



EarthCARE Aerosol products intercomparison with CARO Polly Lidar in Limassol, Cyprus

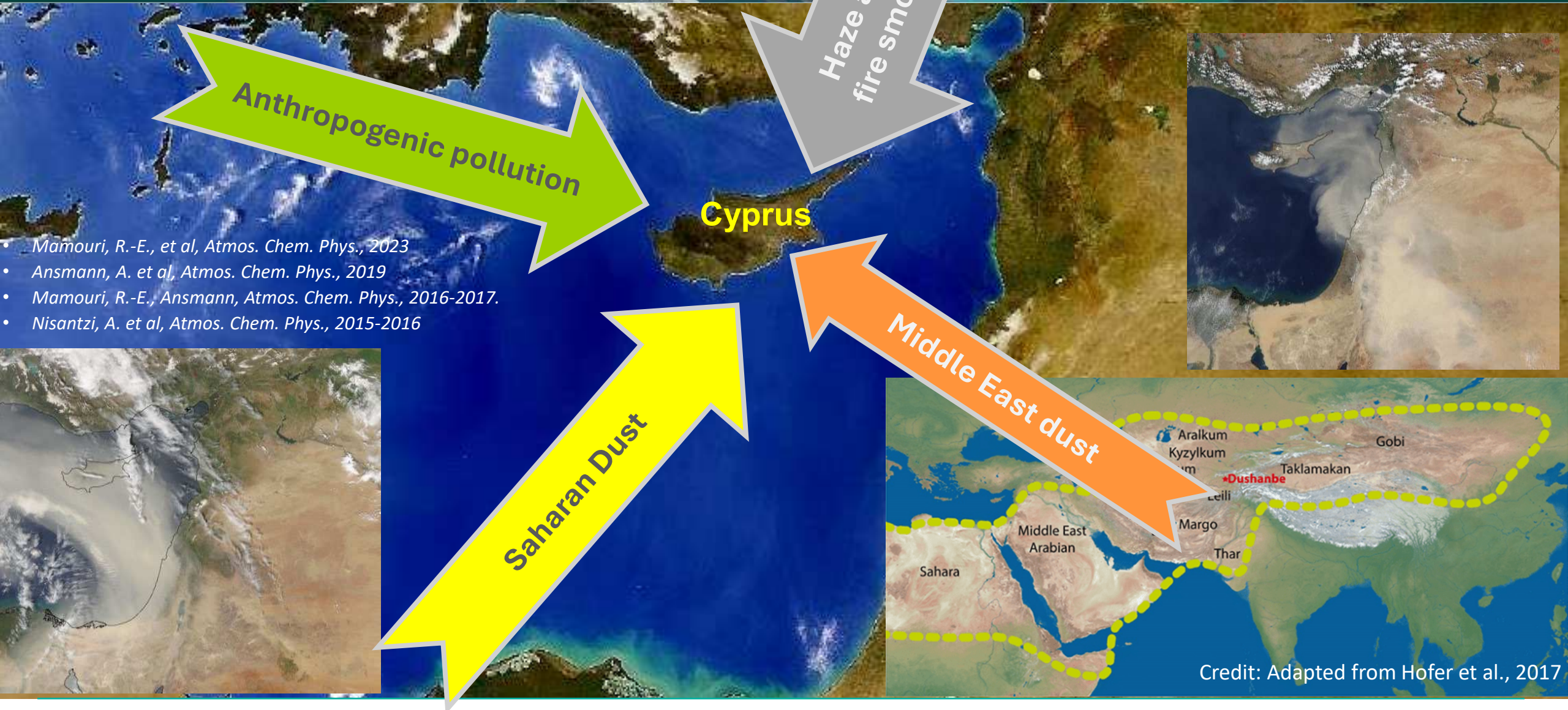
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Athina Savva, Argyro Nisantzi*

ERATOSTHENES Centre of Excellence / Cyprus University of Technology

2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop

17 – 20 March 2025 | ESA-ESRIN | Frascati (Rome), Italy





ERATOSTHENES Center of Excellence:

- Limassol, coastal area
- CARO National Facility
- **ACTRIS Aerosol and Cloud** Remote Sensing Observational Platforms [under Labeling]
- Solar Radiation observations



CARE-C of the Cyprus Institute

- Nicosia, urban and inland areas
- **Cyprus Atmospheric Observatory (CAO)**
- ACTRIS aerosol in situ observational platform
- Unmanned Systems Research Laboratory (**USRL**) – ACTRIS exploratory platform

Presentation by Franco Marengo



Cyprus Atmospheric Remote Sensing Observatory

Limassol, Cyprus [34.7°N, 33°E]

less than 2 km from the coastline; conditions representative of typical Mediterranean and Middle East region



• AEROSOL RS OBSERVATIONAL PLATFORM

- AERONET Sunphotometer – May 2010
- **PollyXT [3β+2α+2δ]** October 2020
- StreamLine **Doppler Lidar** – February 2021



CLOUD RS OBSERVATIONAL PLATFORM

- microwave radiometer – July 2024
- ceilometer, **disdrometer** – February 2024
- **35 GHz MIRA** cloud radar – July 2024



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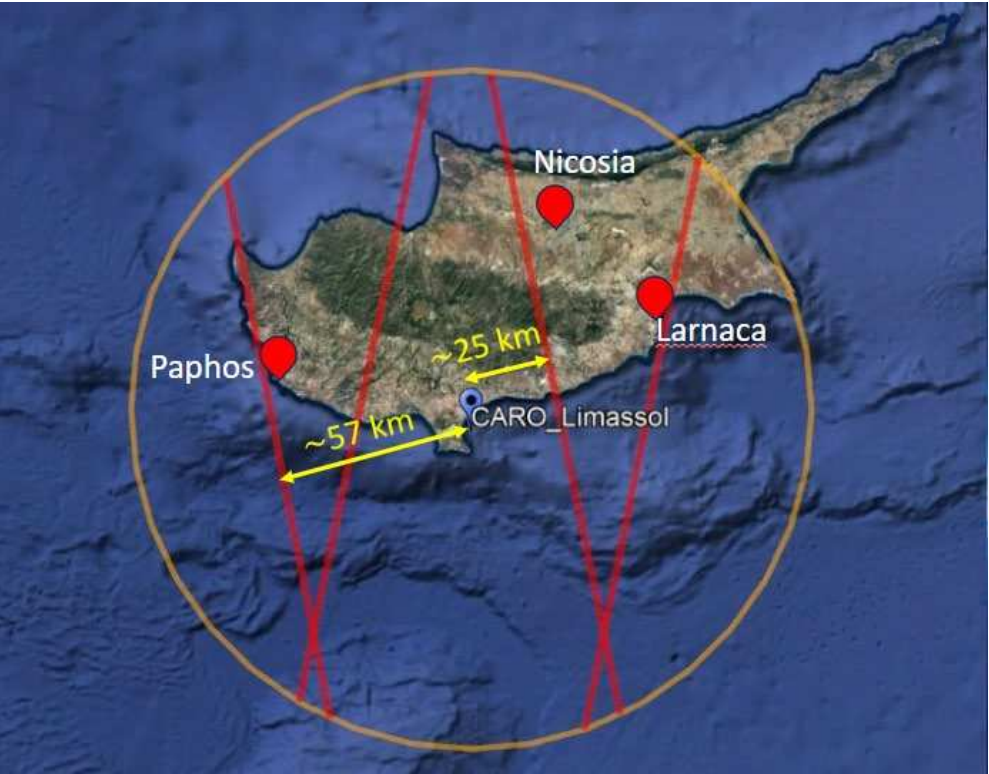
Operates since October 2020

Operates December 2023

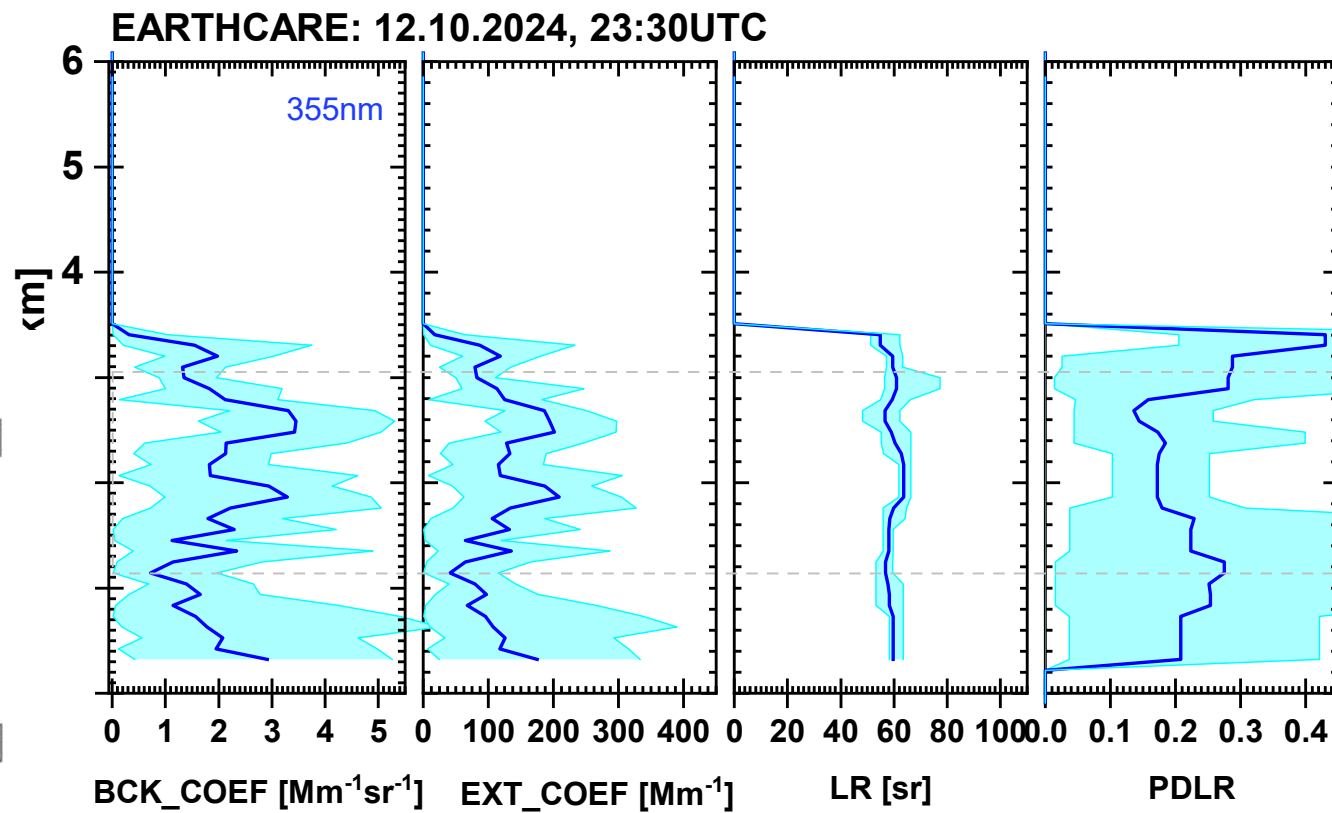
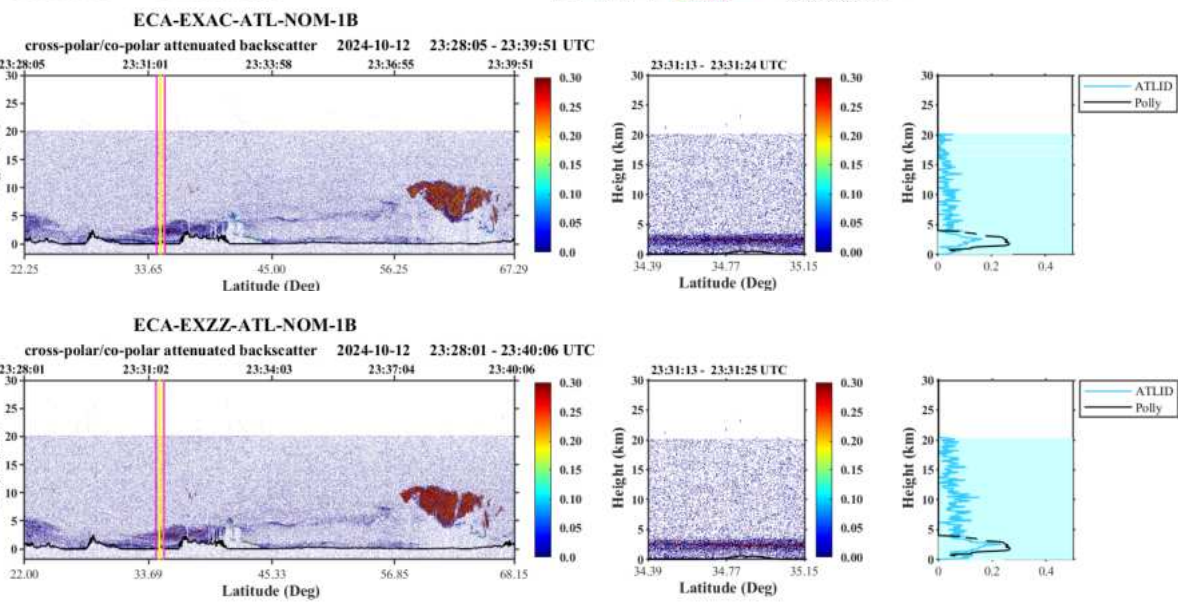
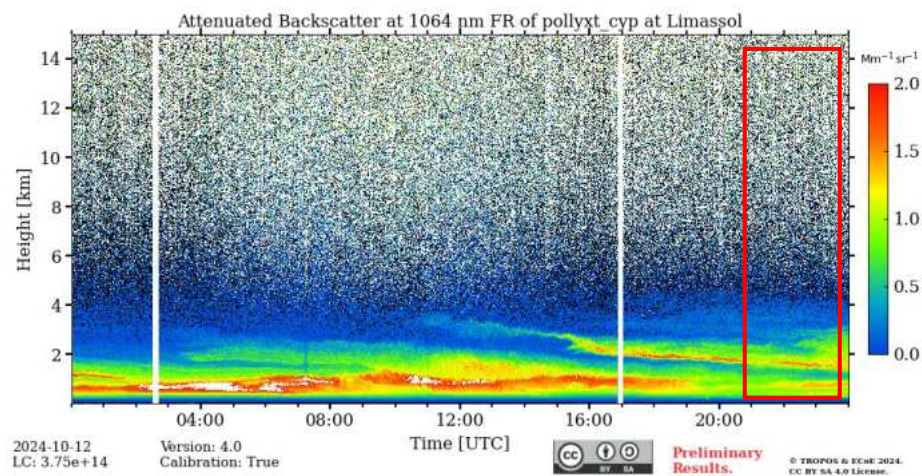


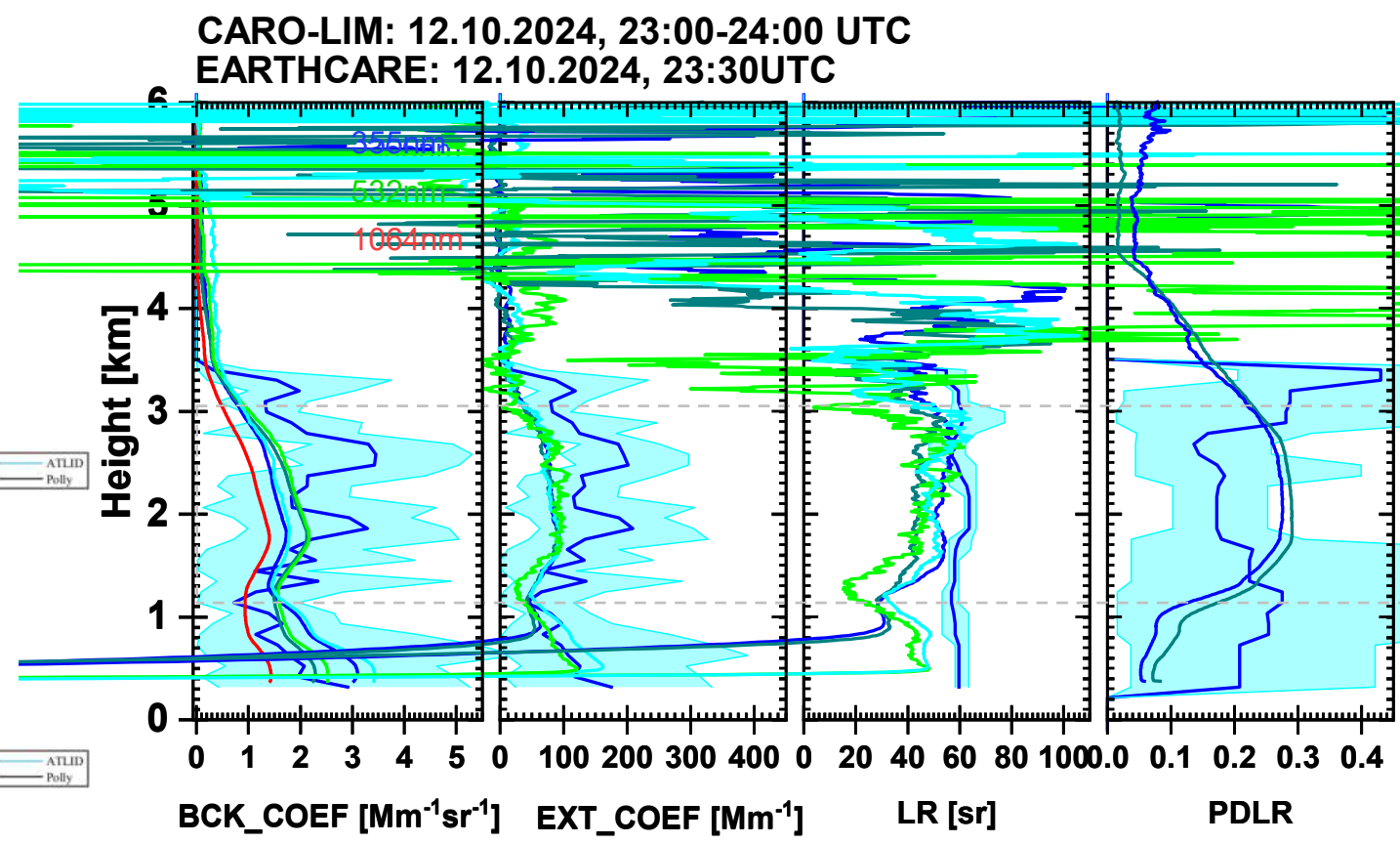
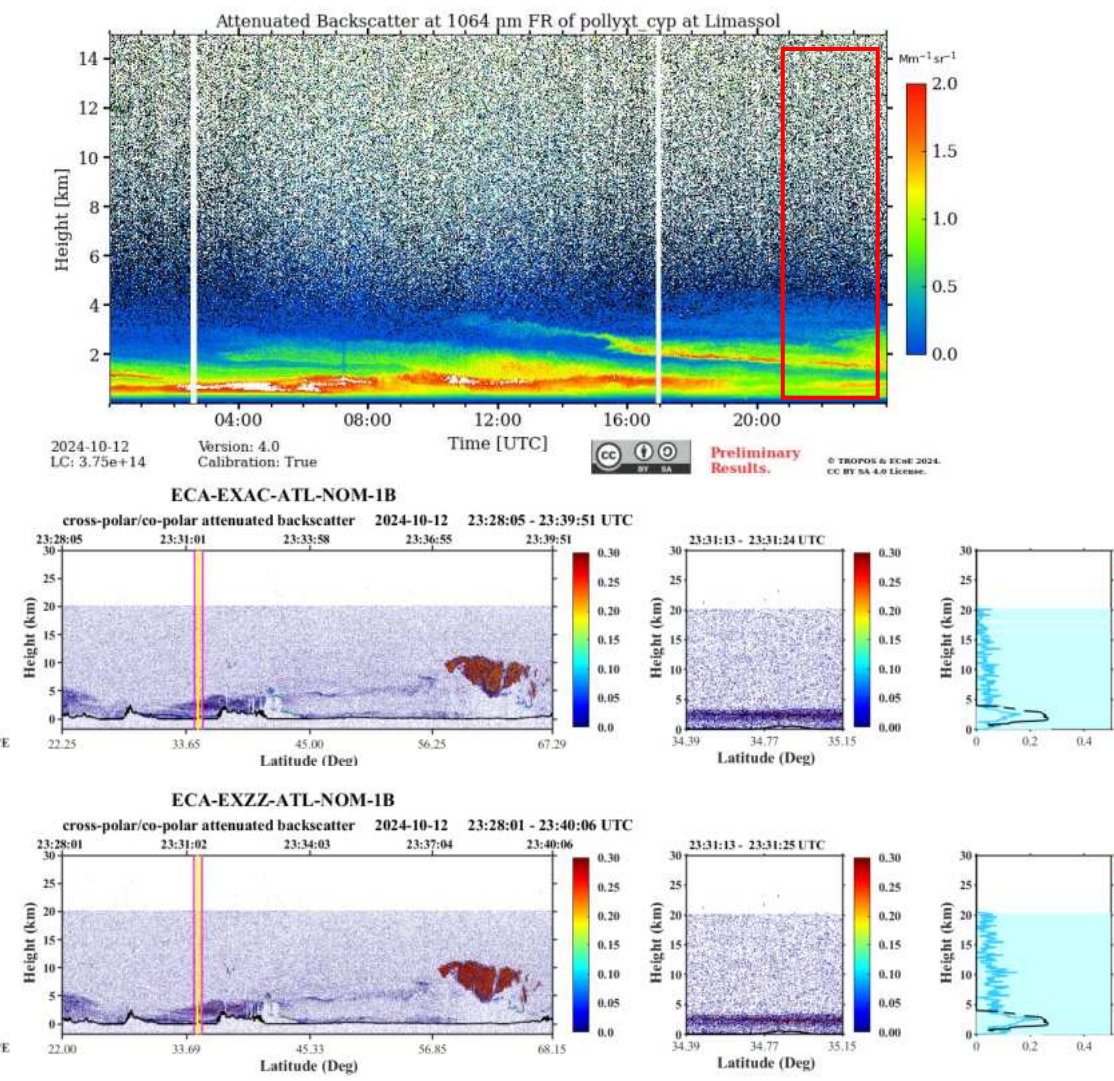
Operates Since July 2024

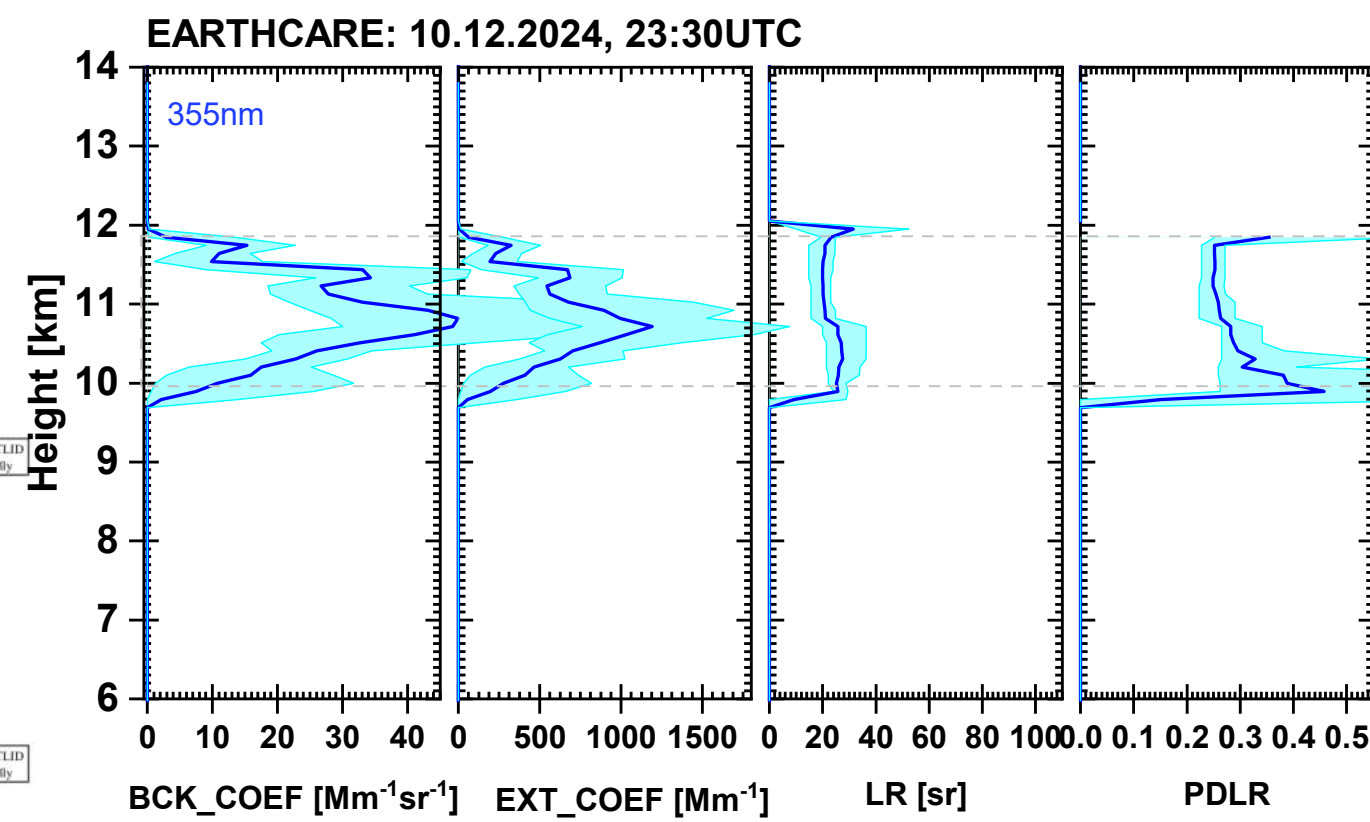
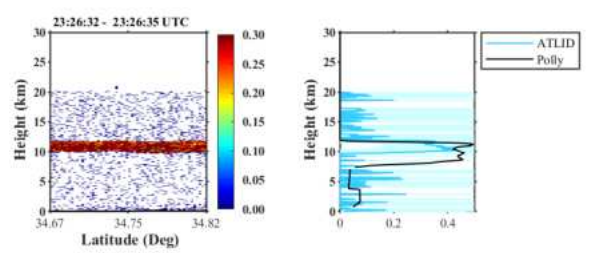
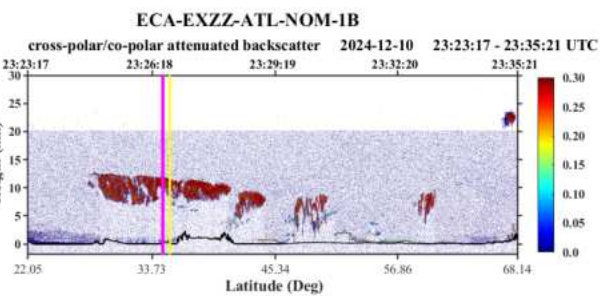
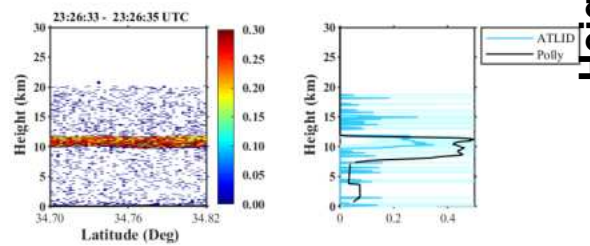
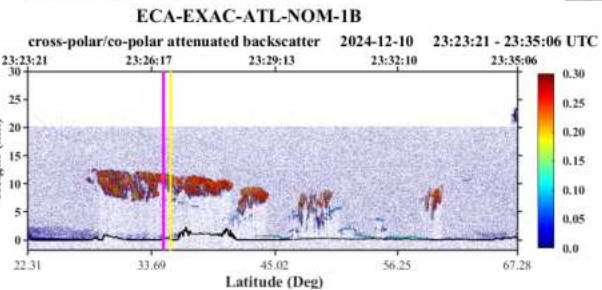
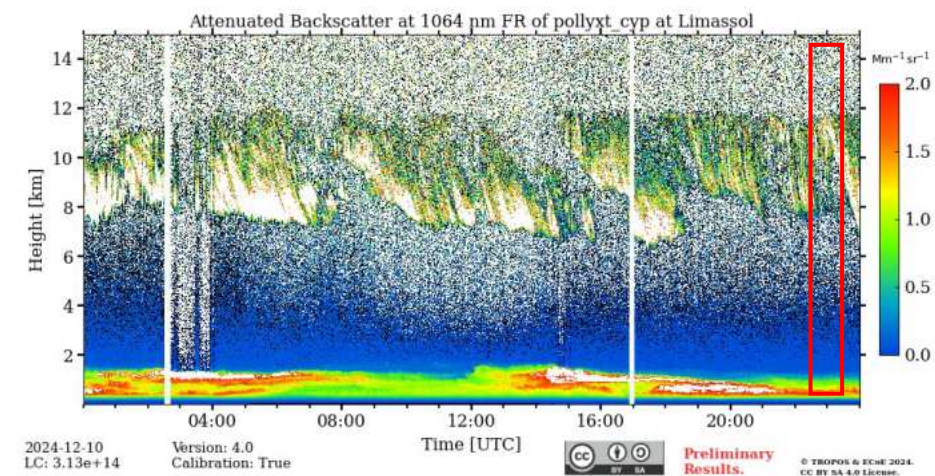
- 49 overpasses within 100km
- 32 ATLID-PollyXT-CYP common measurements
- 29 CPR-MIRA35 common measurements
- 12 cases of PollyXT+MIRA35
- 4 cases aerosol+clouds

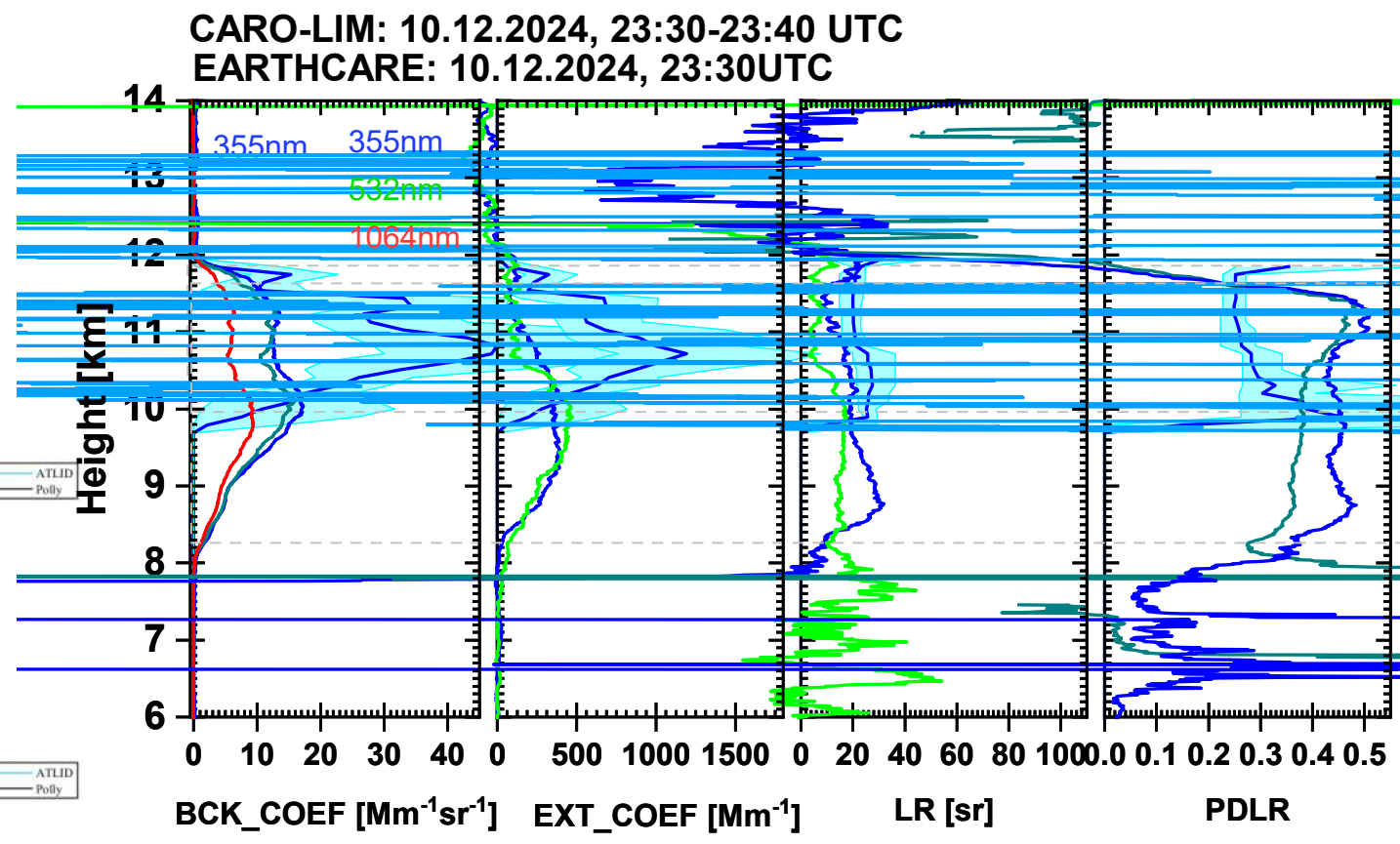
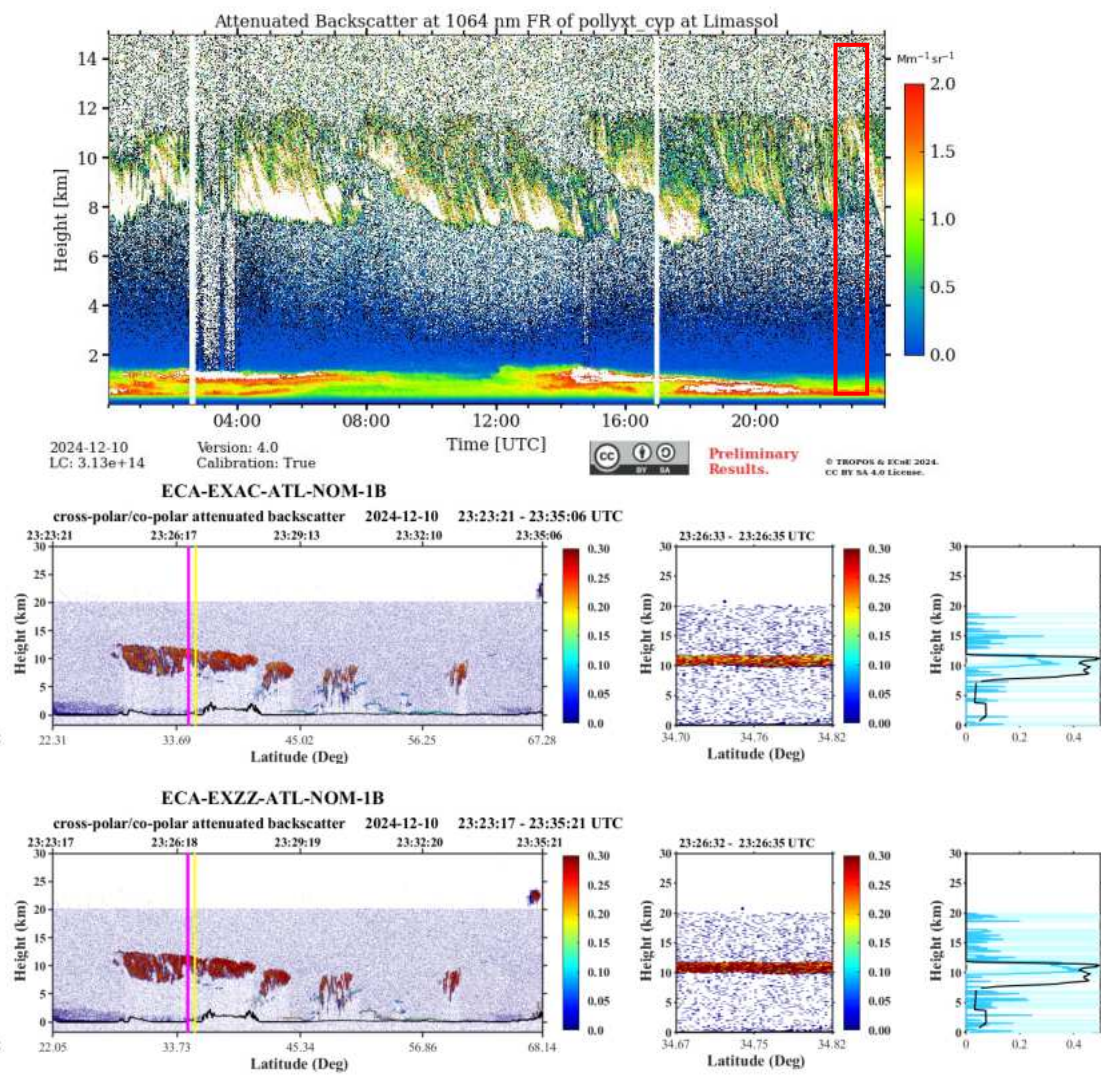


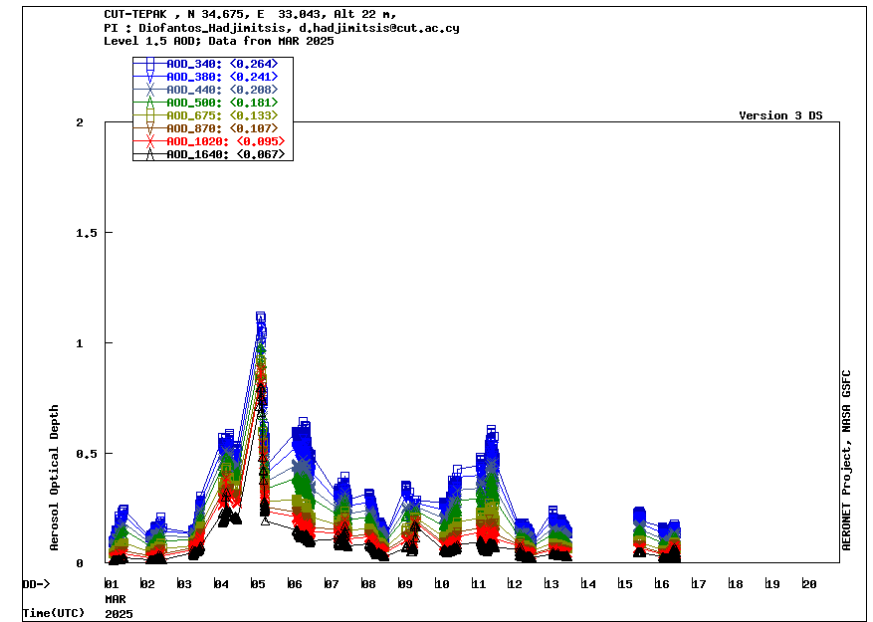
					INSTRUMENT AVAILABILITY		
PASS	DATE	DISTANCE TO MID SWATH	ASCENDING/DESCENDING PH	UTC TIME START	Aerosol PollyXT	Ceilmeter	Cloud MIRA 35
1	2025-03-23	51.340838	DESC	T12:02:25.101382	✓	✓	✓
2	2025-03-20	25.015134	ASC	T23:24:51.158924	✓	✓	✓
3	2025-03-14	31.794807	DESC	T12:06:13.289602	✓	✓	✓
4	2025-03-11	58.129918	ASC	T23:28:42.718667	✓	✓	✓
5	2025-02-26	51	DESC	T12:03:15.372505	✓	✓	✓
6	2025-02-23	25	ASC	T23:25:44.429443	✓	✓	✓
7	2025-02-17	31	DESC	T12:07:06.037747	✓	✓	✓
8	2025-02-14	58	ASC	T23:29:31.745763	✓	✓	✓
9	2025-02-07				✓	✓	✓
10	2025-02-01	51.34056	DESC	T12:03:18.600752	✓	✓	✓
11	2025-01-29	25.015401	ASC	T23:25:44.658287	✓	✓	✓
12	2025-01-23	31.795086	DESC	T12:07:06.789024	✓	✓	✓
13	2025-01-20	58.129652	ASC	T23:29:36.218002	✓	✓	✓
14	2025-01-07	51.188308	DESC	T12:03:39.491724	✓	✓	✓
15	2025-01-04	25.168217	ASC	T23:26:05.769968	✓	✓	✓
16	2024-12-29	31.947926	DESC	T12:07:28.417129	✓	✓	✓
17	2024-12-26	57.977407	ASC	T23:29:58.029417	✓	✓	✓
18	2024-12-13	51.188325	DESC	T12:04:08.241349	✓	✓	✓
19	2024-12-10	25.168183	ASC	T23:26:34.519587	✓	✓	✓
20	2024-12-04	31.947909	DESC	T12:07:57.166740	✓	✓	✓
21	2024-12-01	57.97744	ASC	T23:30:26.779035	✓	✓	✓
22	2024-11-18	51.188428	DESC	T12:04:36.990949	✓	✓	✓
23	2024-11-15	25.168095	ASC	T23:27:03.269192	✓	✓	✓
24	2024-11-09	32.234191	DESC	T12:08:22.806013	✓	✓	✓
25	2024-11-06	57.692418	ASC	T23:30:52.762151	✓	✓	✓
26	2024-10-24	50.903332	DESC	T12:05:04.998022	✓	✓	✓
27	2024-10-21	25.454125	ASC	T23:27:31.690140	✓	✓	✓
28	2024-10-15	32.234008	DESC	T12:08:55.305474	✓	✓	✓
29	2024-10-12	57.692568	ASC	T23:31:25.261663	✓	✓	✓
30	2024-10-06	31.852081	DESC	T12:09:15.412446	✓	✓	✓
31	2024-10-03	58.072862	ASC	T23:31:44.910254	✓	✓	✓
32	2024-09-29	50.903358	DESC	T12:05:37.497513	✓	✓	✓
33	2024-09-26	25.454087	ASC	T23:28:04.189640	✓	✓	✓
34	2024-09-20	38.265223	DESC	T12:09:43.860276	✓	✓	✓
35	2024-09-17	25.072412	ASC	T23:28:21.016135	✓	✓	✓
36	2024-09-11	42.930503	DESC	T12:10:13.171896	✓	✓	✓
37	2024-09-08	74.788961	ASC	T23:33:00.626293	✓	✓	✓
38	2024-09-04	51.005026	DESC	T12:06:11.190332	✓	✓	✓
39	2024-09-01	74.413799	ASC	T23:26:34.445434	✓	✓	✓
40	2024-08-26	1.258111	DESC	T12:08:34.166997	✓	✓	✓
41	2024-08-25	6.511388	ASC	T23:29:37.044277	✓	✓	✓
42	2024-08-23	16.207973	ASC	T23:30:40.684001	✓	✓	✓
43	2024-08-17	28.45347	DESC	T12:10:04.830126	✓	✓	✓
44	2024-08-14	16.607746	ASC	T23:30:55.311648	✓	✓	✓
45	2024-08-08	58.368392	DESC	T12:06:32.186185	✓	✓	✓
46	2024-08-05	98.484601	ASC	T23:26:18.762820	✓	✓	✓
47	2024-08-03	99.576832	ASC	T23:35:07.655859	✓	✓	✓
48	2024-07-28	15.072982	DESC	T12:08:44.366994	✓	✓	✓
49	2024-07-25	89.796254	ASC	T23:27:01.079948	✓	✓	✓
50	2024-07-23	81.525471	ASC	T23:34:36.753890	✓	✓	✓
51	2024-07-12	38.947596	ASC	T23:29:48.414533	✓	✓	✓

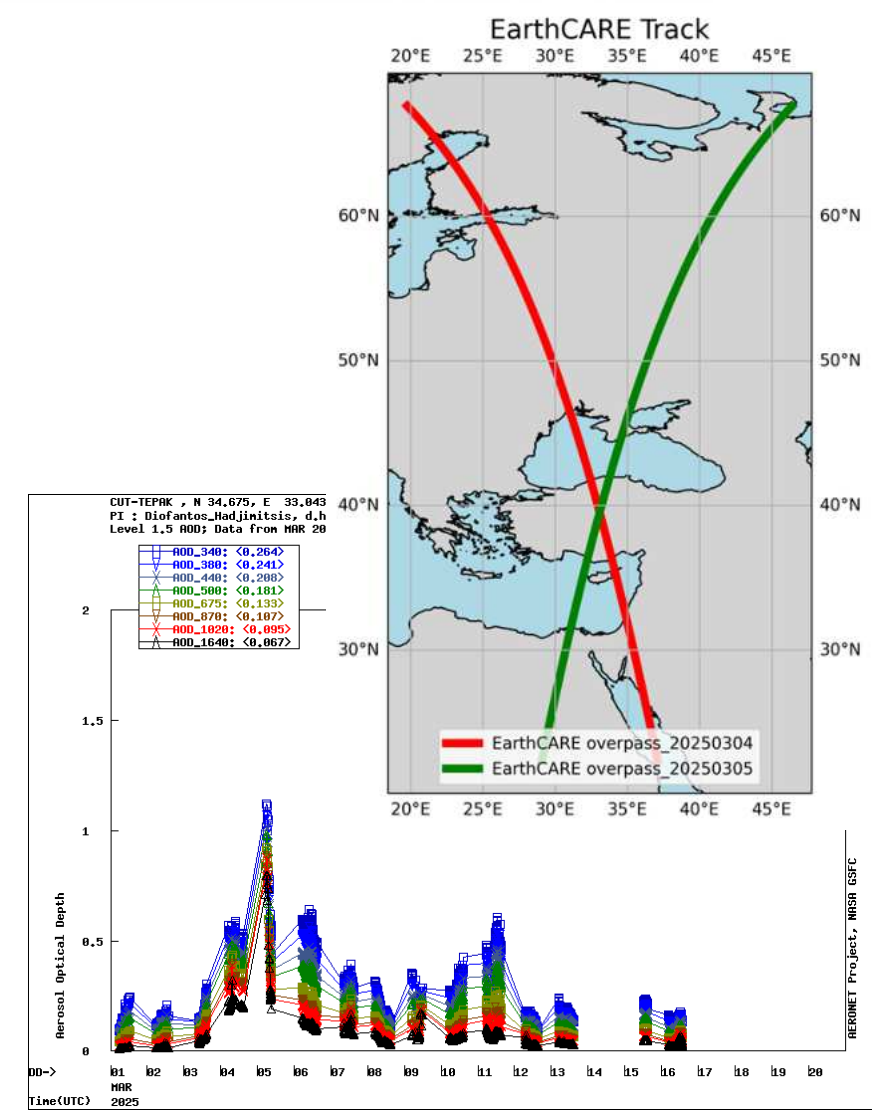


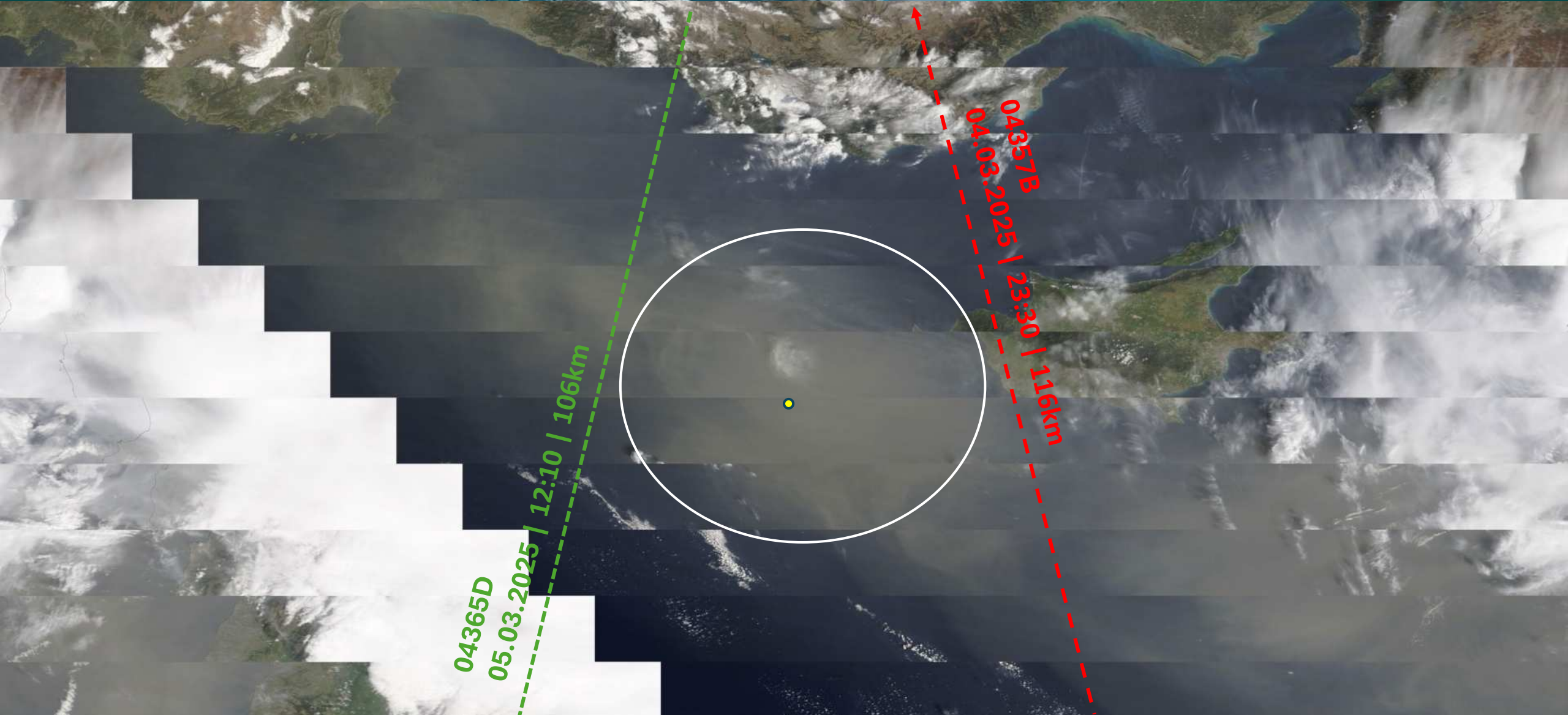


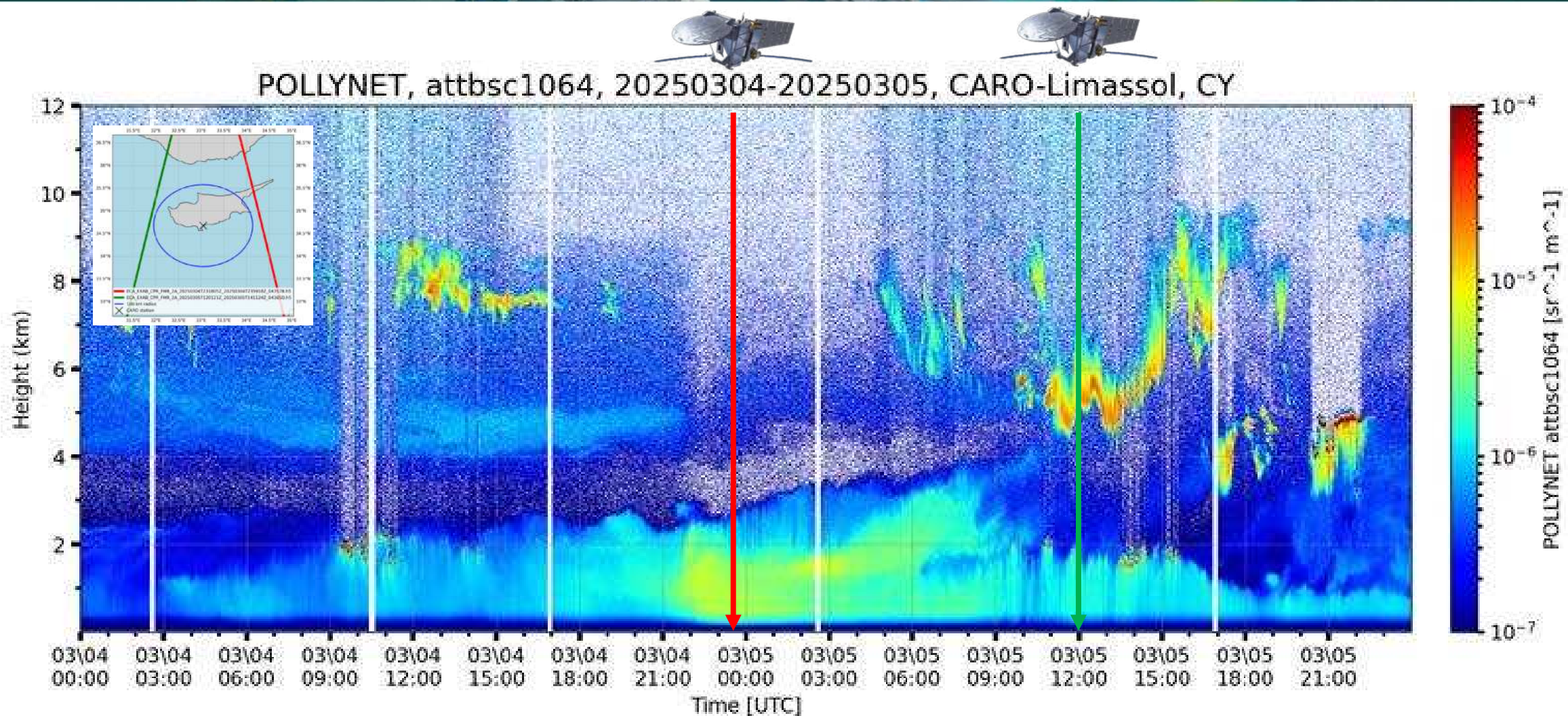






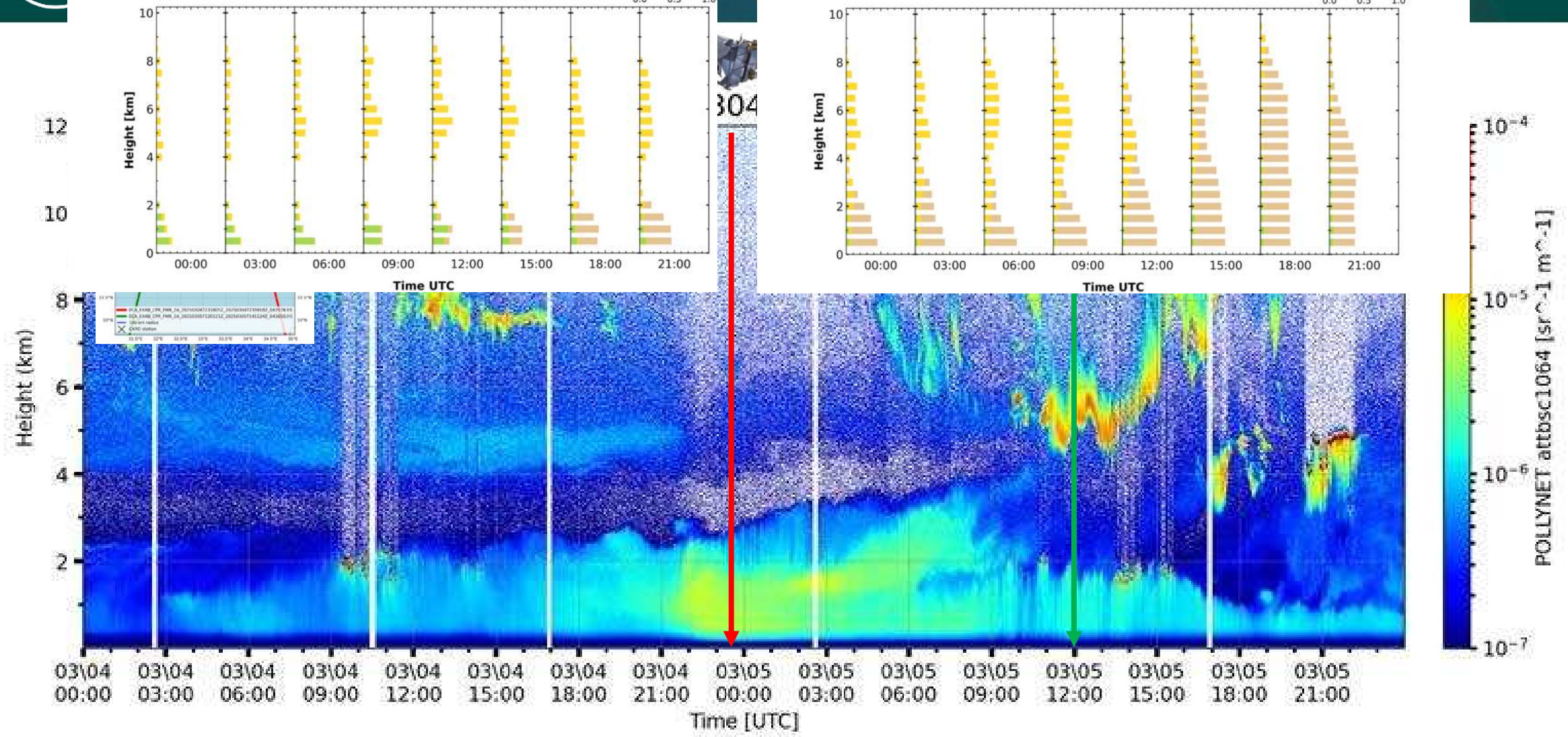






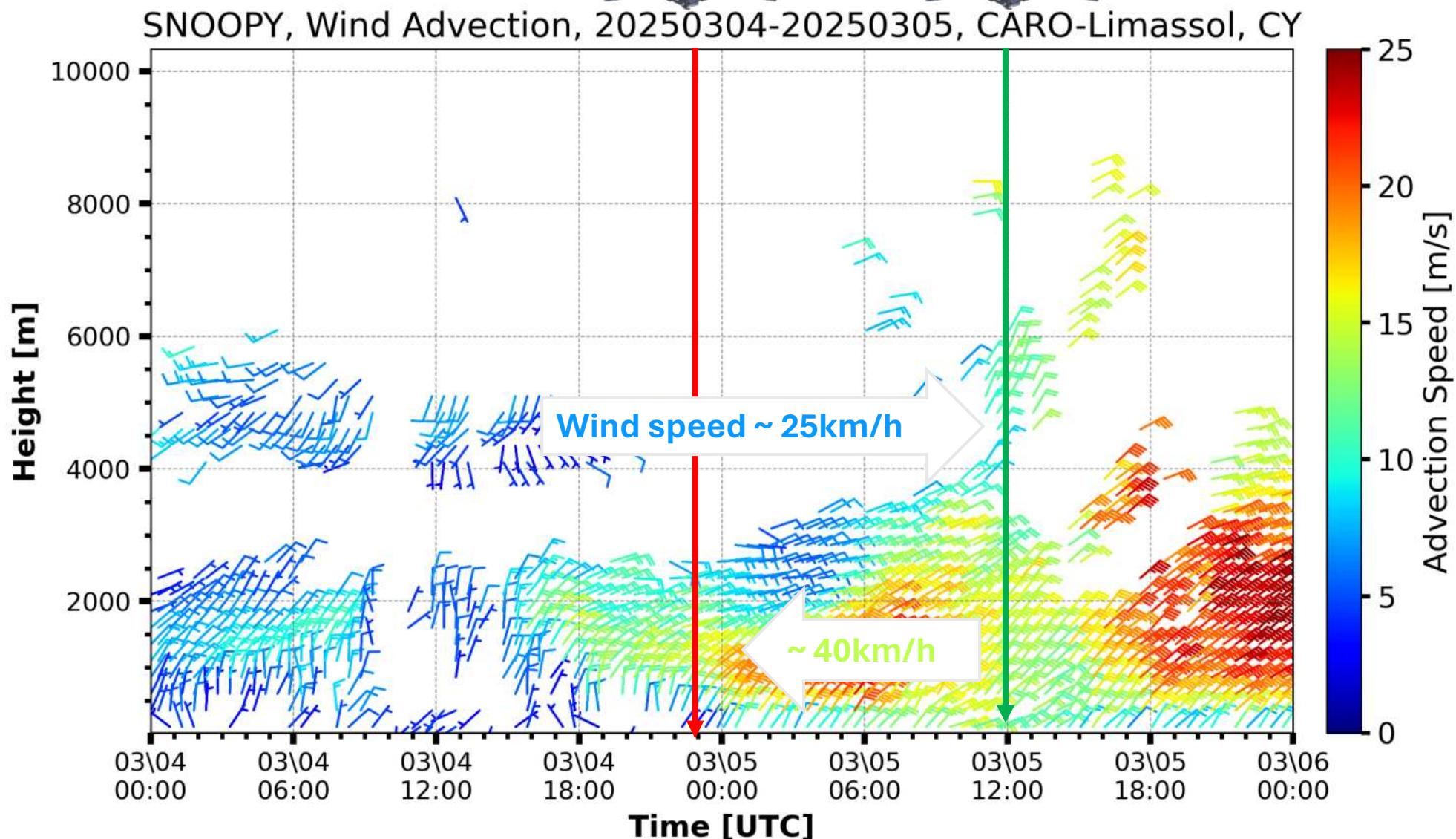
04357B
dis= 116km

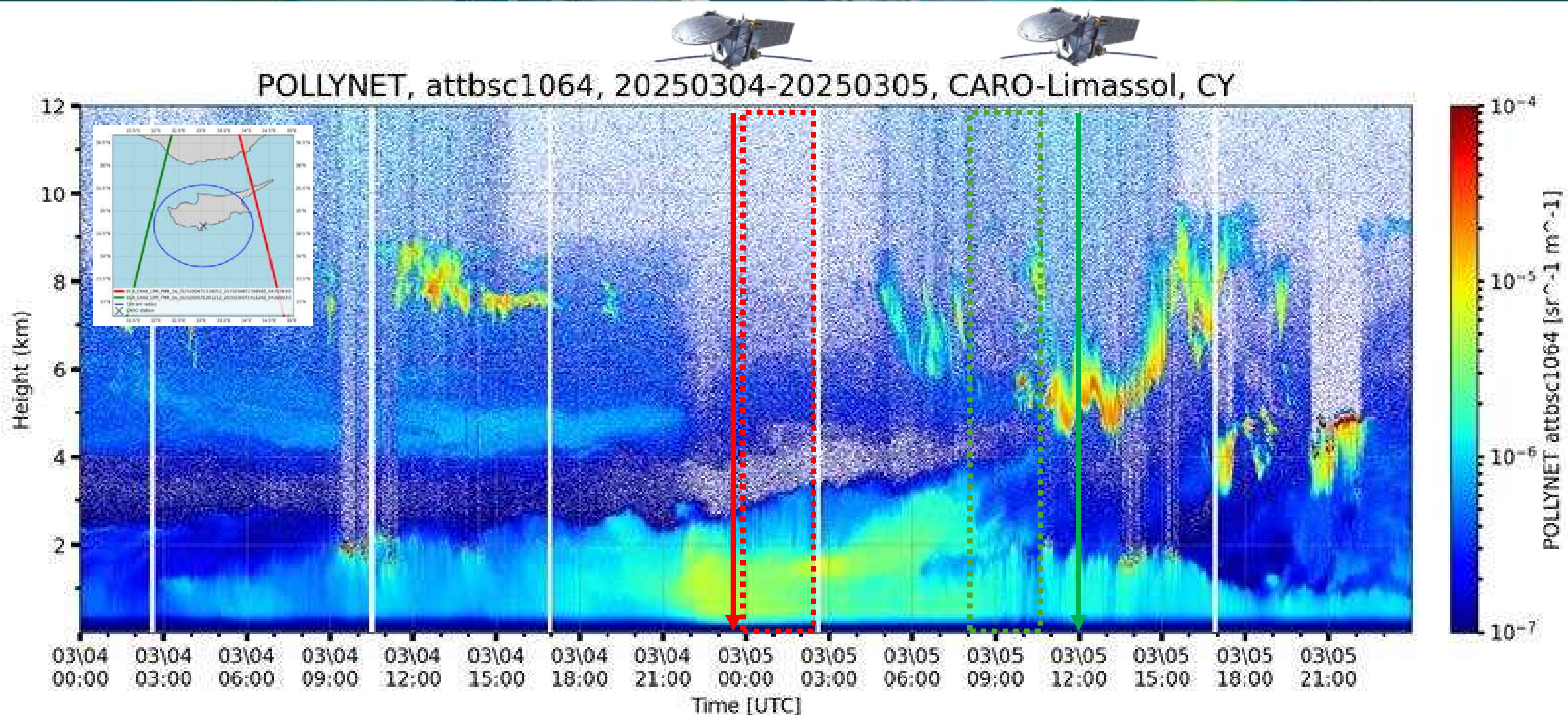
04365D
dis= 107km



04357B
dis= 116km

04365D
dis= 107km



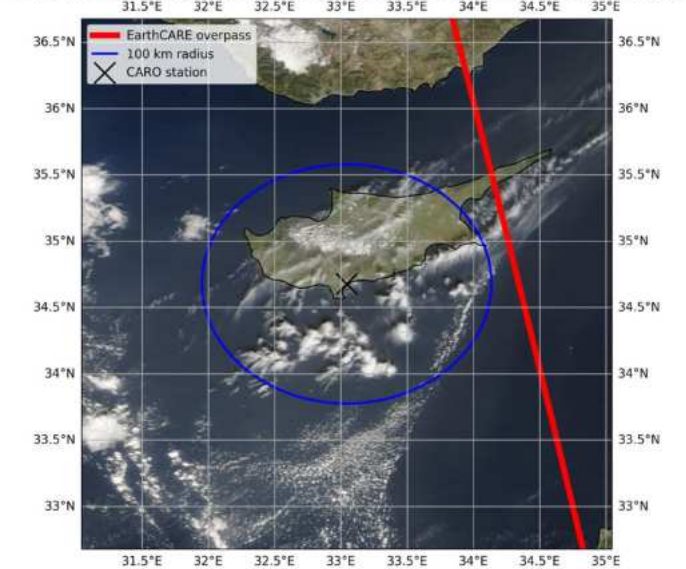


2-3 hours delay at
GB observations

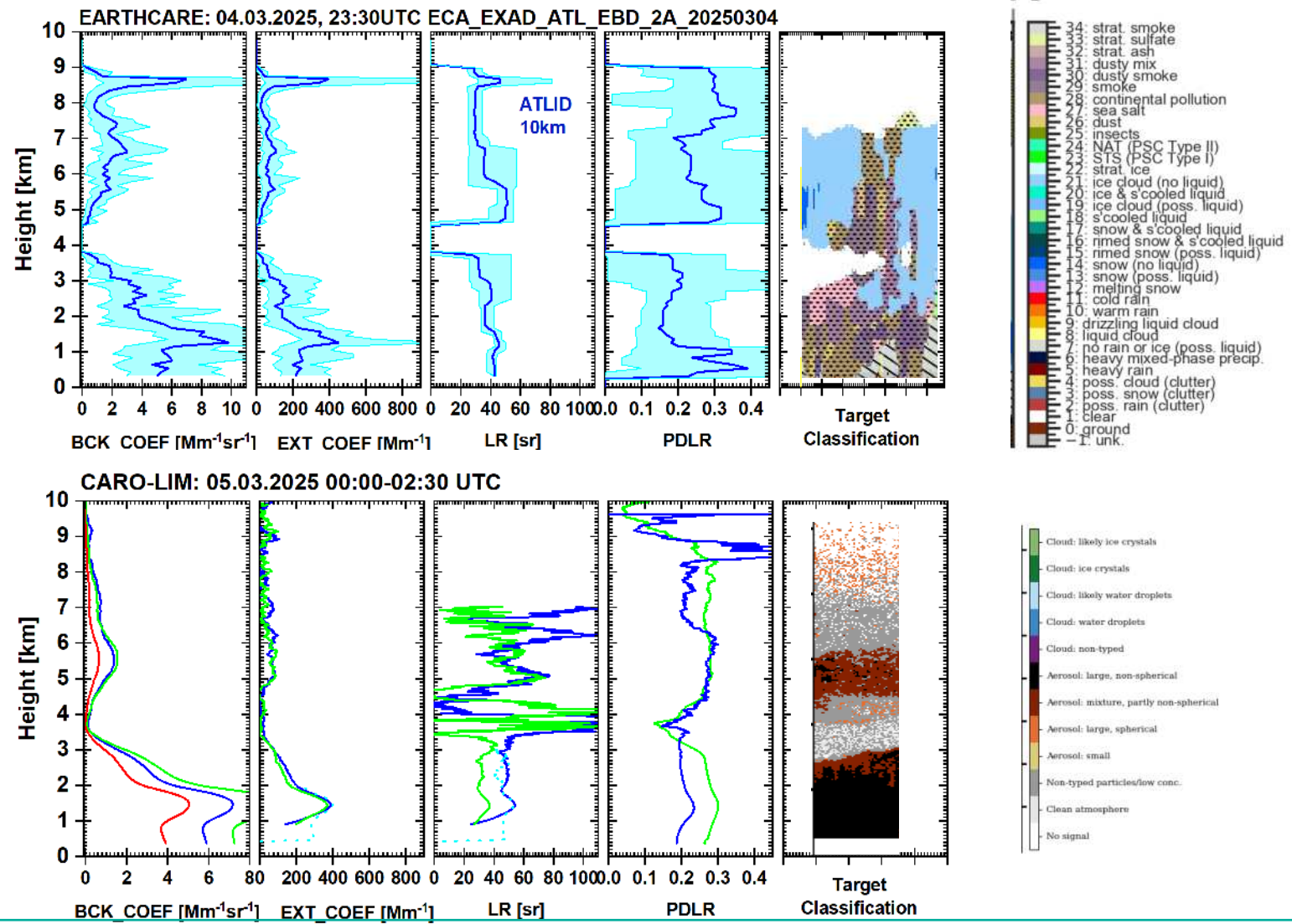
2-3 hours before overpass
time

GB observations

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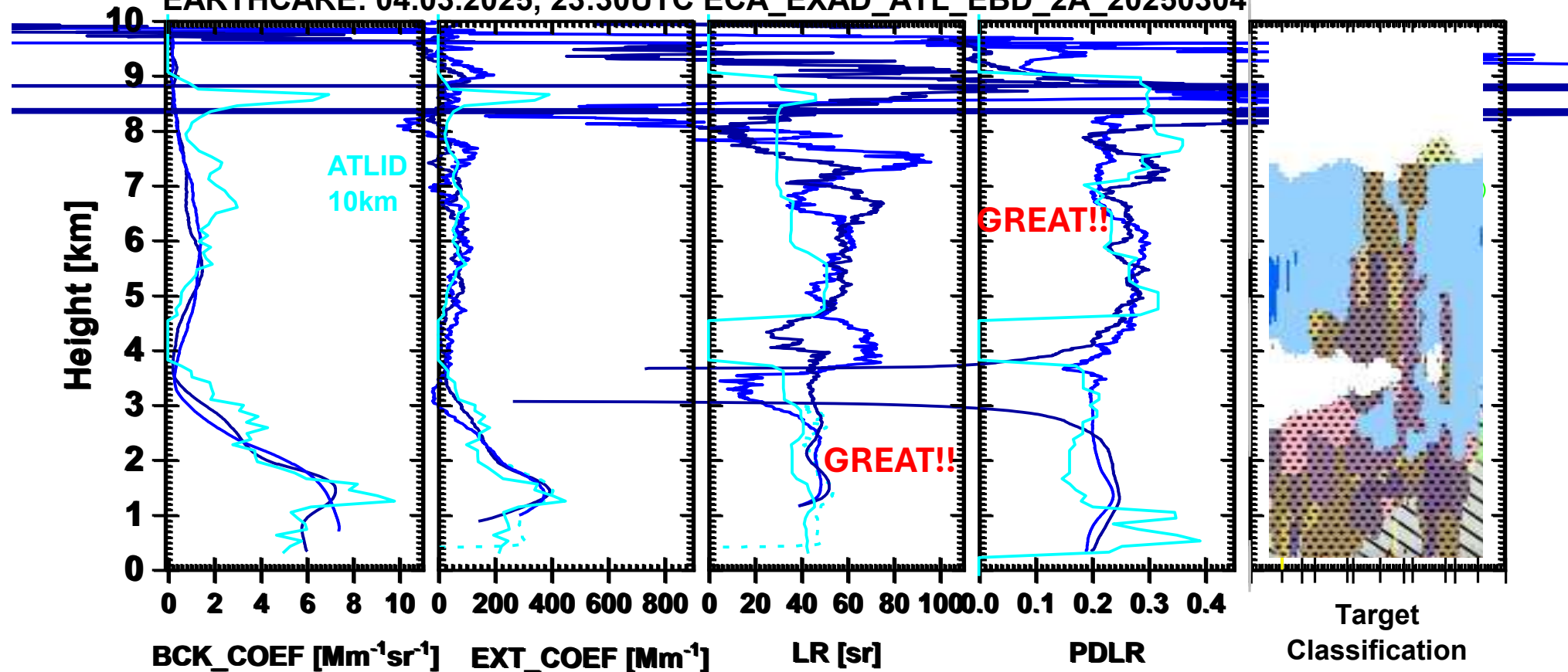


PollyXT_CYP, Limassol, Cyprus,
 5 March 2025, 00:00-02:30UTC
 + EarthCARE ATLID A-EBD (AC)
 Ascending overpass
 Min distance= 116Km
 Wind speed= 34-40km/hour
 Wind dir = East
 2-3 hours delay at GB observations

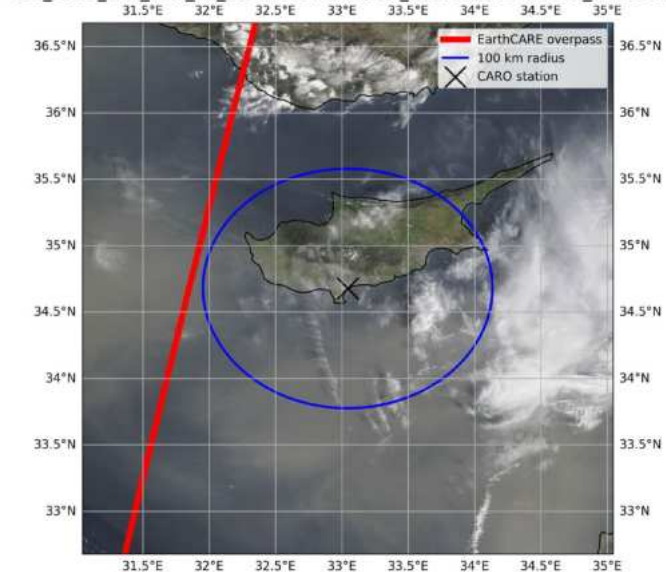


CARO-LIM: 04.03.2025, 23:00-24:00 | 05.03.2025 00:00-02:30 UTC

EARTHCARE: 04.03.2025, 23:30UTC ECA_EXAD_ATL_EBD_2A_20250304

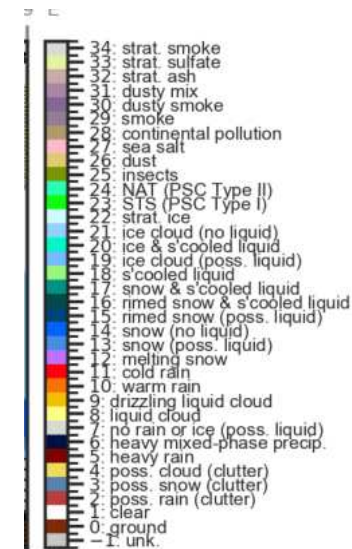
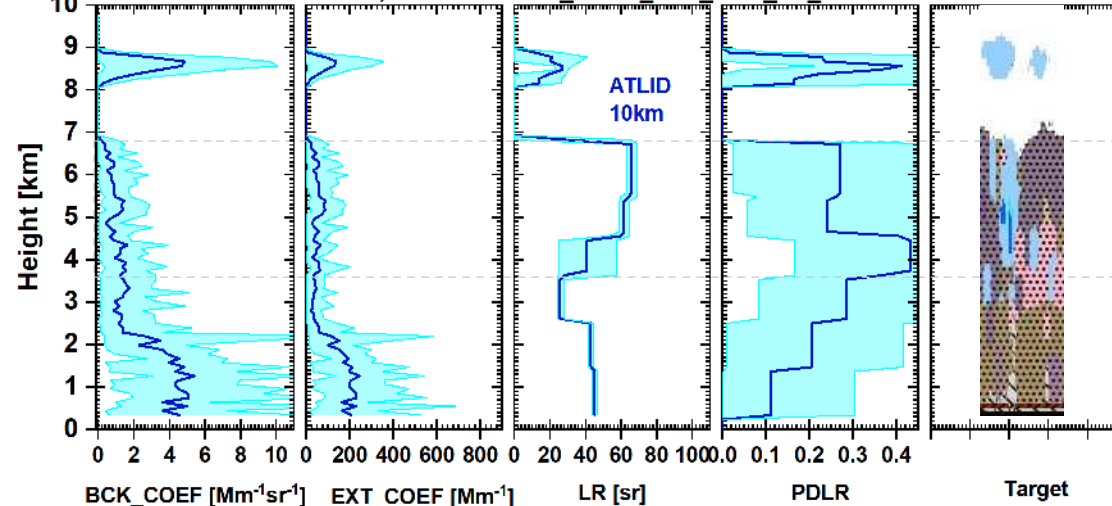


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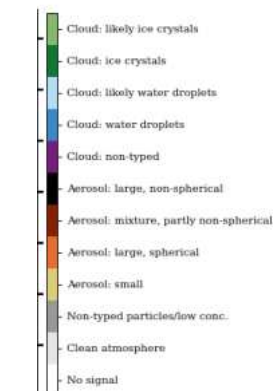
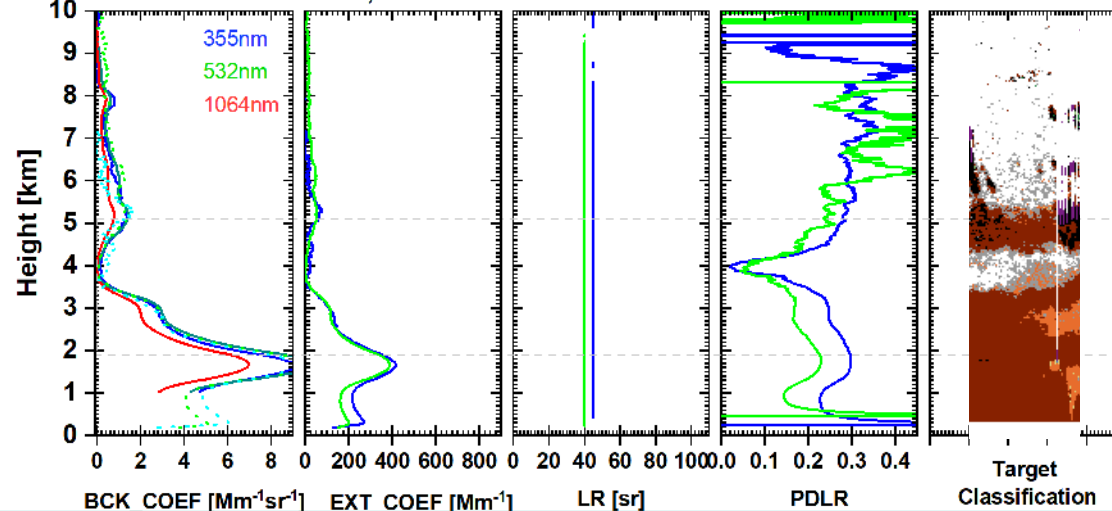


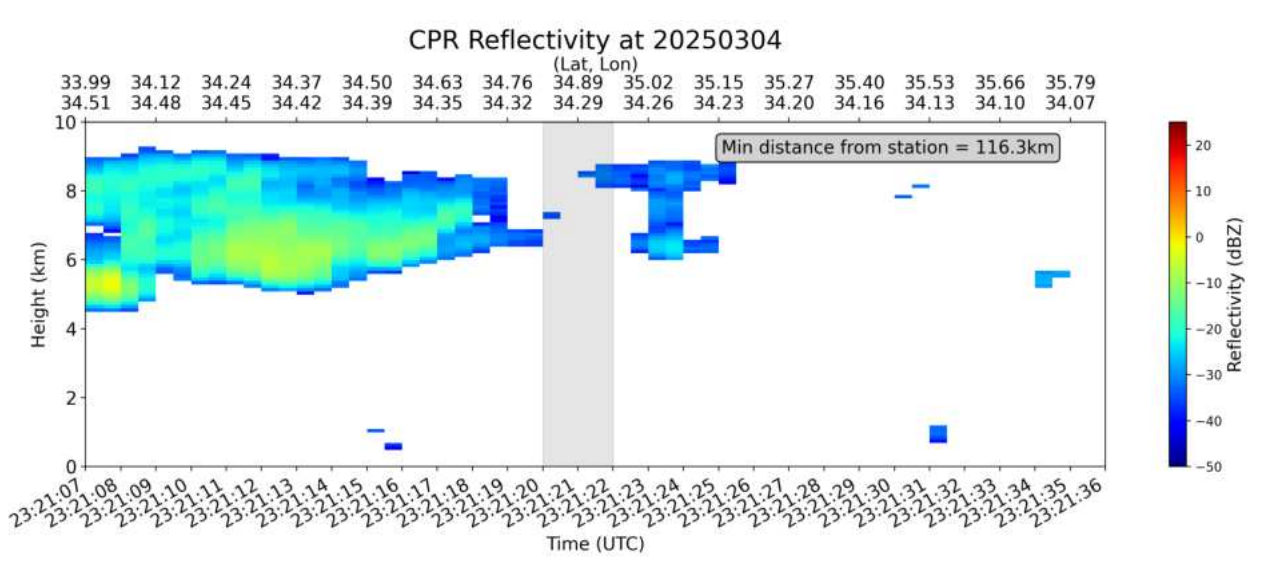
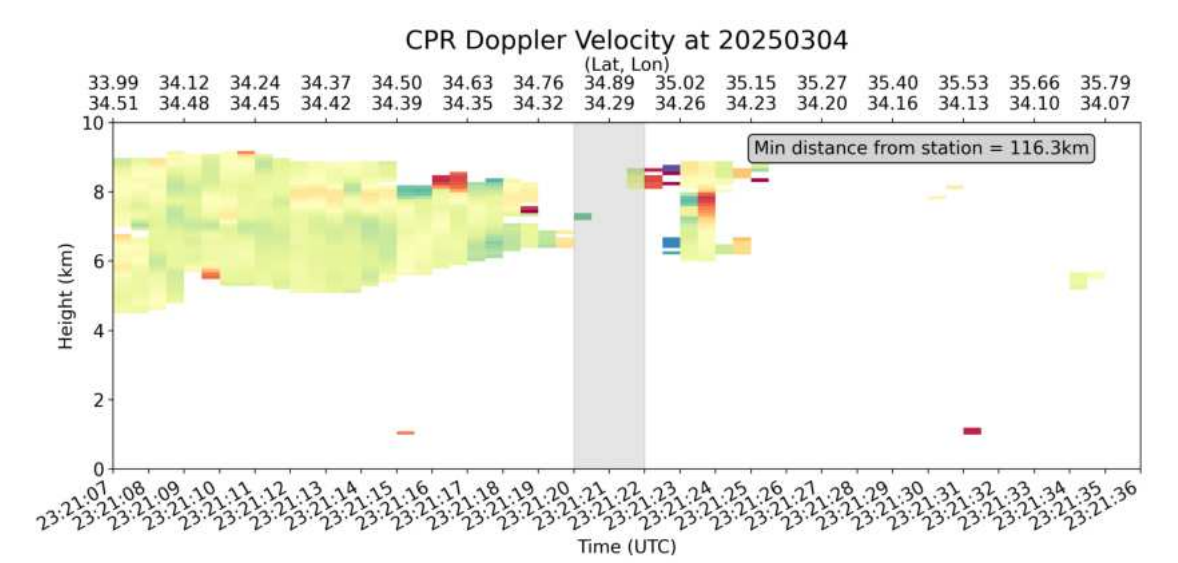
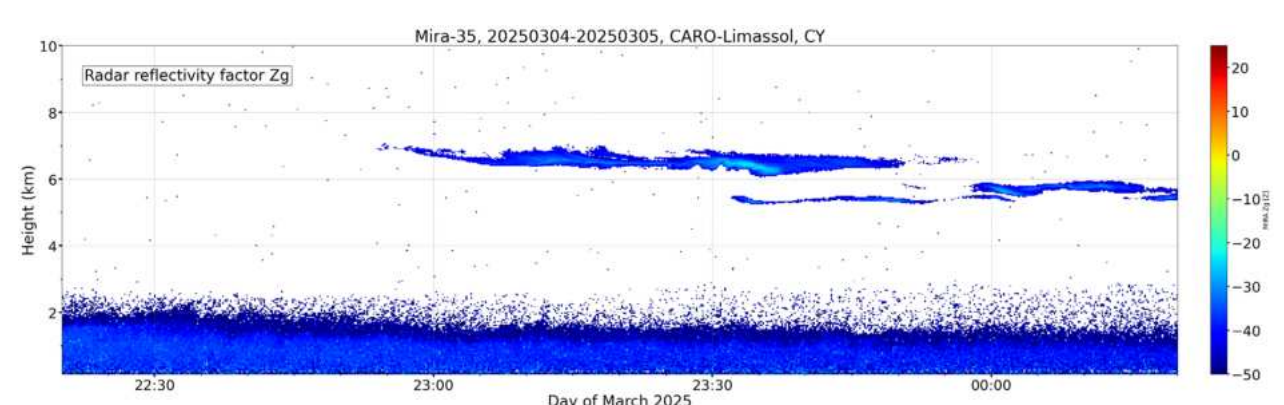
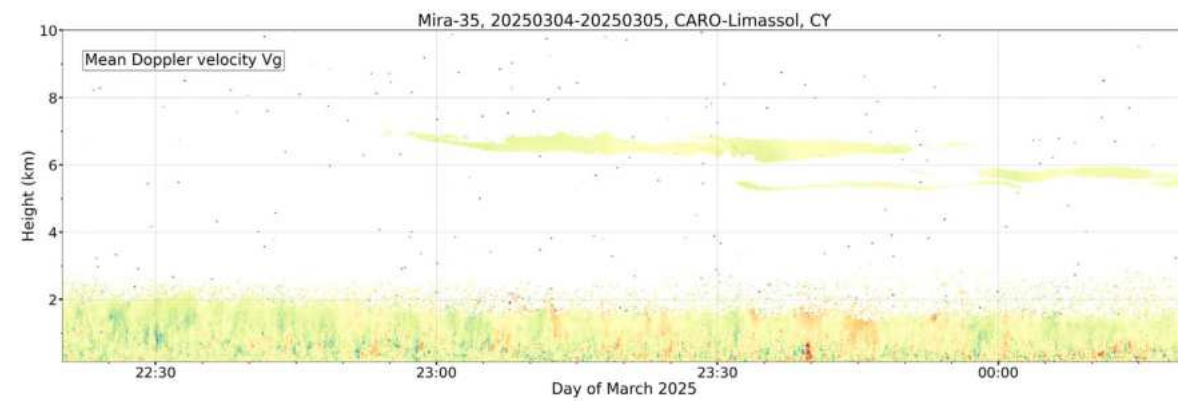
PollyXT_CYP, Limassol, Cyprus,
 5 March 2025, 08:30-09:30UTC
 + EarthCARE ATLID A-EBD (AC)
 Descending overpass
 Min distance= 108Km
 Wind speed= 34-40km/hour
 Wind dir = East
 2-3 hours before overpass time GB
 observations

EARTHCARE: 05.03.2025, 12:10UTC ECA EXAD ATL EBD 2A 20250305



CARO-LIM: 05.04.2025, 08:30-09:30 UTC





Conclusions and next steps

- **Continuous suborbital measurements with CARO-Limassol Lidar and Radar**
- *L1 A-NOM AC intercomparison:*
 - ATLID depolarization ratio significantly improved at ZZ baseline for high depolarizing aerosols
 - (Dust and cirrus cases) but still underestimated
- *L2 AC intercomparison with 4 overpasses (3 nighttime & 1 daytime):*
 - Accurate classification of ice clouds and dusty cases
 - A-EBD: most features bp, ap, LR, dp were within the errors
 - **Good to perfect agreement for the case of intense dust plume from Middle East!**
- Future work:
 - Continue measurements & quantification of L2 product differences
 - Participation to the activities of the RACE and ACROSS community intense operations including
 - radiation/cloud/in-situ measurements
 - Use of CLOUDNET observations for CPR validation