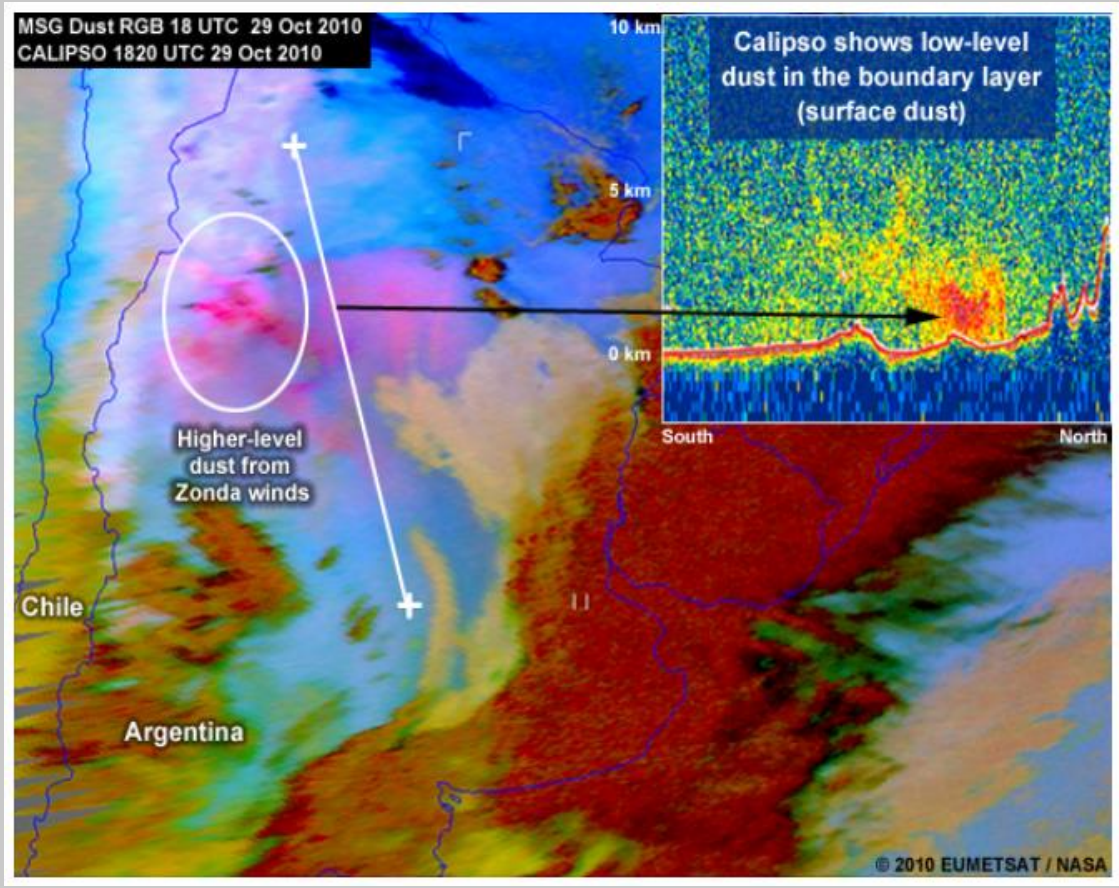
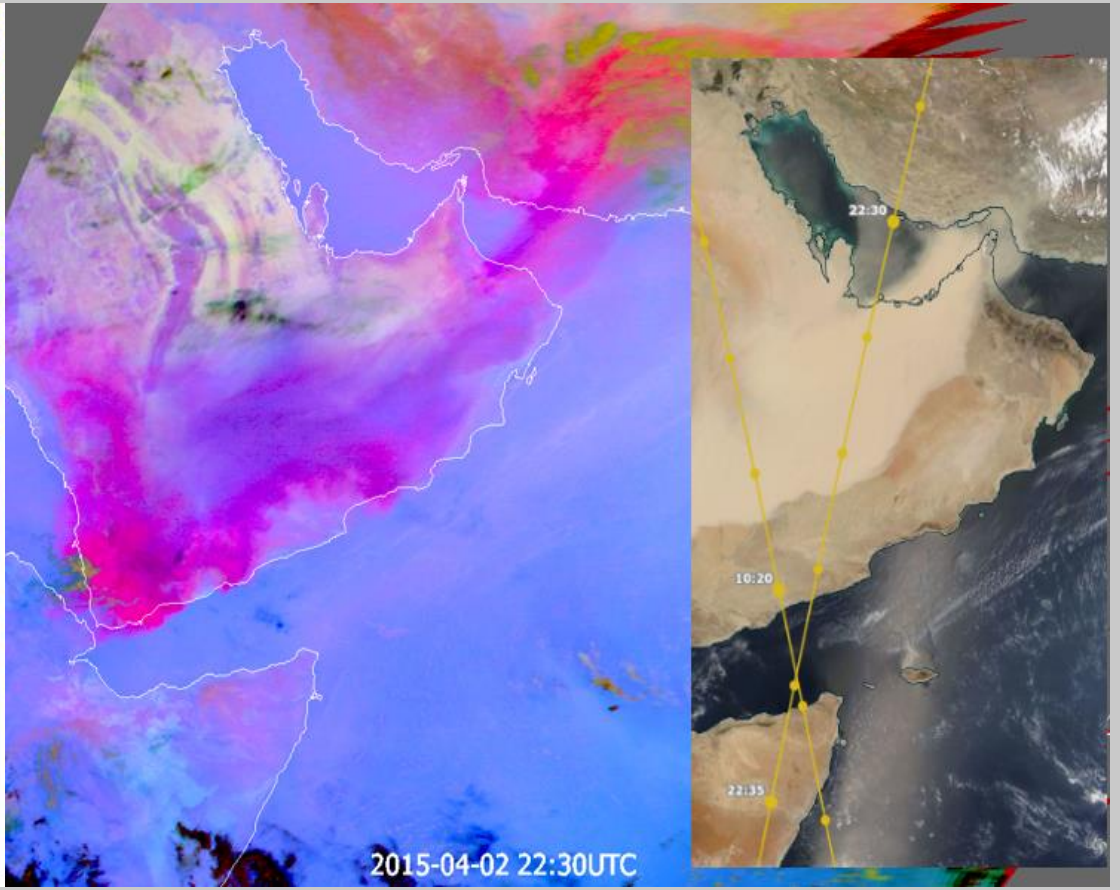
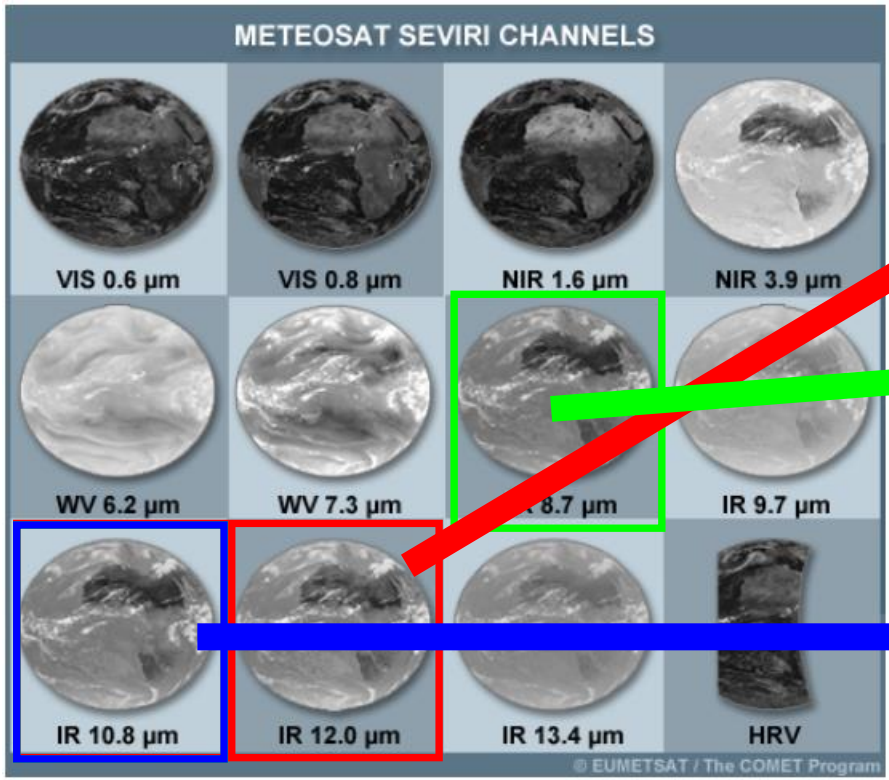
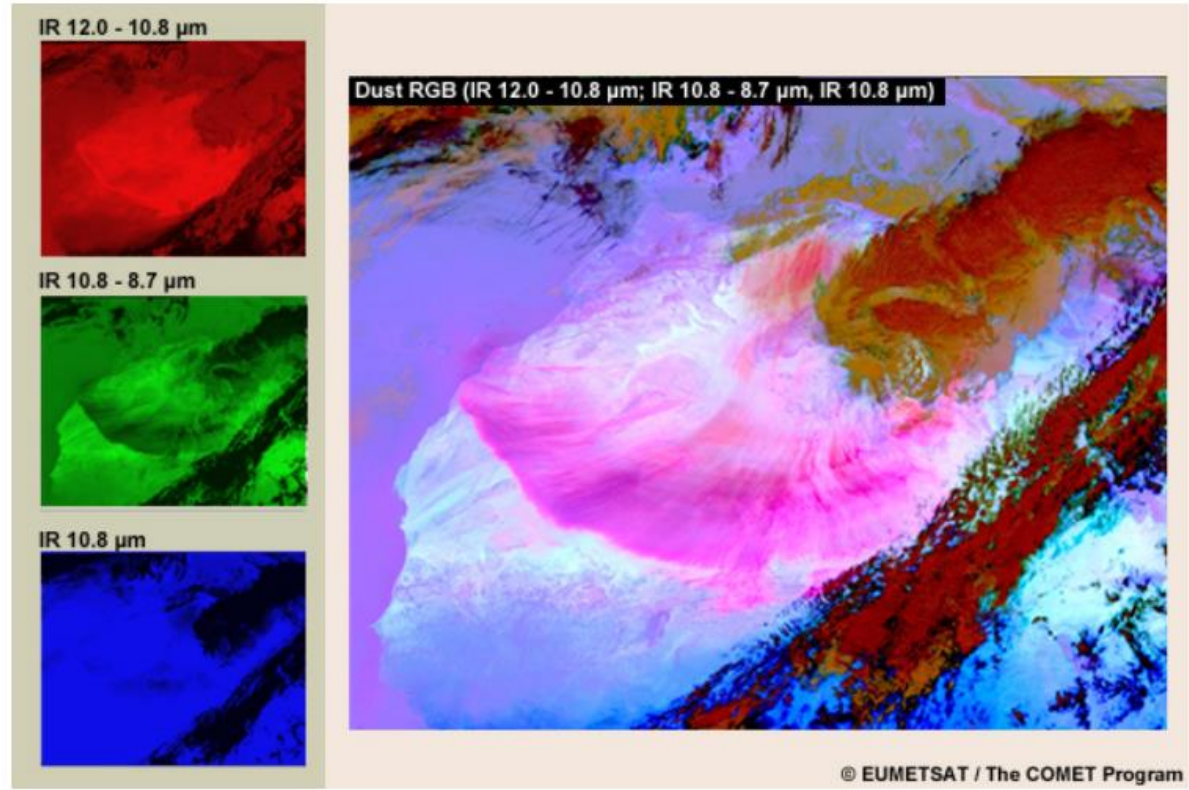
# Case Studies Using Dust RGB and CALIPSO

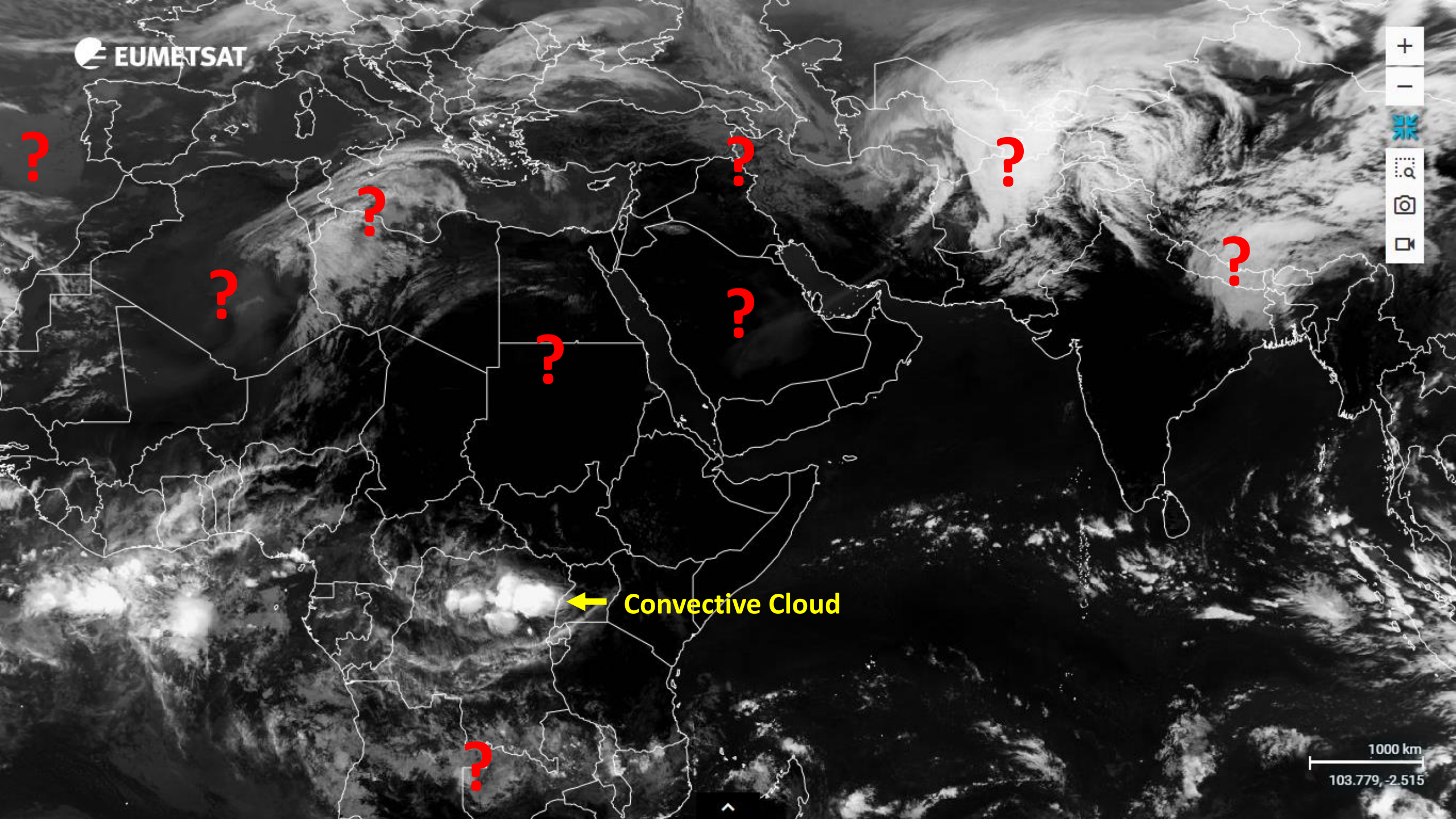


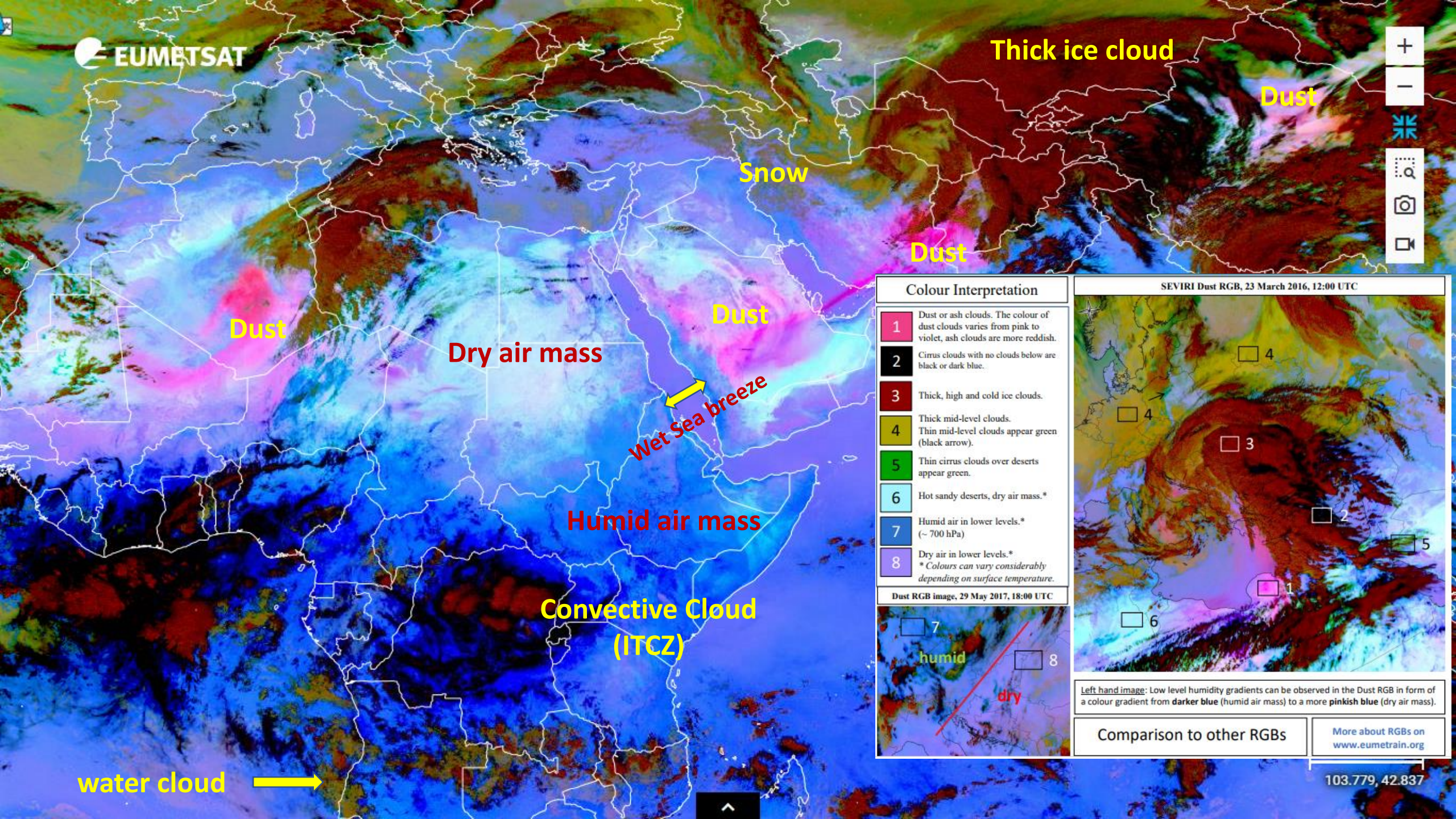




*Ibrahim Al Abdulsalam*
*Meteorologist*
*Directorate General of Meteorology/Oman*

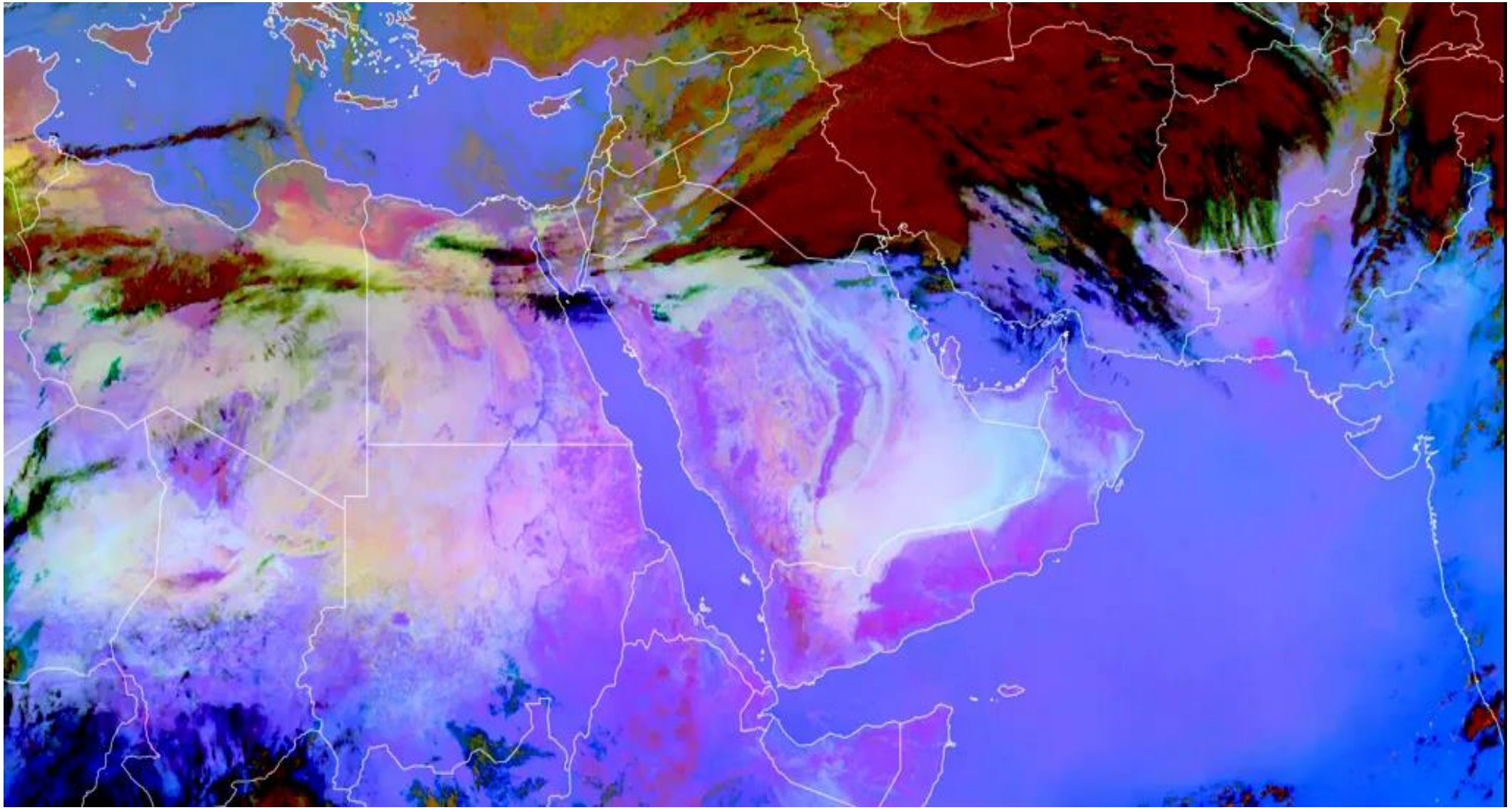

METEOSAT SEVIRI CHANNELS
VIS 0.6 µm
VIS 0.8 µm
NIR 1.6 µm
NIR 3.9 µm
WV 6.2 µm
WV 7.3 µm
IR 9.7 µm
IR 10.8 µm
IR 12.0 µm
IR 13.4 µm
HRV
© EUMETSAT / The COMET Program

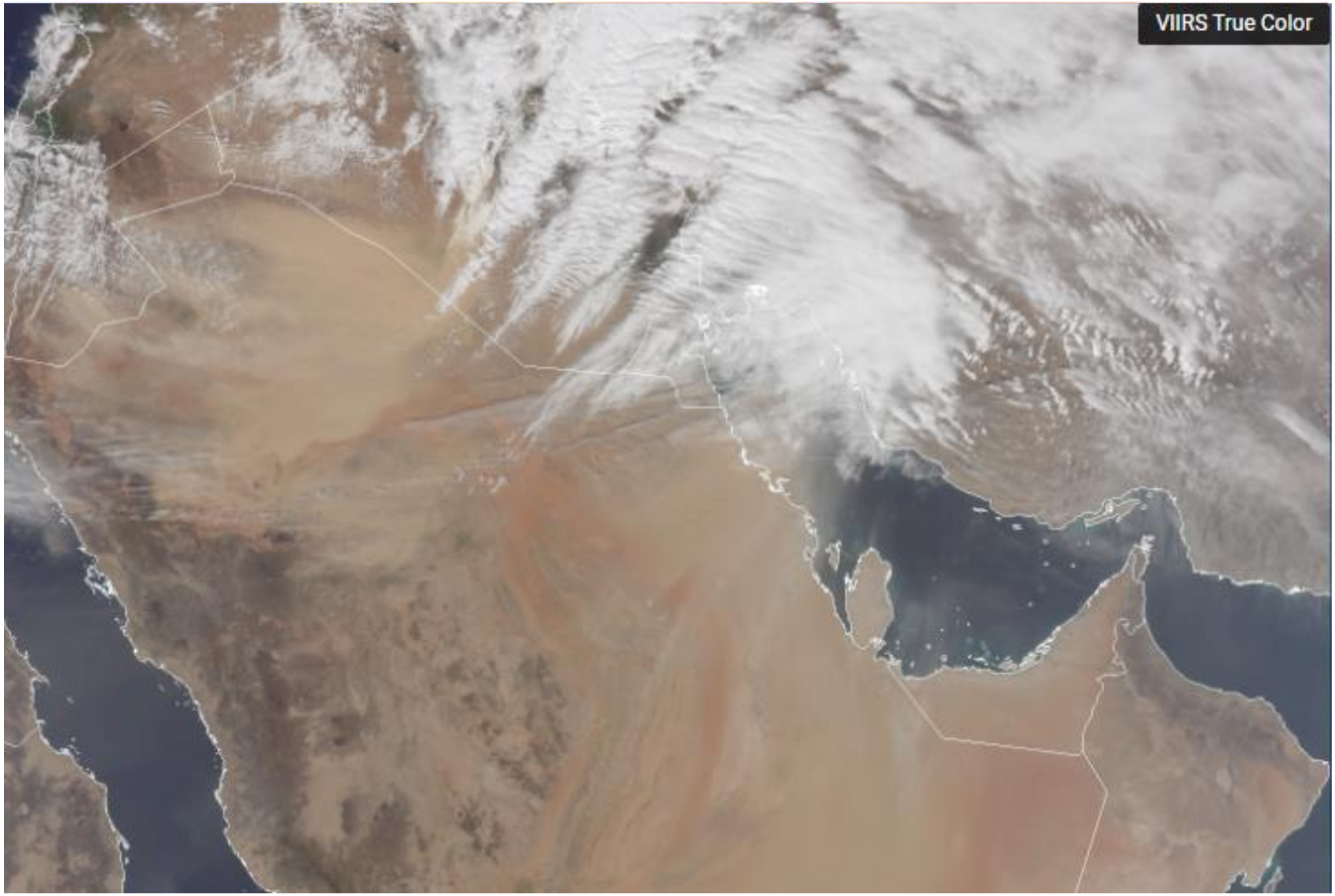

IR 12.0 - 10.8 µm
IR 10.8 - 8.7 µm
IR 10.8 µm
Dust RGB (IR 12.0 - 10.8 µm; IR 10.8 - 8.7 µm, IR 10.8 µm)
© EUMETSAT / The COMET Program


EUMETSAT
?
?
?
?
?
?
?
?
Convective Cloud
1000 km
103.779, -2.515

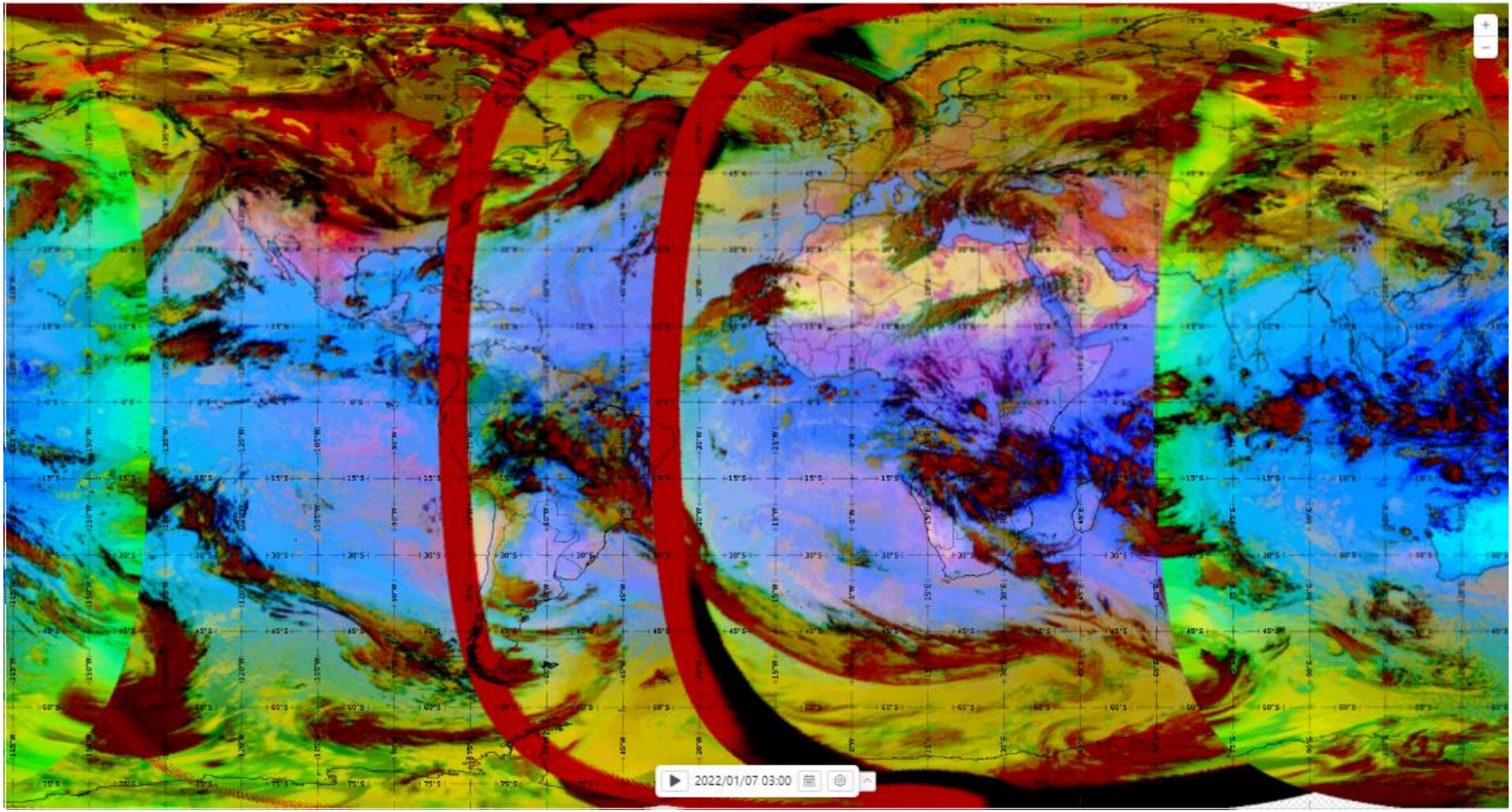

EUMETSAT
Thick ice cloud
Dust
Snow
Dust
Dust
Dust
Dry air mass
Wet Sea breeze
Humid air mass
Convective Cloud
(ITCZ)
water cloud
Colour Interpretation
1 Dust or ash clouds. The colour of dust clouds varies from pink to violet, ash clouds are more reddish.
2 Cirrus clouds with no clouds below are black or dark blue.
3 Thick, high and cold ice clouds.
4 Thick mid-level clouds. Thin mid-level clouds appear green (black arrow).
5 Thin cirrus clouds over deserts appear green.
6 Hot sandy deserts, dry air mass.*
7 Humid air in lower levels.* (~ 700 hPa)
8 Dry air in lower levels.*
* Colours can vary considerably depending on surface temperature.
Dust RGB image, 29 May 2017, 18:00 UTC
7
humid
8
dry
SEVIRI Dust RGB, 23 March 2016, 12:00 UTC
4
4
3
2
5
1
6
Left hand image: Low level humidity gradients can be observed in the Dust RGB in form of a colour gradient from darker blue (humid air mass) to a more pinkish blue (dry air mass).
Comparison to other RGBs
More about RGBs on www.eumetrain.org
103.779, 42.837

# Dust RGB




VIIRS True Color

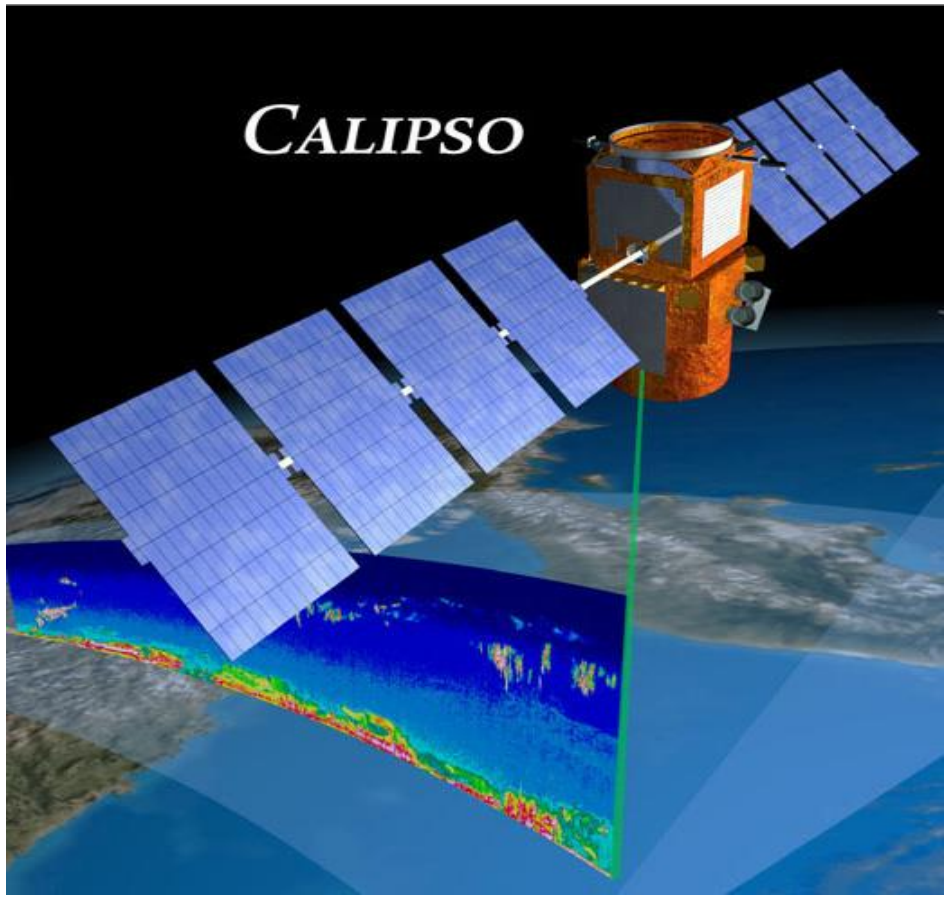
# Covering the Whole Earth

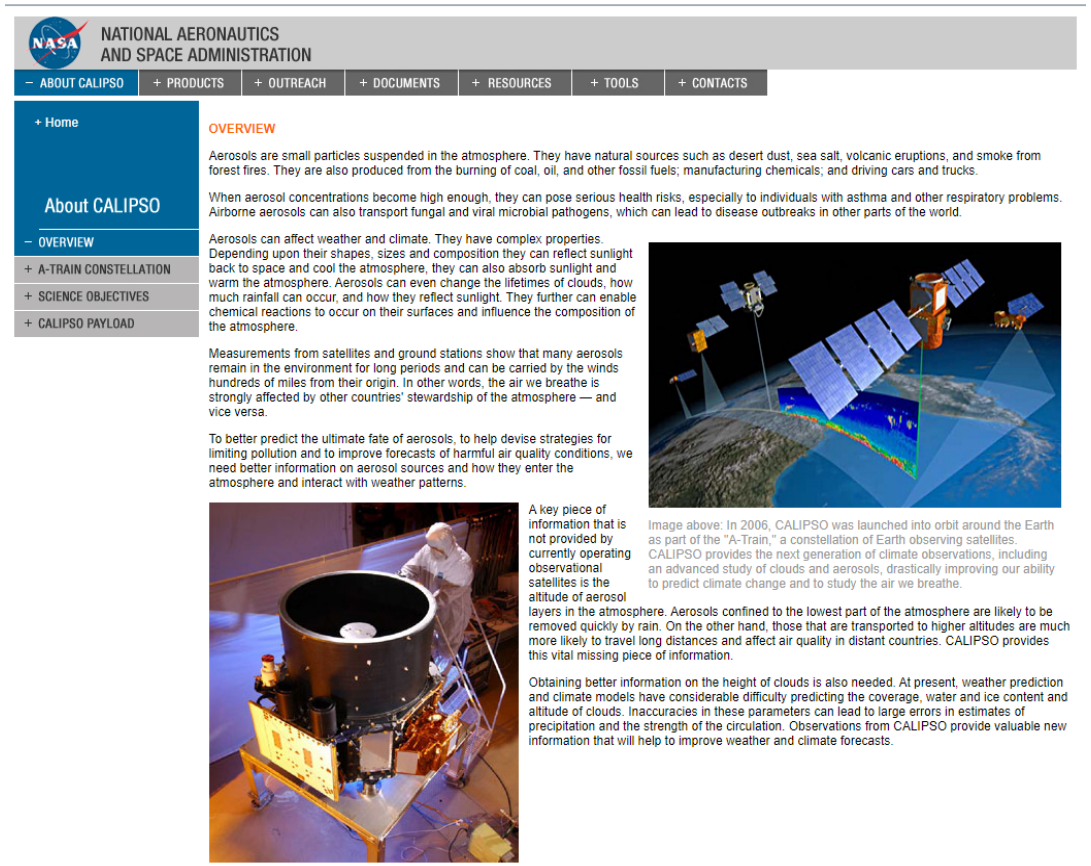


# CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations)

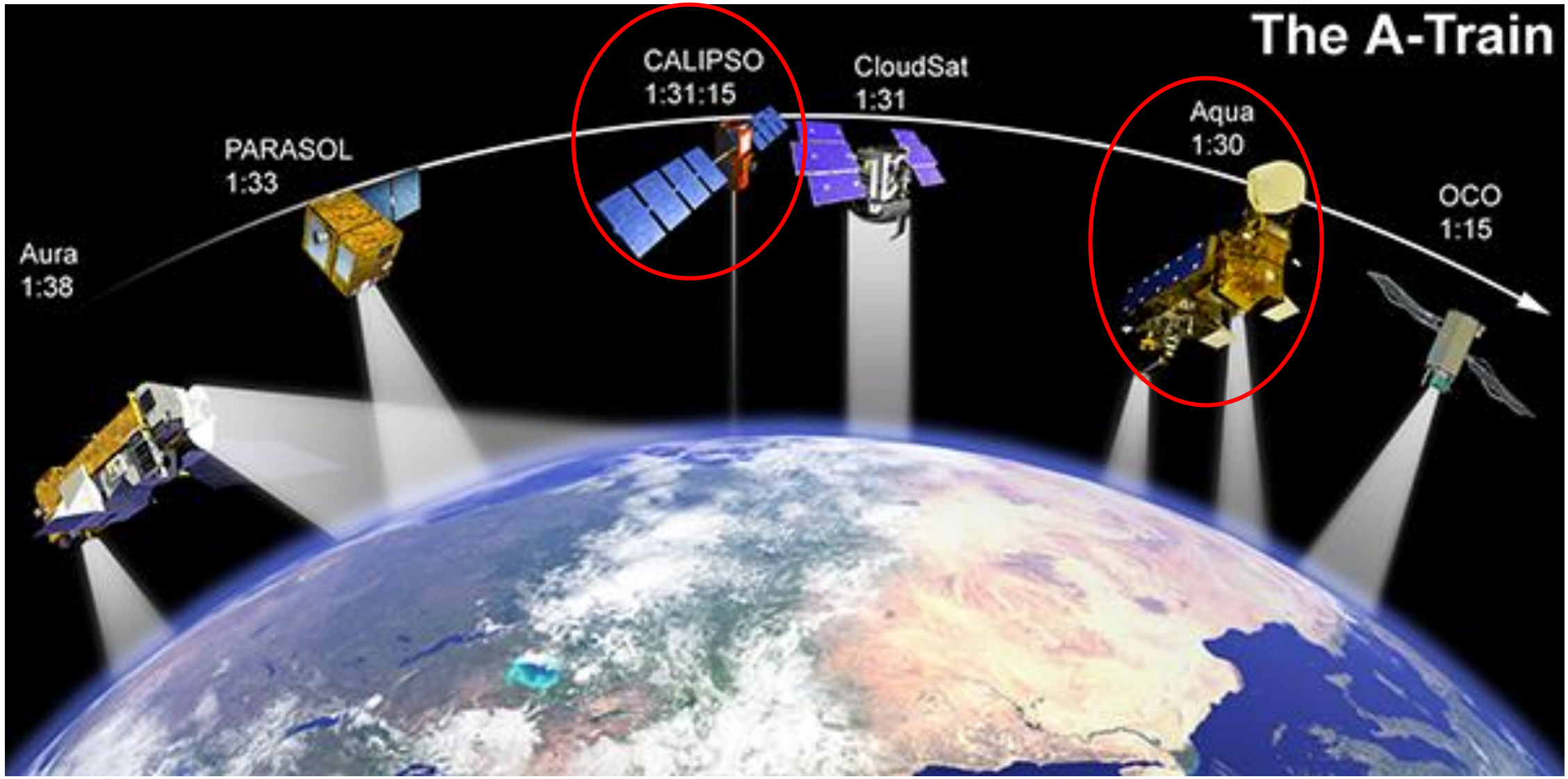
**Li**ght **d**etection **a**nd **r**anging

**R**adar = **R**adio **d**etection **a**nd **r**anging

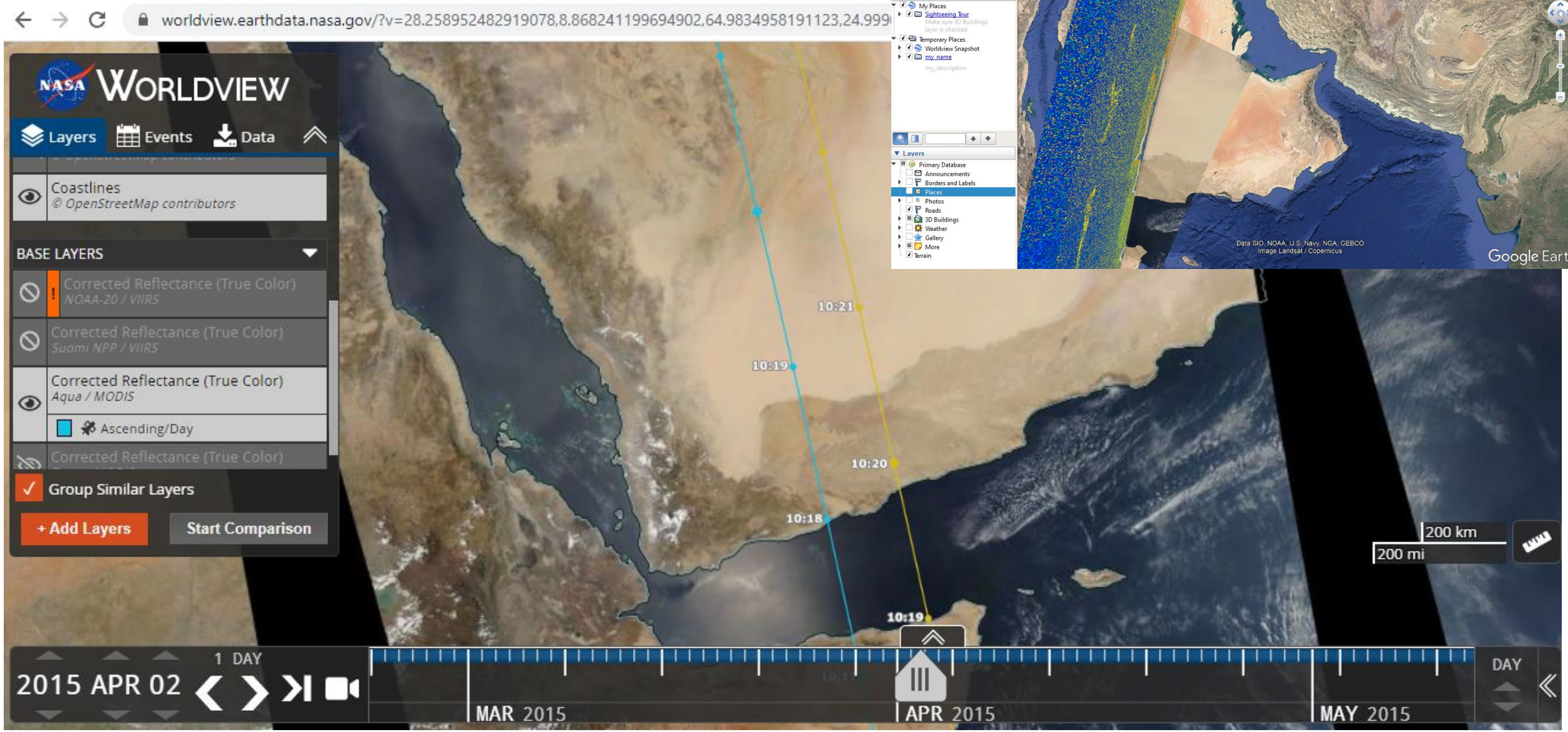


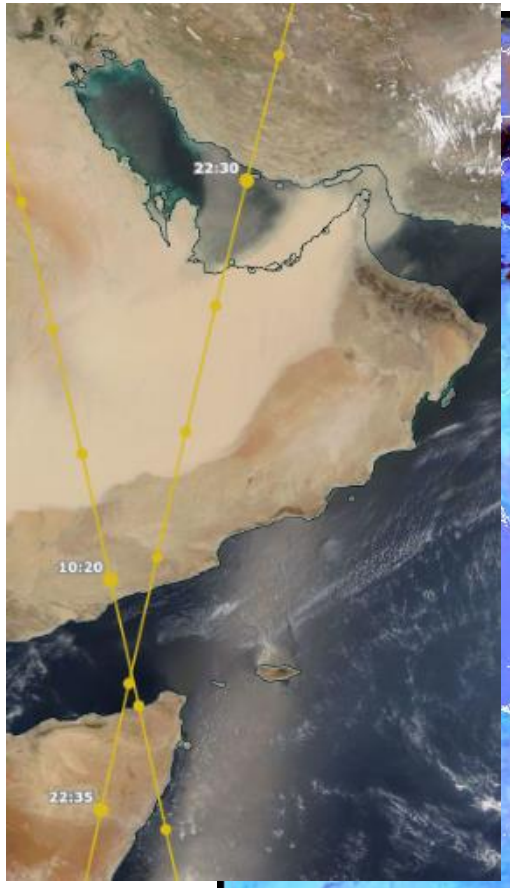

https://www-calipso.larc.nasa.gov/products/lidar/browse_images/production/index.php


The A-Train
CALIPSO
1:31:15
CloudSat
1:31
PARASOL
1:33
Aura
1:38
Aqua
1:30
OCO
1:15

# Dust Storm 2015.04.02

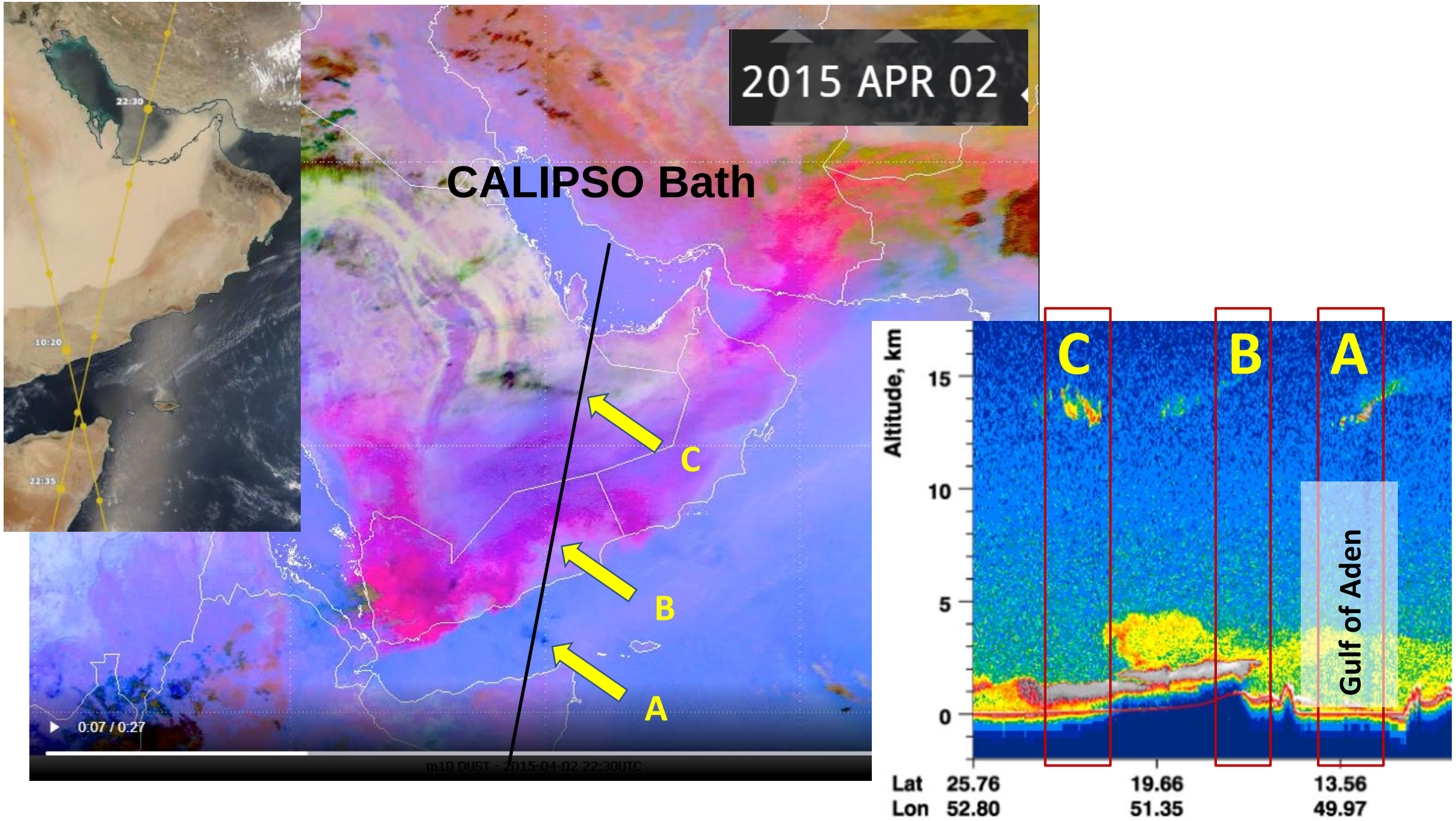


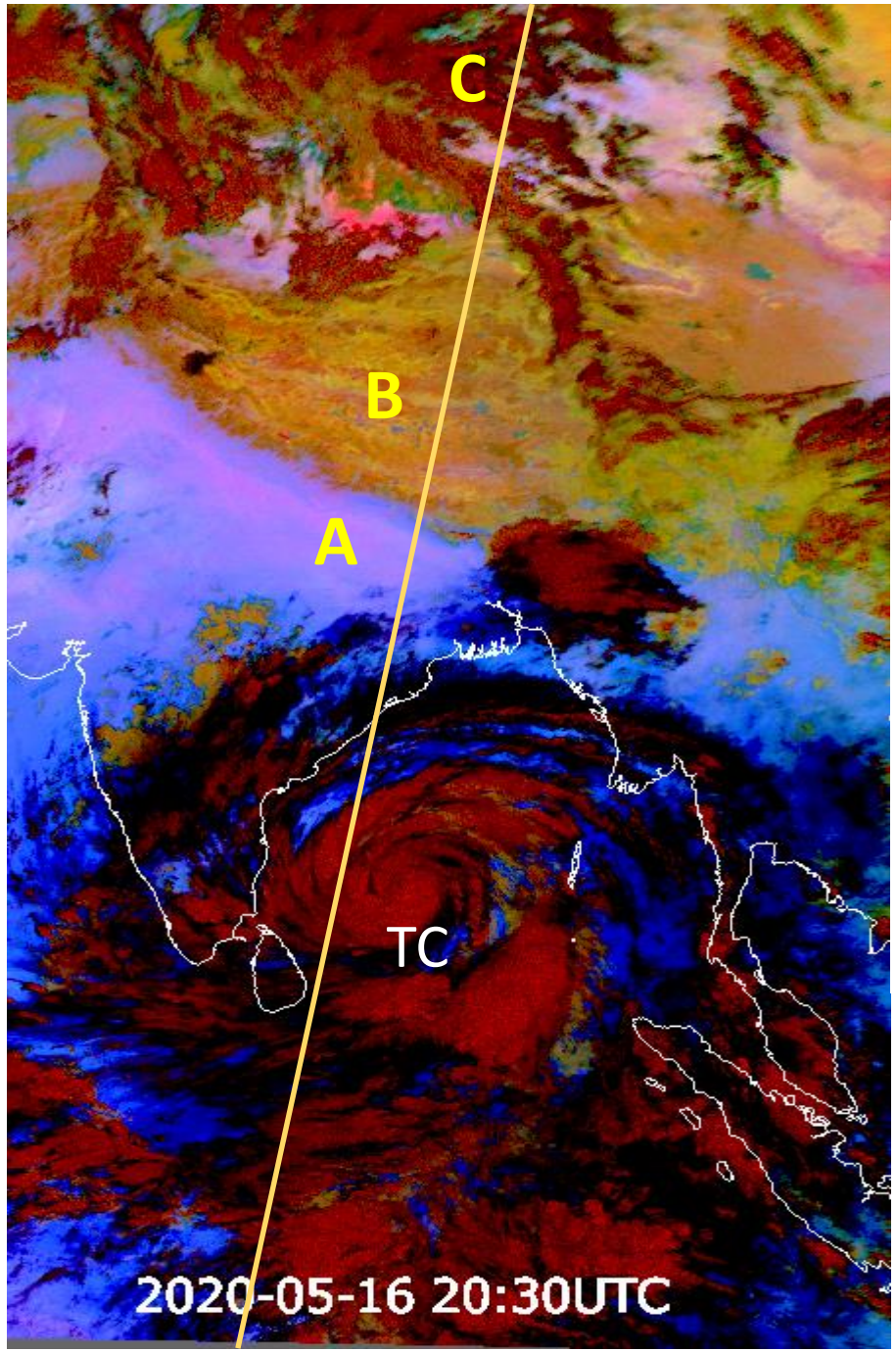
Let try do it !

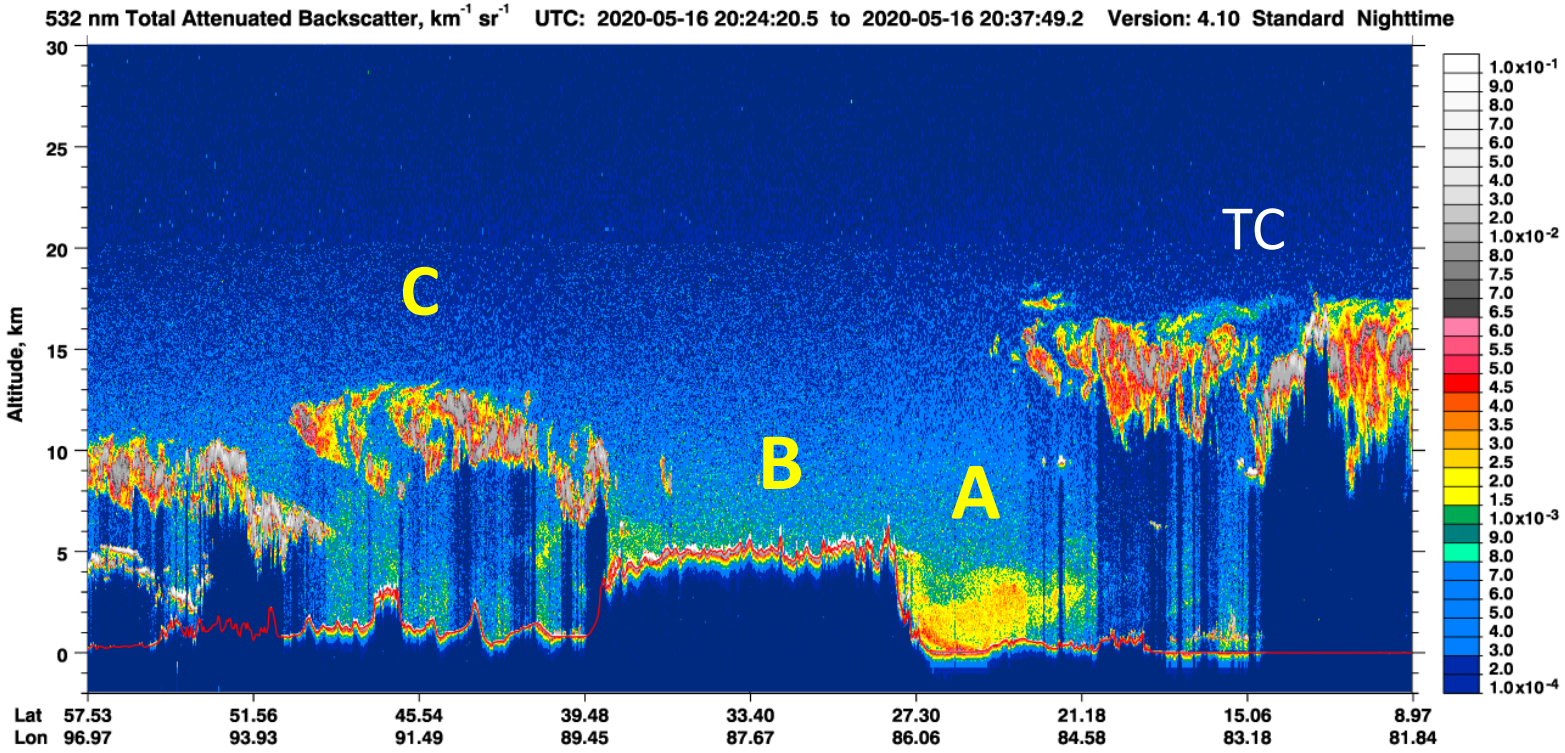

22:30
10:20
22:35

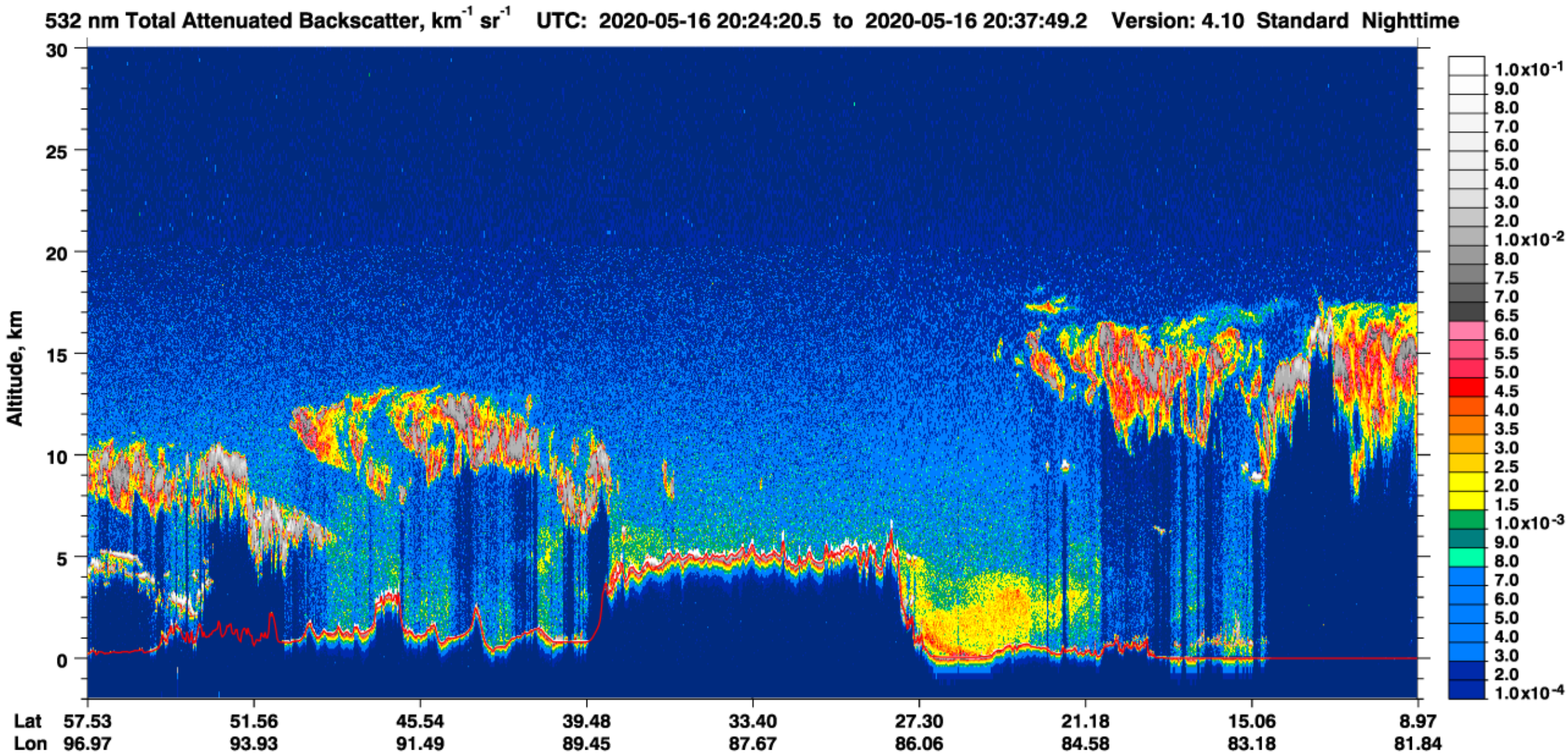

2015.04.02 1015z
0:05 / 0:27


10
5
0
Gulf of Aden
Lat 11.81 17.92 24.02
Lon 49.90 48.54 47.11


2015 APR 02
CALIPSO Bath
22:30
10:20
22:35
C
B
A
0:07 / 0:27
m10 DUST - 2015-04-02 22:30UTC
Altitude, km
15
10
5
0
C
B
A
Gulf of Aden
Lat 25.76 19.66 13.56
Lon 52.80 51.35 49.97

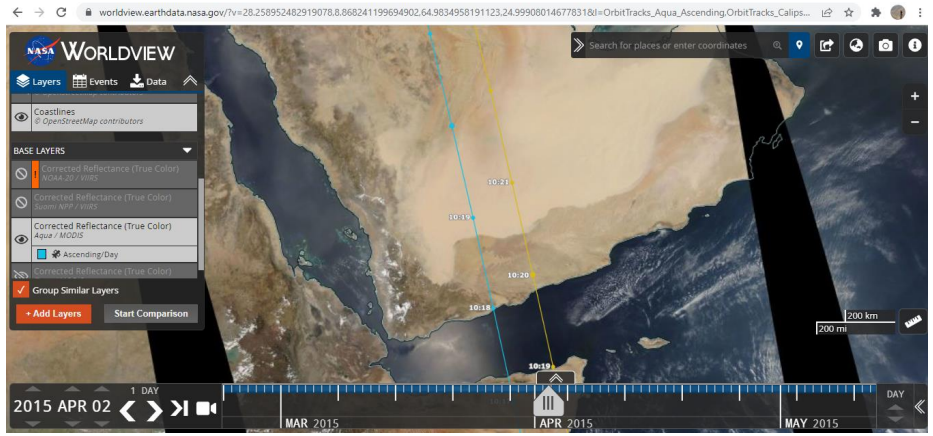

C
B
A
TC
2020-05-16 20:30UTC

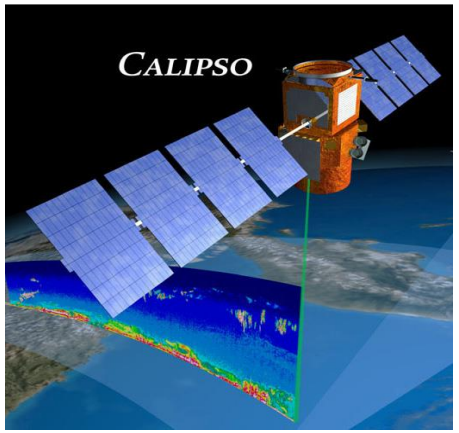

532 nm Total Attenuated Backscatter, km-1 sr-1 UTC: 2020-05-16 20:24:20.5 to 2020-05-16 20:37:49.2 Version: 4.10 Standard Nighttime
Altitude, km
30
25
20
15
10
5
0
C
B
A
TC
Lat 57.53 51.56 45.54 39.48 33.40 27.30 21.18 15.06 8.97
Lon 96.97 93.93 91.49 89.45 87.67 86.06 84.58 83.18 81.84
1.0x10-1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10-2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0x10-3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10-4


532 nm Total Attenuated Backscatter, km-1 sr-1 UTC: 2020-05-16 20:24:20.5 to 2020-05-16 20:37:49.2 Version: 4.10 Standard Nighttime
Altitude, km
30
25
20
15
10
5
0
1.0x10-1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10-2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0x10-3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0x10-4
Lat 57.53 51.56 45.54 39.48 33.40 27.30 21.18 15.06 8.97
Lon 96.97 93.93 91.49 89.45 87.67 86.06 84.58 83.18 81.84

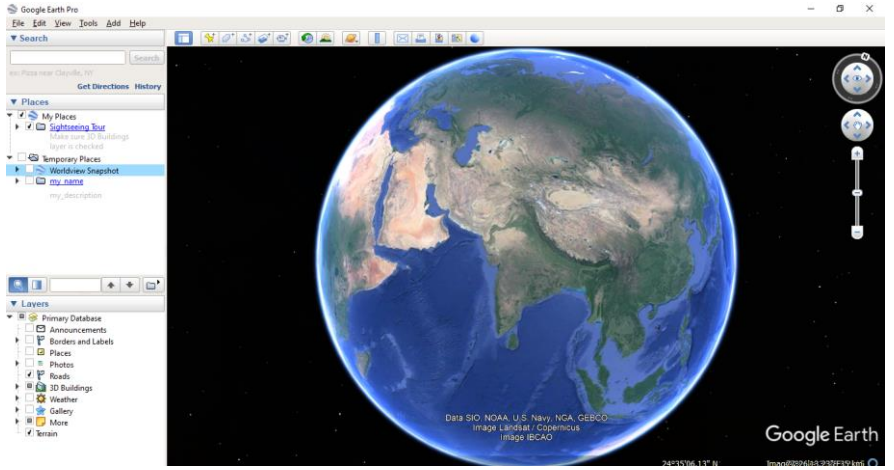
# Using Google Earth

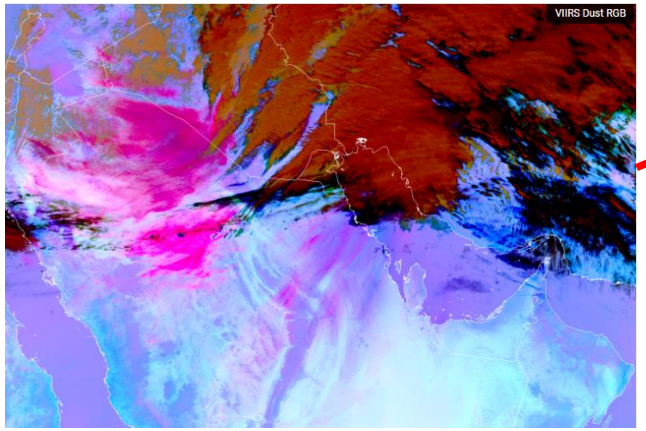
https://worldview.earthdata.nasa.gov/?v=15.408516006218086,3.175729580863475,83.21415046401614,38.37638903180629&l=OrbitTracks_Aqua_Descending(hidden),OrbitTracks_Aqua_Ascending,OrbitTracks_Calipso_Descending(hidden),OrbitTracks_Calipso_Ascending,Reference_Labels_15m(hidden),Reference_Features_15m(hidden),Coastlines_15m,VIIRS_NOAA20_CorrectedReflectance_TrueColor(hidden),VIIRS_SNPP_CorrectedReflectance_TrueColor(hidden),MODIS_Aqua_CorrectedReflectance_TrueColor,MODIS_Terra_CorrectedReflectance_TrueColor(hidden)&lg=true&t=2015-04-02-T03%3A36%3A00Z



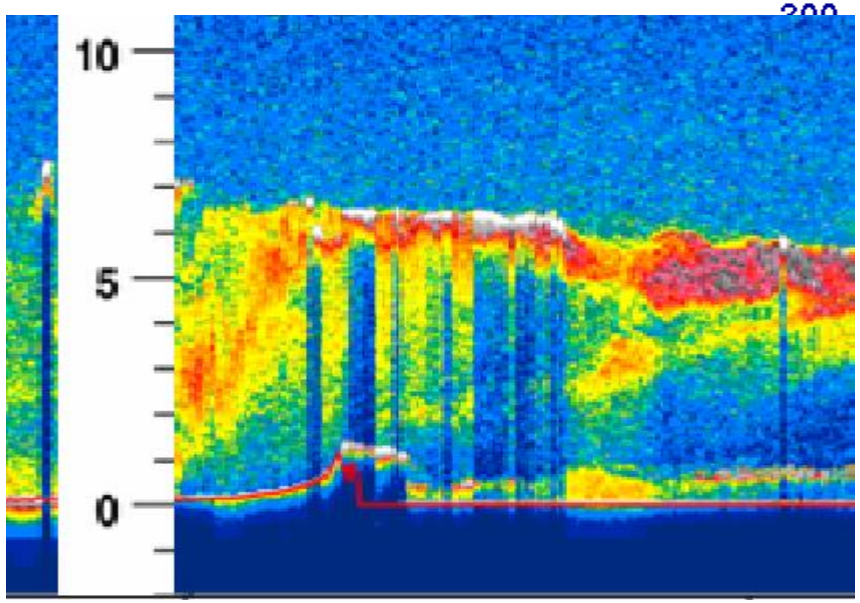



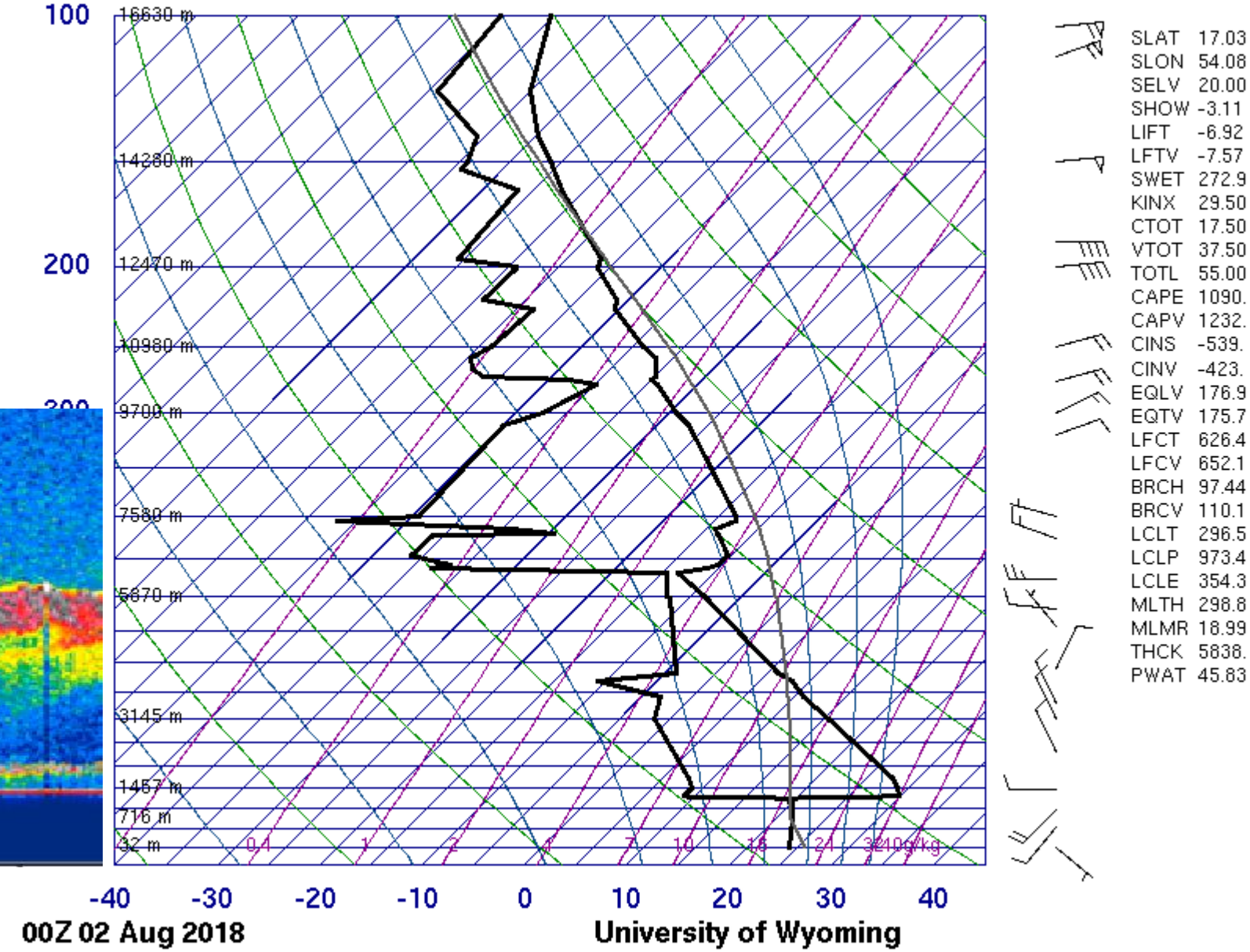

https://www-calipso.larc.nasa.gov/products/kmz_exp/

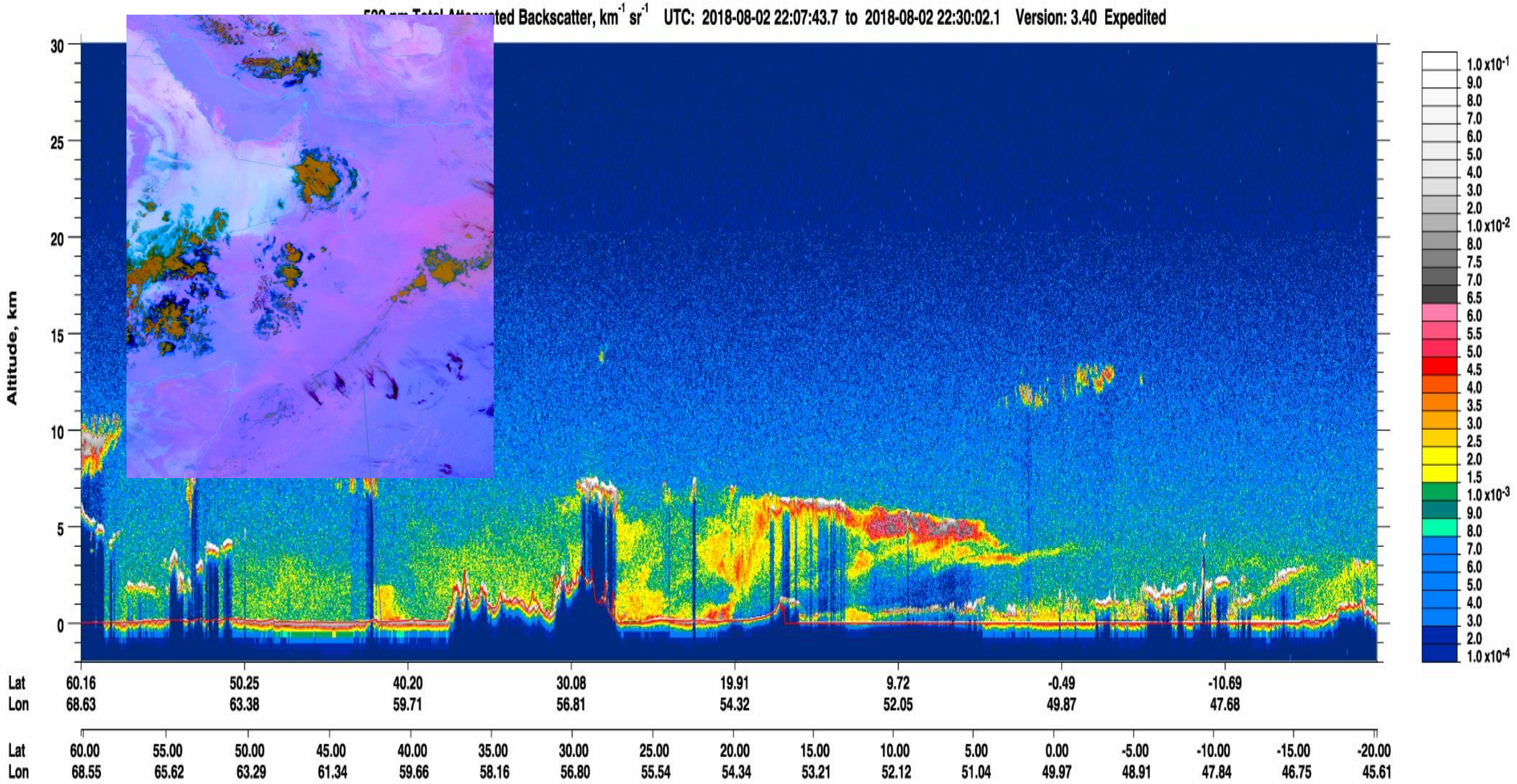


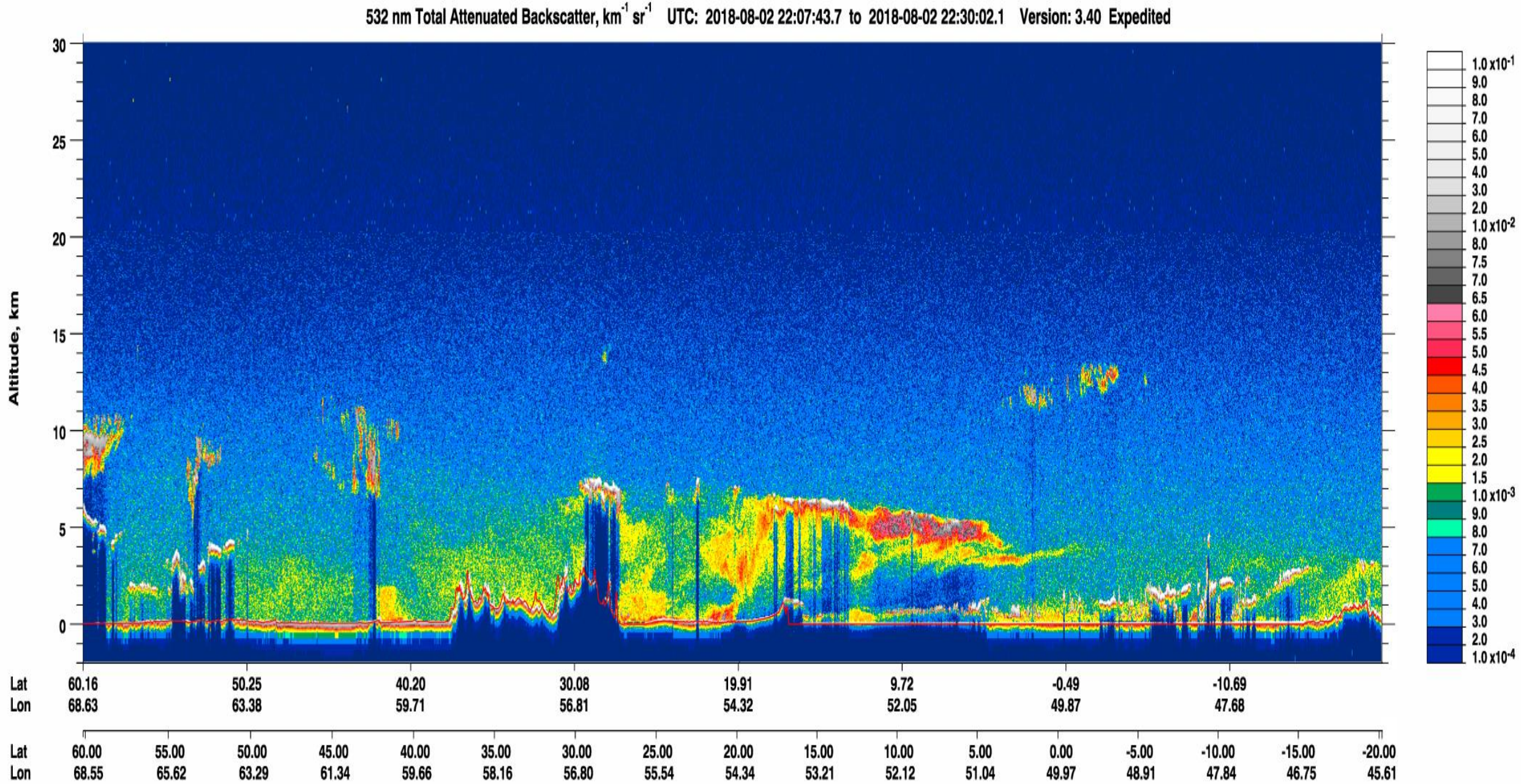




Thank You


10
5
0


41316 OOSA Salalah
100
200
16630 m
14280 m
12470 m
10980 m
9700 m
7580 m
5670 m
3145 m
1457 m
716 m
32 m
0.4
1
2
4
7
10
16
24
32
40g/kg
-40
-30
-20
-10
0
10
20
30
40
00Z 02 Aug 2018
University of Wyoming
SLAT 17.03
SLON 54.08
SELV 20.00
SHOW -3.11
LIFT -6.92
LFTV -7.57
SWET 272.9
KINX 29.50
CTOT 17.50
VTOT 37.50
TOTL 55.00
CAPE 1090.
CAPV 1232.
CINS -539.
CINV -423.
EQLV 176.9
EQTV 175.7
LFCT 626.4
LFCV 652.1
BRCH 97.44
BRCV 110.1
LCLT 296.5
LCLP 973.4
LCLE 354.3
MLTH 298.8
MLMR 18.99
THCK 5838.
PWAT 45.83


532 nm Total Attenuated Backscatter, km-1 sr-1 UTC: 2018-08-02 22:07:43.7 to 2018-08-02 22:30:02.1 Version: 3.40 Expedited
Altitude, km
30
25
20
15
10
5
0
1.0 x10-1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0 x10-2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0 x10-3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0 x10-4
Lat 60.16 50.25 40.20 30.08 19.91 9.72 -0.49 -10.69
Lon 68.63 63.38 59.71 56.81 54.32 52.05 49.87 47.68
Lat 60.00 55.00 50.00 45.00 40.00 35.00 30.00 25.00 20.00 15.00 10.00 5.00 0.00 -5.00 -10.00 -15.00 -20.00
Lon 68.55 65.62 63.29 61.34 59.66 58.16 56.80 55.54 54.34 53.21 52.12 51.04 49.97 48.91 47.84 46.75 45.61


532 nm Total Attenuated Backscatter, km-1 sr-1 UTC: 2018-08-02 22:07:43.7 to 2018-08-02 22:30:02.1 Version: 3.40 Expedited
Altitude, km
30
25
20
15
10
5
0
1.0 x10-1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0 x10-2
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0 x10-3
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0 x10-4
Lat 60.16 50.25 40.20 30.08 19.91 9.72 -0.49 -10.69
Lon 68.63 63.38 59.71 56.81 54.32 52.05 49.87 47.68
Lat 60.00 55.00 50.00 45.00 40.00 35.00 30.00 25.00 20.00 15.00 10.00 5.00 0.00 -5.00 -10.00 -15.00 -20.00
Lon 68.55 65.62 63.29 61.34 59.66 58.16 56.80 55.54 54.34 53.21 52.12 51.04 49.97 48.91 47.84 46.75 45.61