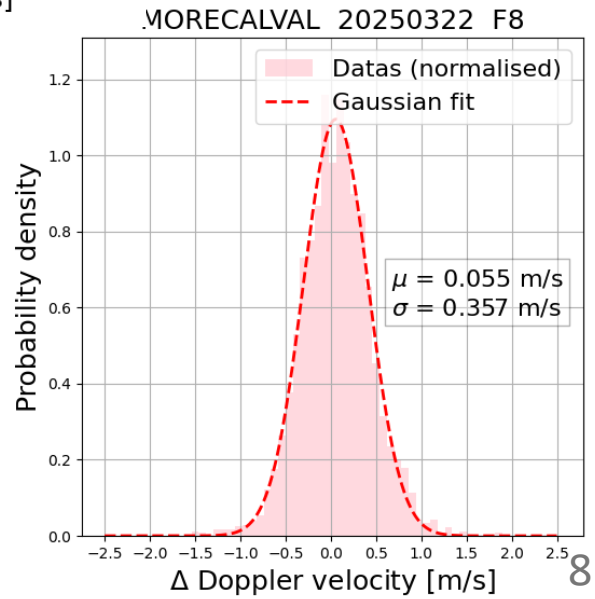
MORECALVAL – F8 2025/03/22
→ Doppler velocity comparisons

Baseline CPR : **BA_CD__2A**
Frame **4631D**



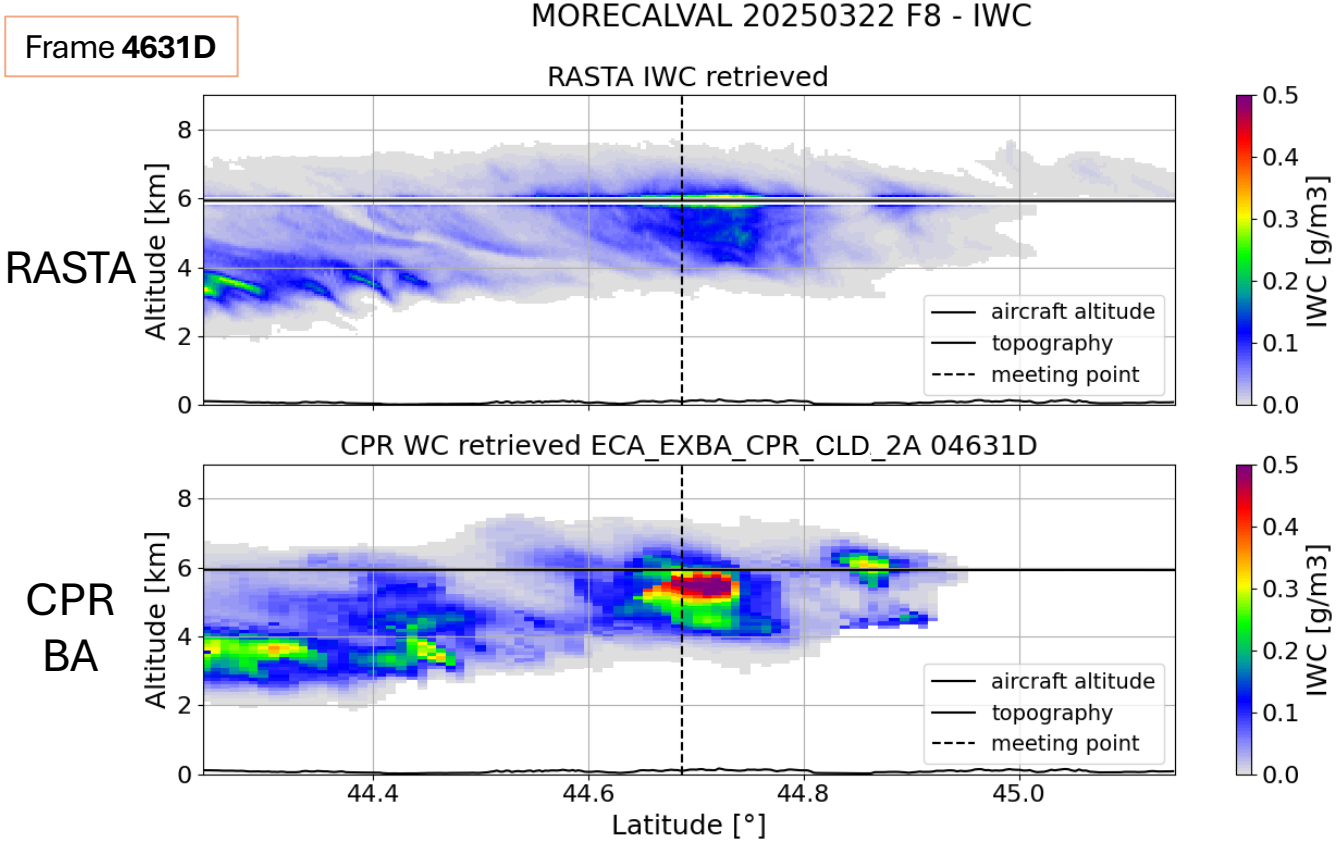


Average difference between each instrument is less than 6 cm per second ⟹

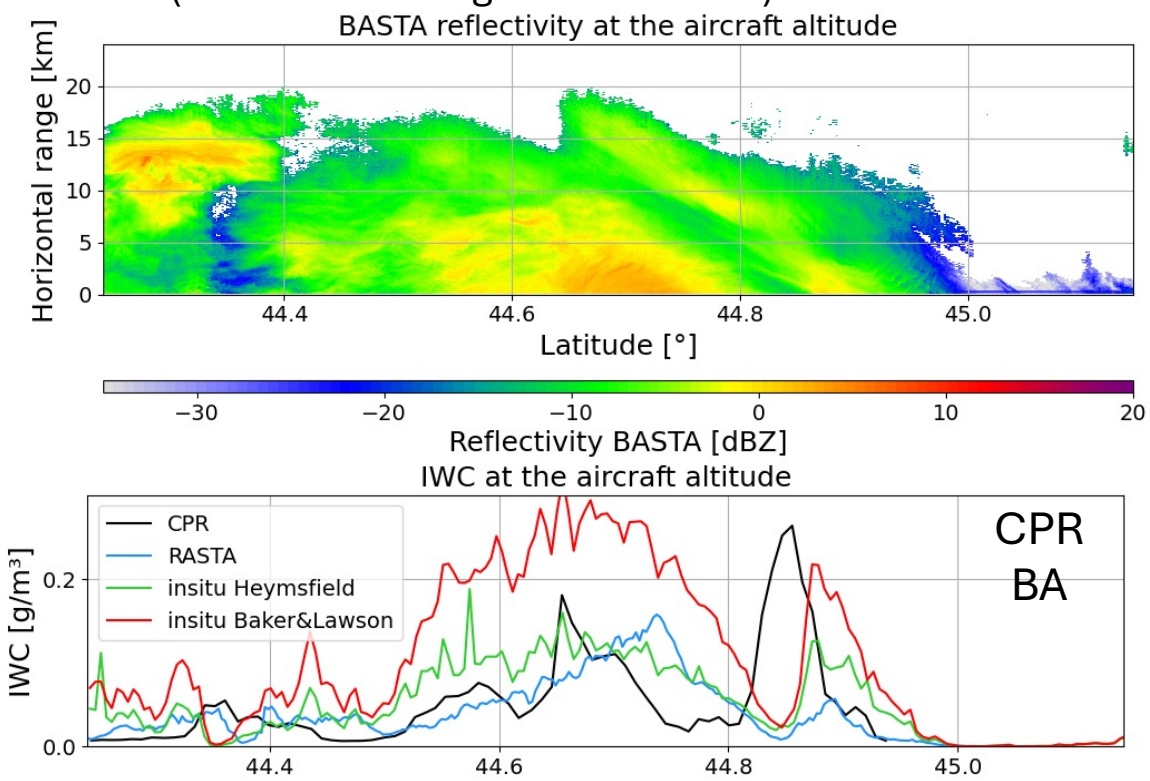


MORECALVAL – F8 2025/03/22
→ IWC comparisons

Frame **4631D**



BASTA (sideward looking airborne radar)



MORECALVAL – F8 2025/03/22
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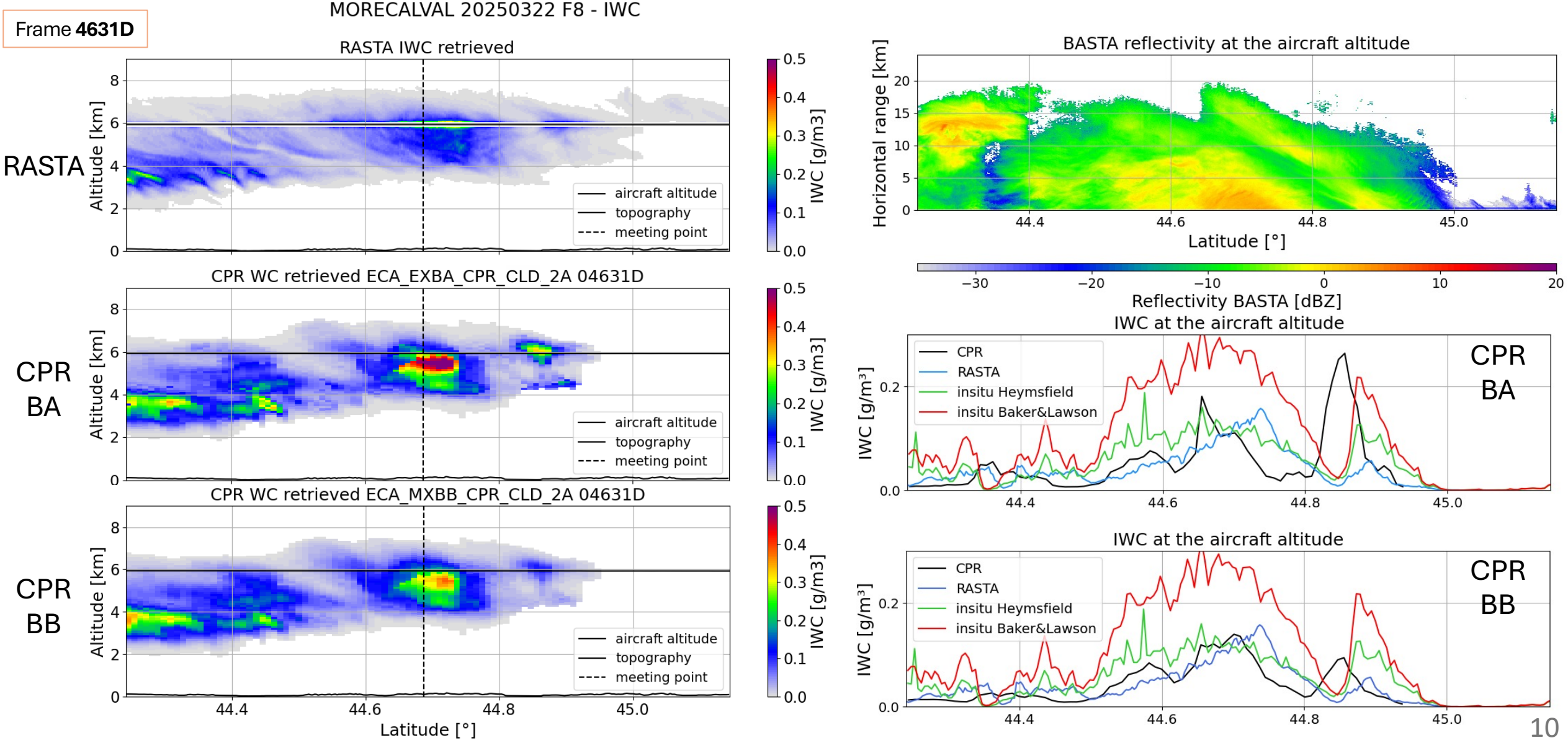
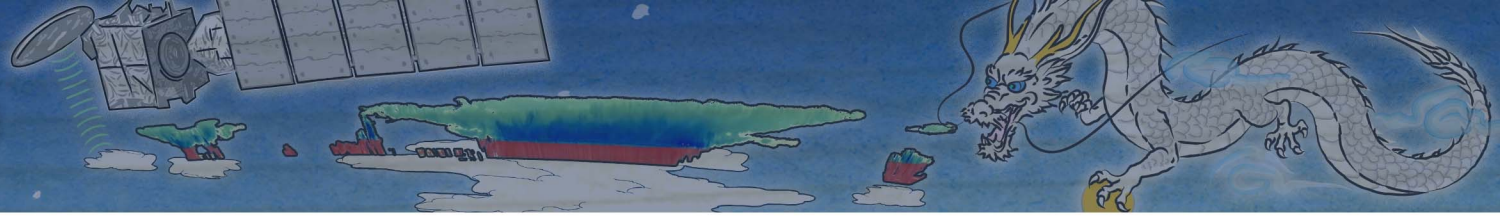


Conclusion



- CPR reflectivity calibration, Doppler velocity and associated products checked
- Improvement of IWC retrieval with the BB baseline

What's next ?

- Radar-lidar synergistic products to be analysed for this case
- Upcoming CalVal opportunities
  - *NAWDIC – DICHOTOMI* (Ireland, February 2026) – Dry Intrusion and Cloud Head winds On Top Of Marine Interface
  - *BACCOPA* (Congo, September 2026) – cloud aerosol interaction in Central Africa

Thank you for your attention

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