Atmosphere SIPS
UW HSRL MAGPIE

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S. Dutcher, E. Eloranta, G. Quinn, P. Veglio, and the A-SIPS team

special thanks to JMA for AHI data feed/support

Overview

- NASA Atmosphere-SIPS status and updates
- Exploring severe aerosol/cloud identification via machine learning
- UW HSRL aerosol retrievals in marine environments (side scanning)

NASA Atmosphere-SIPS status & updates

Atmosphere SIPS Overview

- The VIIRS Atmosphere SIPS (ASIPS) is located within the Space Science and Engineering Center at the University of Wisconsin-Madison.
- ASIPS supports operational ingest, processing, and delivery of JPSS Atmosphere VIIRS products to NASA LAADS/LANCE/GESDISC/CERES for archive and distribution.
- ASIPS is responsible for supporting the development, testing, evaluation, and production of VIIRS atmosphere products created by the ROSES-funded VIIRS Atmosphere Science Team members (aka “Continuity products”).
- ASIPS supports **global standard and near real time** processing in “forward stream” mode and reprocessing of entire mission records.
- ASIPS delivers imagery to NASA GIBS for display in Worldview.

LAADS (not ASIPS) is responsible for the production, archive, and distribution of MODIS atmosphere products (MxD35, MxD07, MxD06, MxD04, MxD08, …) supported by NASA Senior Review.

Atmosphere Discipline Team Members (Product Developers)

Team Leads	ROSES-20 A.52 and A.33 Funded Proposals
Christina Hsu (NASA GSFC)	Extending Long-Term Aerosol Data Records from MODIS to VIIRS using e-Deep Blue Algorithm. (ROSES – 2020 A.52)
Robert Levy (NASA GSFC)	Upgrading the Dark Target aerosol data record for the 2020s and beyond. (ROSES – 2020 A.52)
Kerry Meyer (NASA GSFC)	The continuation and evolution of the CLDMSK and CLDPROP continuity cloud product suite. (ROSES – 2020 A.52)
Kerry Meyer (NASA GSFC)	Transitioning an existing near real-time MODIS cloud and above-cloud absorbing aerosol retrieval algorithm into a new MODIS/VIIRS continuity product. (ROSES – 2020 A.33)
Vincent Realmuto (NASA JPL)	TIR-Based Volcanic SO2 Science Products for MODIS and VIIRS. (ROSES – 2020 A.33)

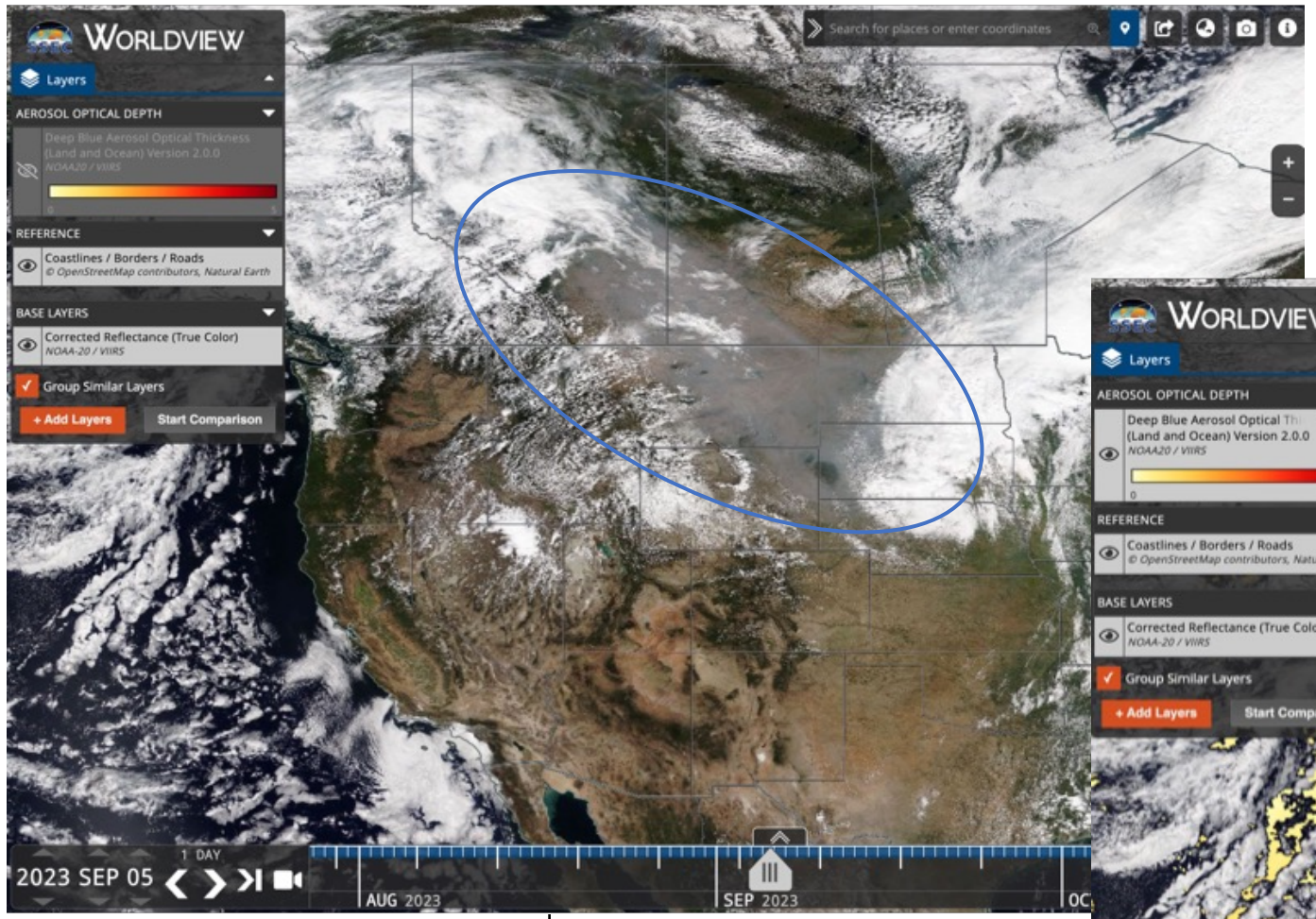
Products Generated by the ASIPS (11/23)

Product Short Name	Product Description	ST Lead	Distribution
AERDB_L2_VIIRS_[SNPP|NOAA20] AERDB_D3_VIIRS_[SNPP|NOAA20] AERDB_M3_VIIRS_[SNPP|NOAA20]	Deep Blue Aerosol (day only) Standard and NRT	Christina Hsu (NASA GSFC)	LAADS (standard) LANCE (NRT)
AERDT_L2_VIIRS_[SNPP|NOAA20]	Dark Target Aerosol (day only) Standard and NRT	Robert Levy (NASA GSFC)	LAADS (standard) LANCE (NRT)*
CLDMSK_L2_VIIRS_[SNPP|NOAA20]	Continuity Cloud Mask (day/night) Standard and NRT	Bob Holz (SSEC UW)	LAADS (standard) LANCE (NRT)
CLDMSK_L2_MODIS_Aqua	Continuity Cloud Mask (day/night) Standard	Bob Holz (SSEC UW)	LAADS
CLDPROP_L2_VIIRS_[SNPP|NOAA20] CLDPROP_D3_VIIRS_[SNPP|NOAA20] CLDPROP_M3_VIIRS_[SNPP|NOAA20]	Continuity Cloud Properties (day/night) Standard	Kerry Meyer (NASA GSFC)	LAADS
CLDPROP_L2_MODIS_Aqua CLDPROP_D3_MODIS_Aqua CLDPROP_M3_MODIS_Aqua	Continuity Cloud Properties (day/night) Standard	Kerry Meyer (NASA GSFC)	LAADS
SNDRSNCrISL1BIMG (SNPP) SNDRJ1CrISL1BIMG (NOAA-20)	Collocated VIIRS Level 1 and cloud mask statistical summary	Dave Tobin (SSEC UW)	GESDISC
MCD06COSP_D3_MODIS	Terra/Aqua MODIS CFMIP (Cloud Feedback Model Intercomparison Project) Observation Simulator Package (COSP) Cloud Properties Products	Kerry Meyer (NASA GSFC)	LAADS
FSNRAD_L2_VIIRS_CrIS_[SNPP|NOAA20]	Fusion of VIIRS and CrIS Data to Construct Supplementary Infrared Band Radiances for VIIRS.	Eva Borbas (SSEC UW)	LAADS/CERES
CLDCR_L2_VIIRS_SNPP	Cirrus Reflectance (daytime only)	Bo Cai (NRL)	LAADS

* NOAA-20 Dark Target (v2.0.1) NRT not yet in operational status

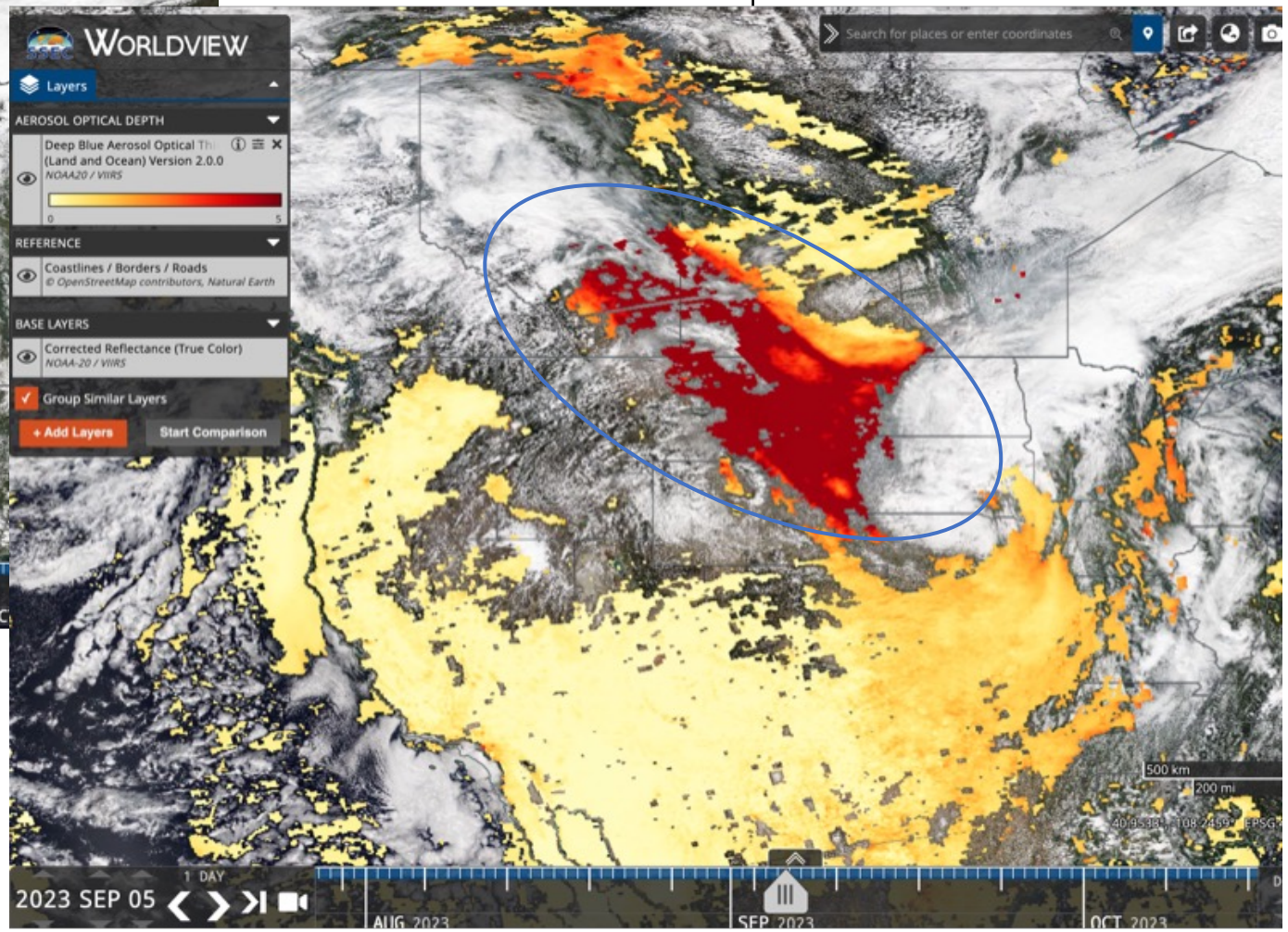
Orphaned Product

ASIPS Internal Worldview: NOAA-20 Deep V2.0 Blue AOT Product

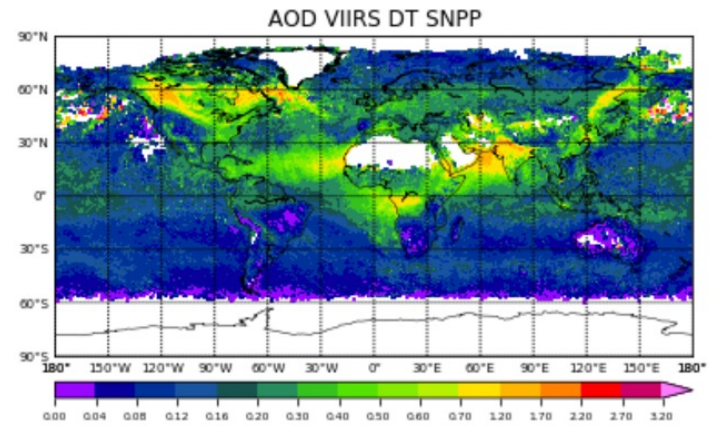


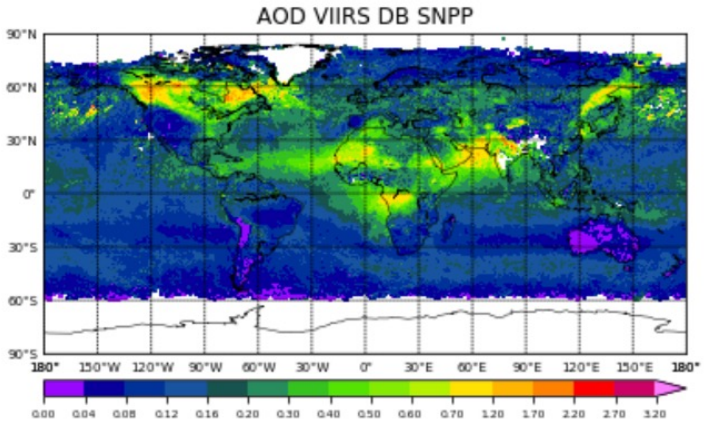
NOAA-20 VIIRS True Color
5 - Sep - 2023

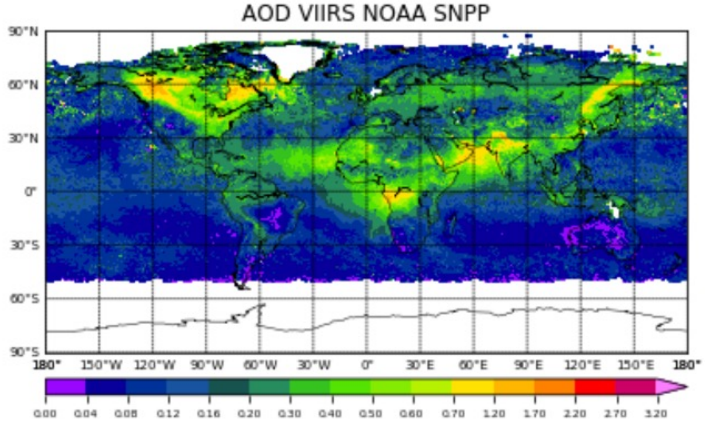
NOAA-20 Deep Blue (v2.0.0) AOT
5 - Sep - 2023

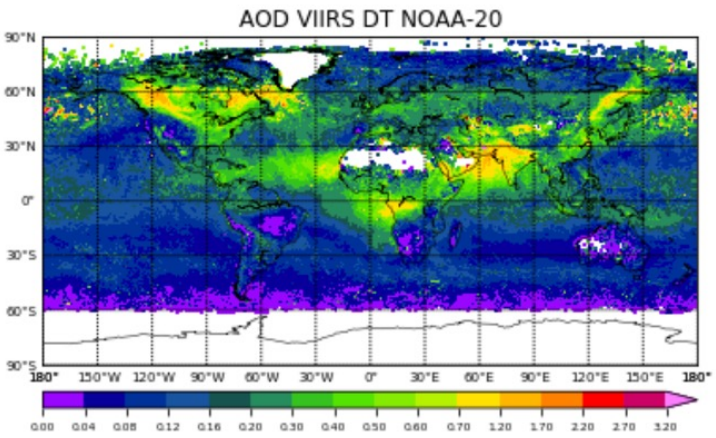


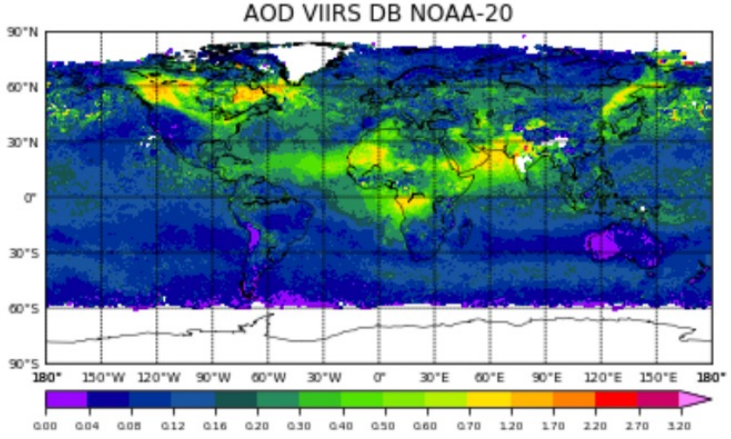
NOAA Operational, Dark Target V2.0 and Deep Blue V2.0 July 2023 AOD

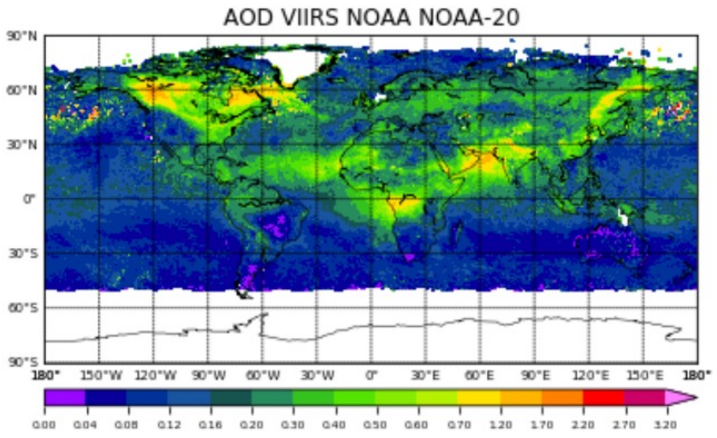






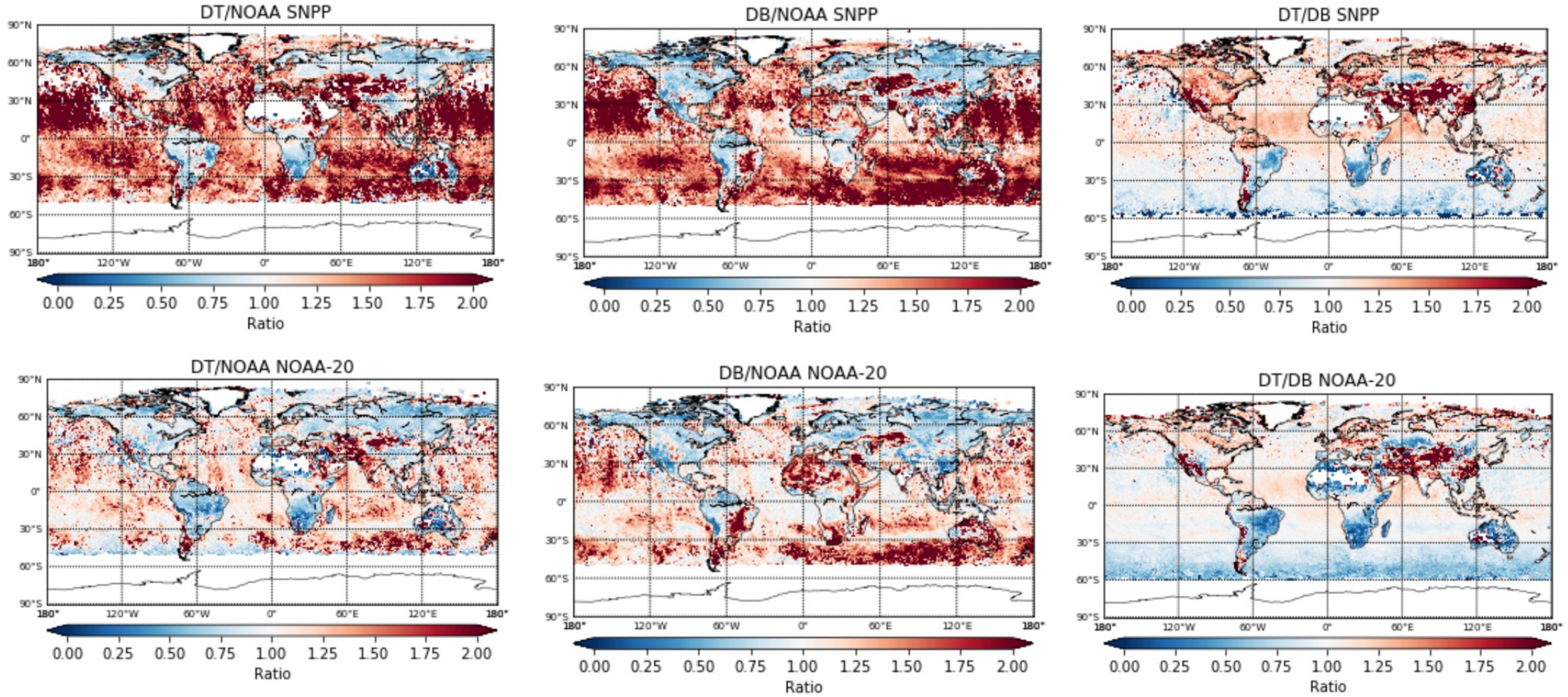






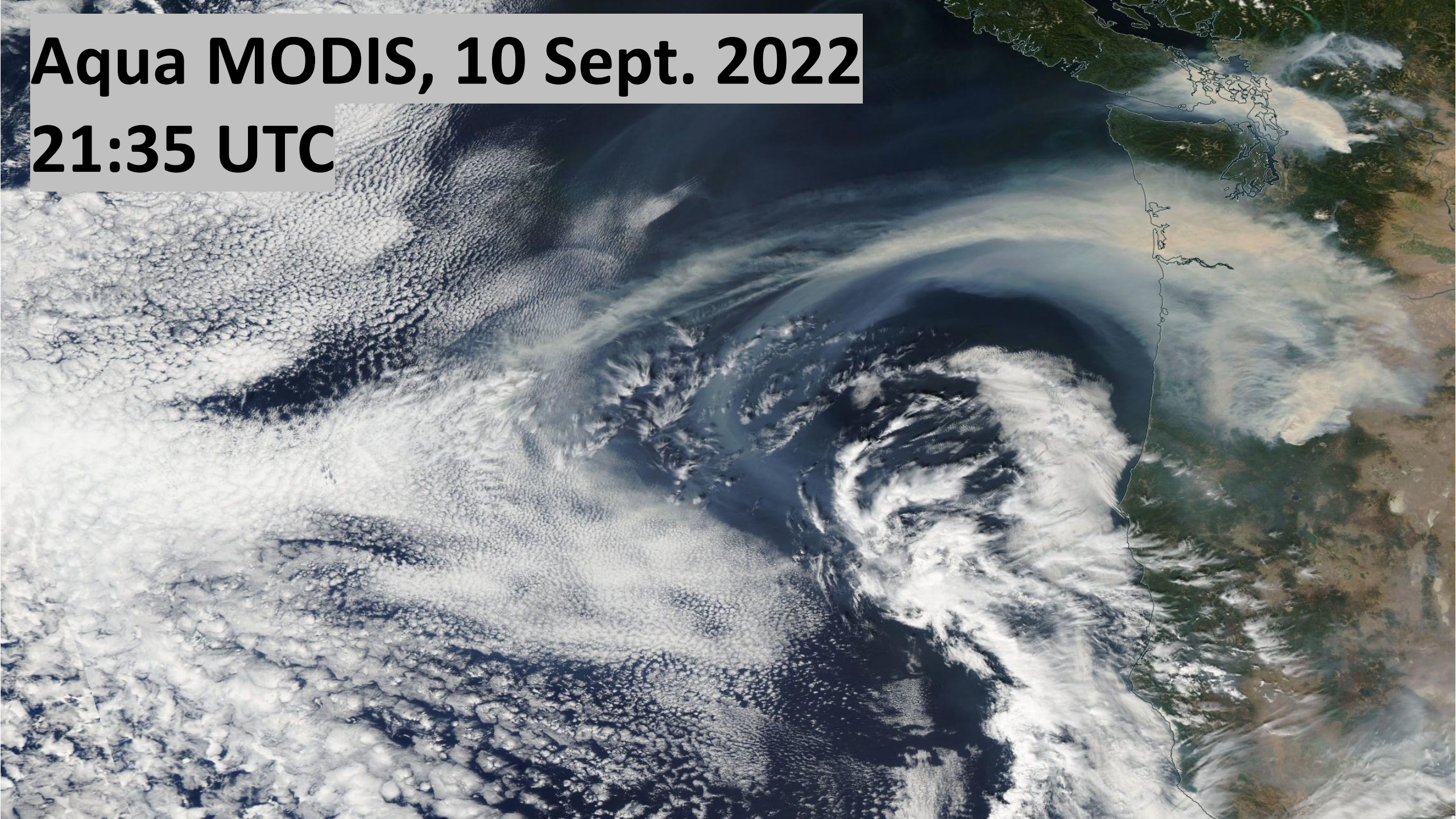
Global L3 AOD retrievals for Dark Target (DT) V2.0, Deep Blue (DB) V2.0 and the NOAA operational product is presented for July 2023.

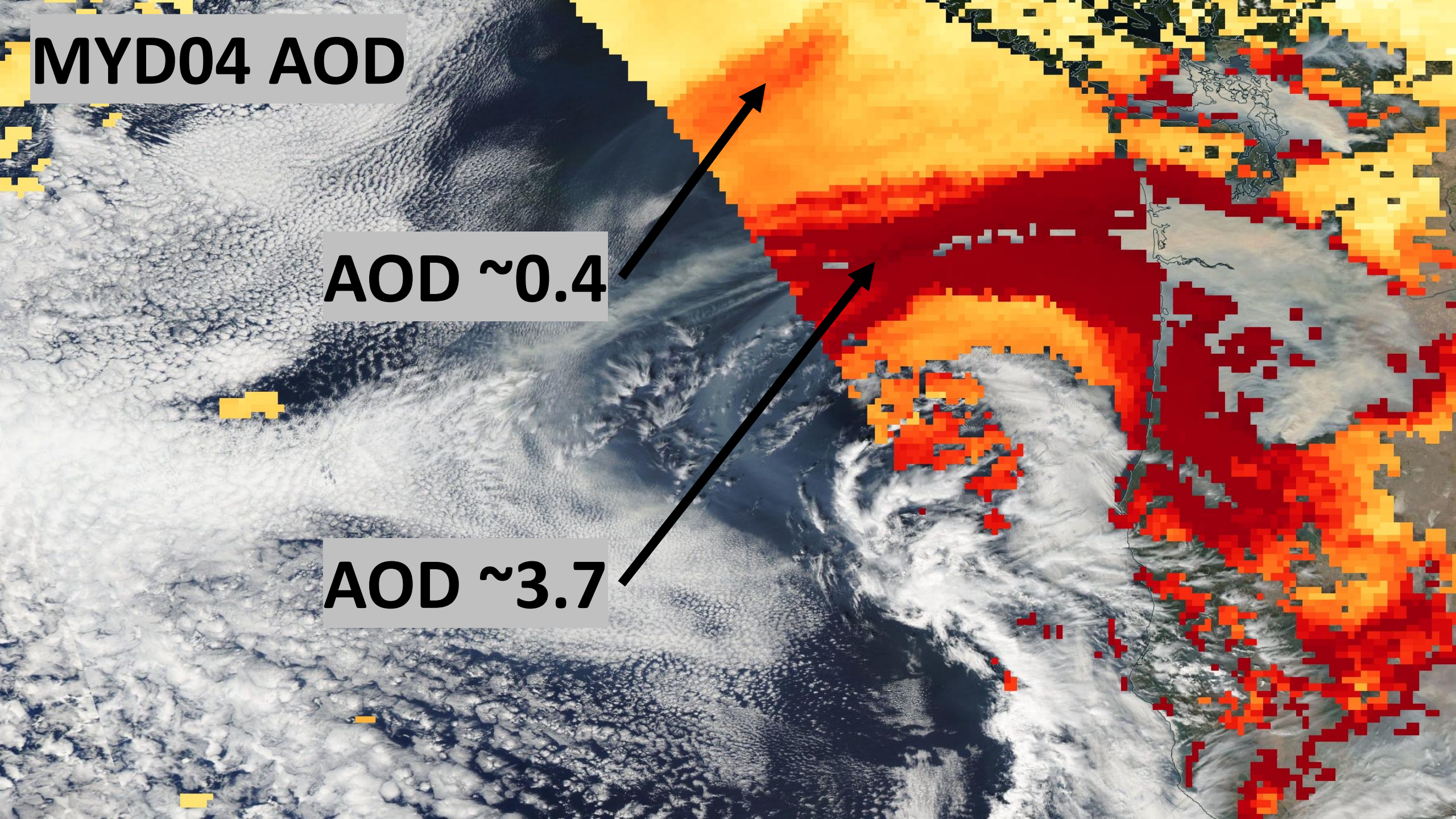
July 2023 AOD Ratios Comparing DT, DB, and NOAA Operational

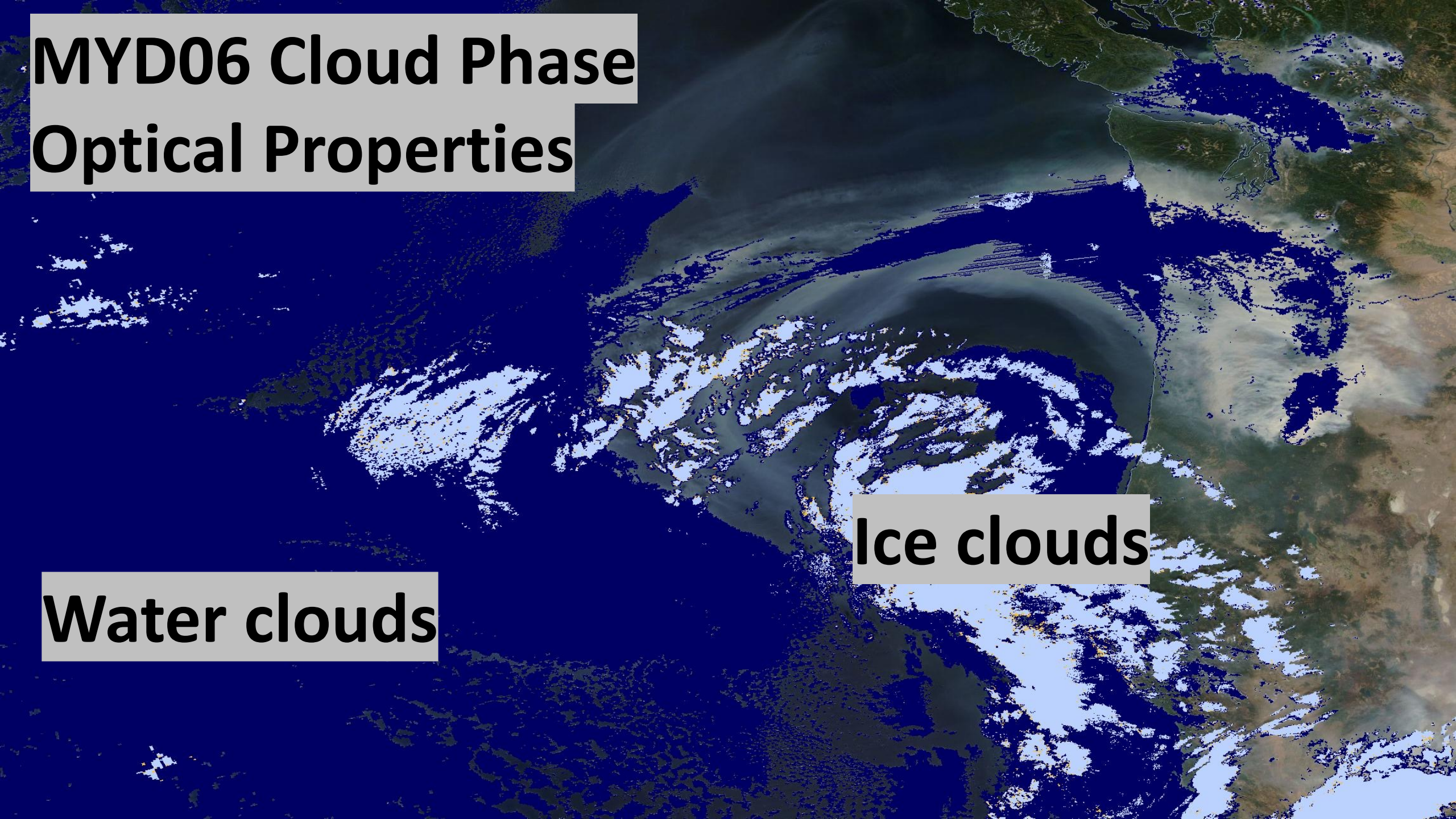


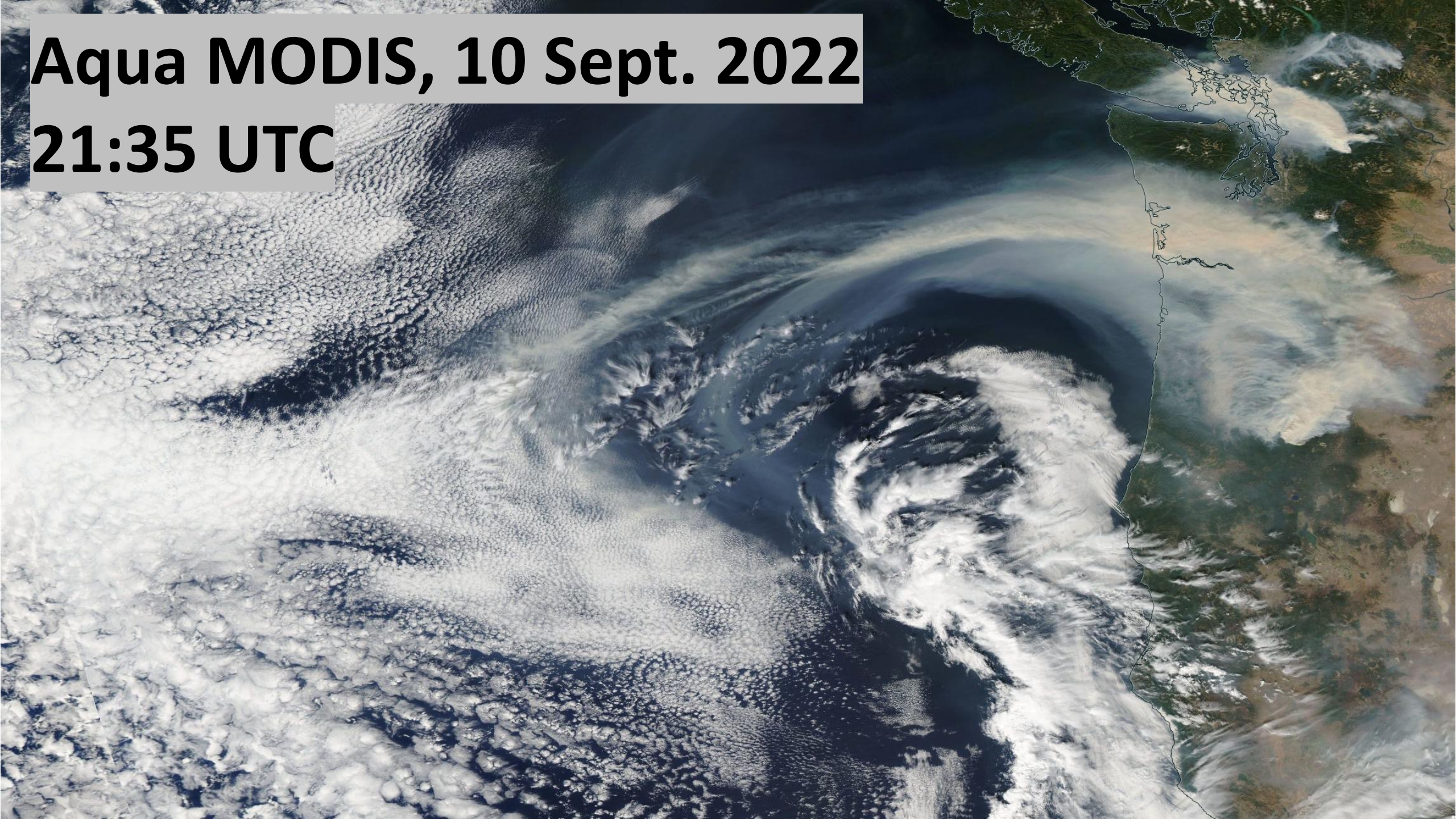
- Bias between (DT/DB) and NOAA operational AOD over oceans with DT/DB higher over ocean.
- DT, DB, and NOAA show regional differences (relative bias) over land.
- NOAA-20 demonstrates better agreement between DT/DB and NOAA operational retrieval.

Severe aerosol/cloud identification via machine learning


Aqua MODIS, 10 Sept. 2022
21:35 UTC

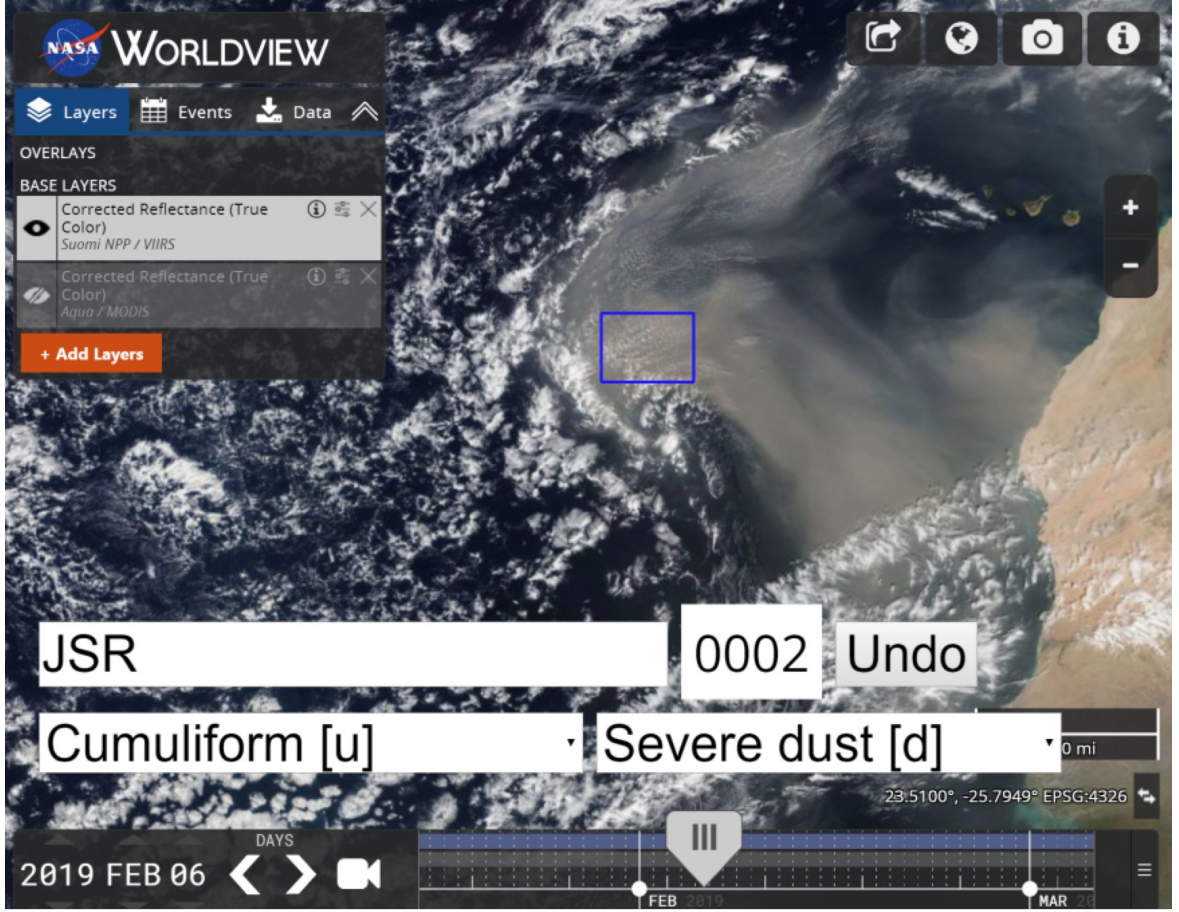

MYD04 AOD
AOD ~0.4
AOD ~3.7

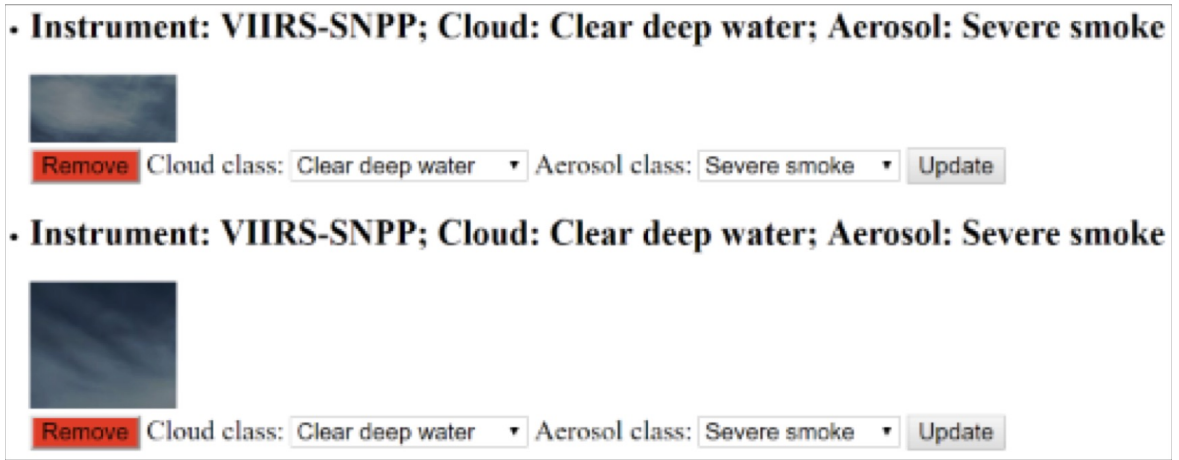

MYD06 Cloud Phase
Optical Properties
Ice clouds
Water clouds


Aqua MODIS, 10 Sept. 2022
21:35 UTC

Training dataset for CNN methodology

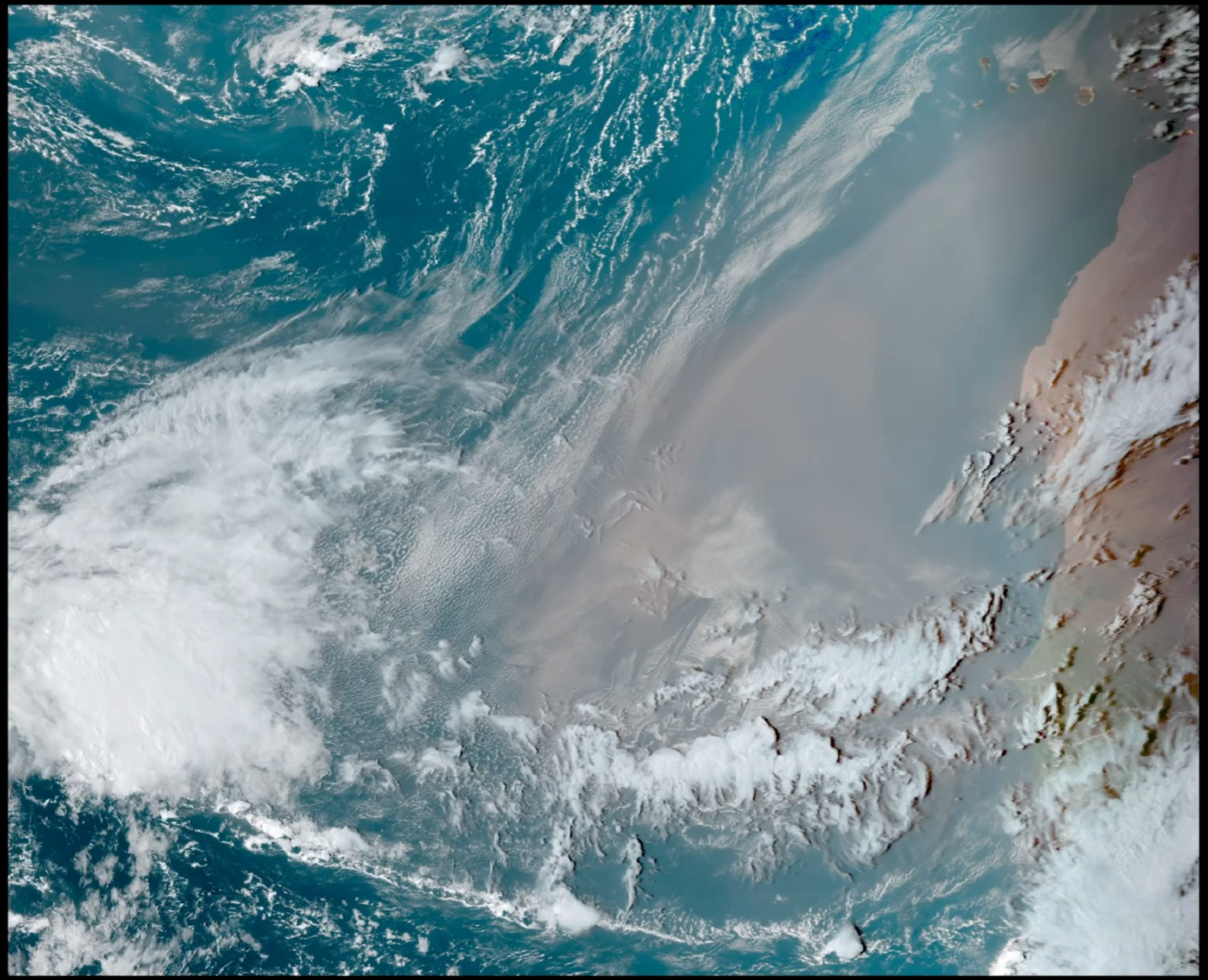
- Adapted NASA Worldview to label regions over images.
- Labels: “clear-sky”, aerosols, cirrus, cumuliform, open- and closed-stratiform.
- For now, only consider daytime over-ocean observations.





Marais, Willem J., Robert E. Holz, Jeffrey S. Reid, and Rebecca M. Willett, "Leveraging spatial textures, through machine learning, to identify aerosols and distinct cloud types from multispectral observations", AMT (2020)

GOES-16
2023/10/01
West of N-Africa



UW HSRL aerosol retrievals in marine environments (side scanning)

The Moisture & Aerosol Gradients/Physics of Inversion Evolution (MAGPIE)

Contact person: Jeff Reid

Sponsor:

The Moisture & Aerosol Gradients/Physics of Inversion Evolution (MAGPIE)

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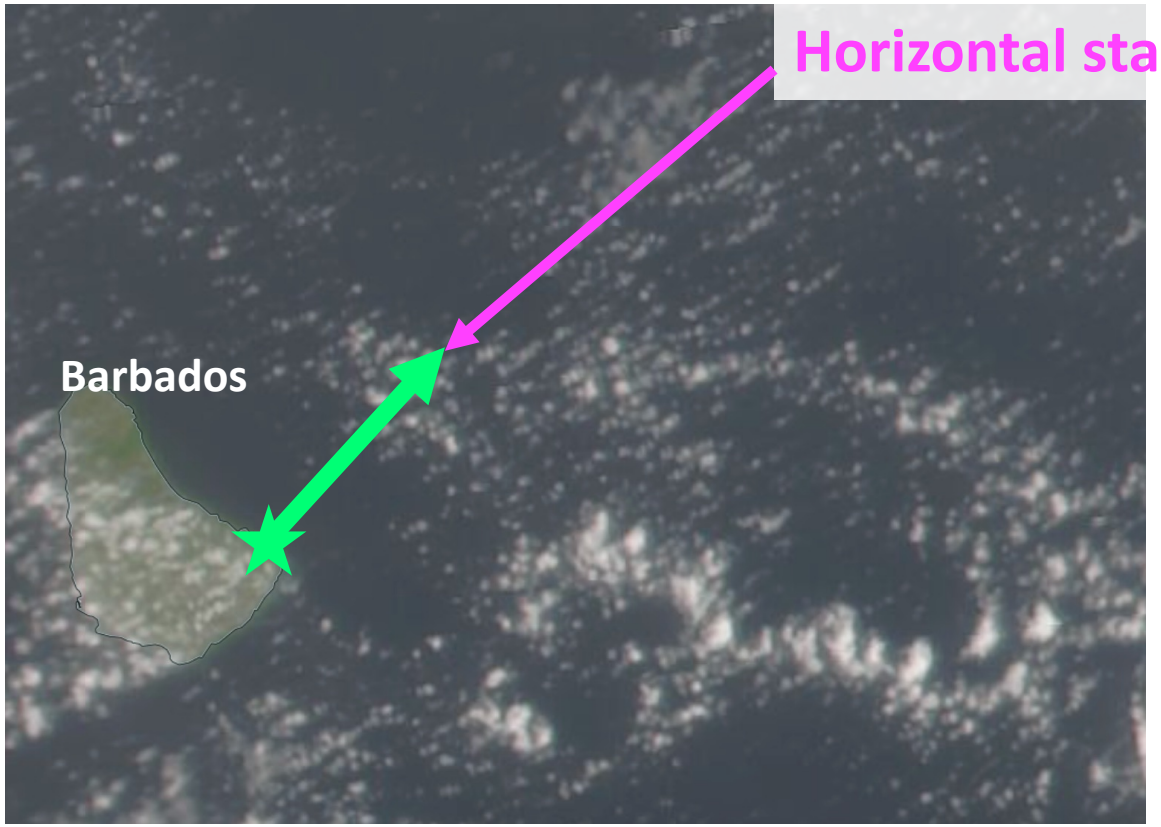
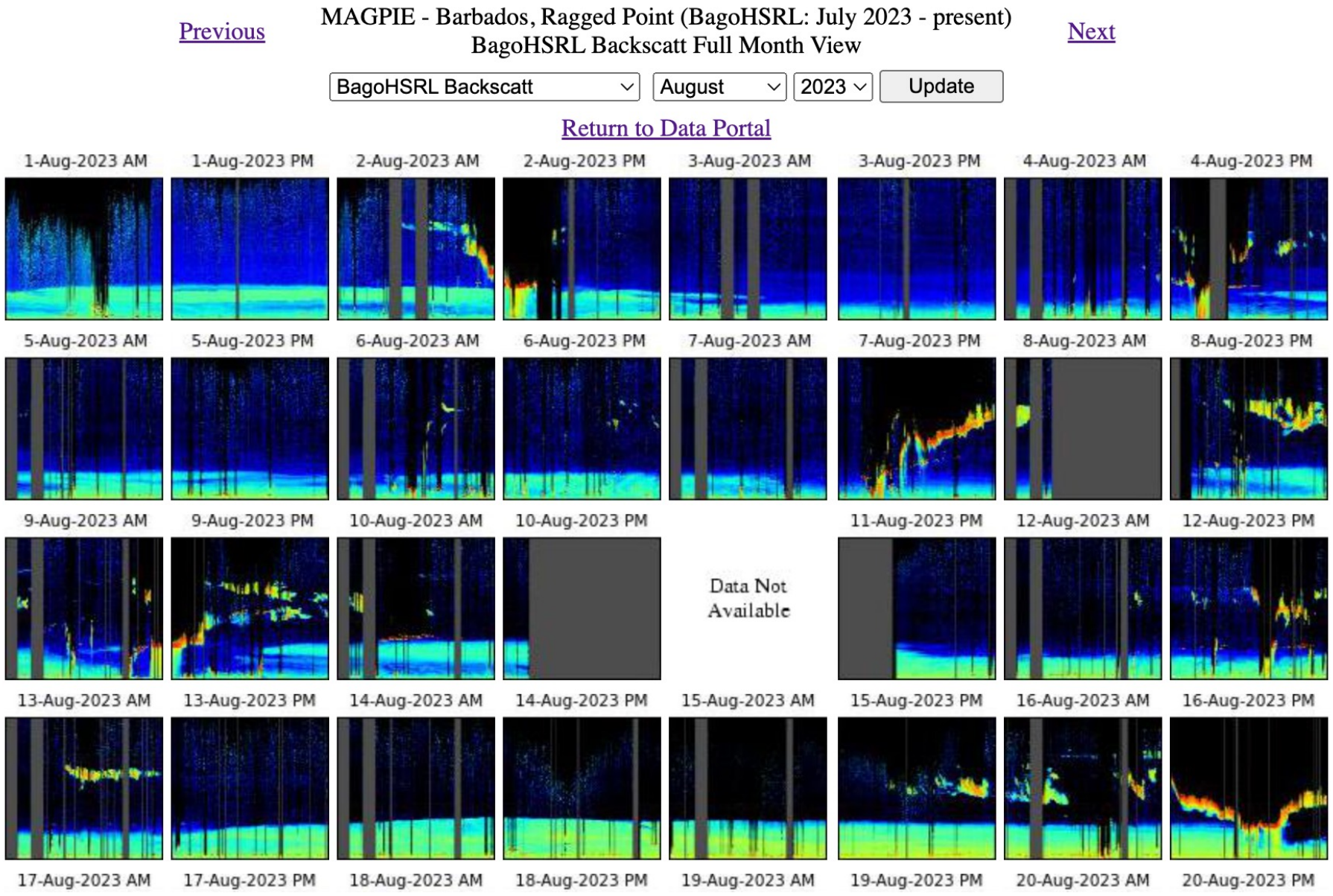
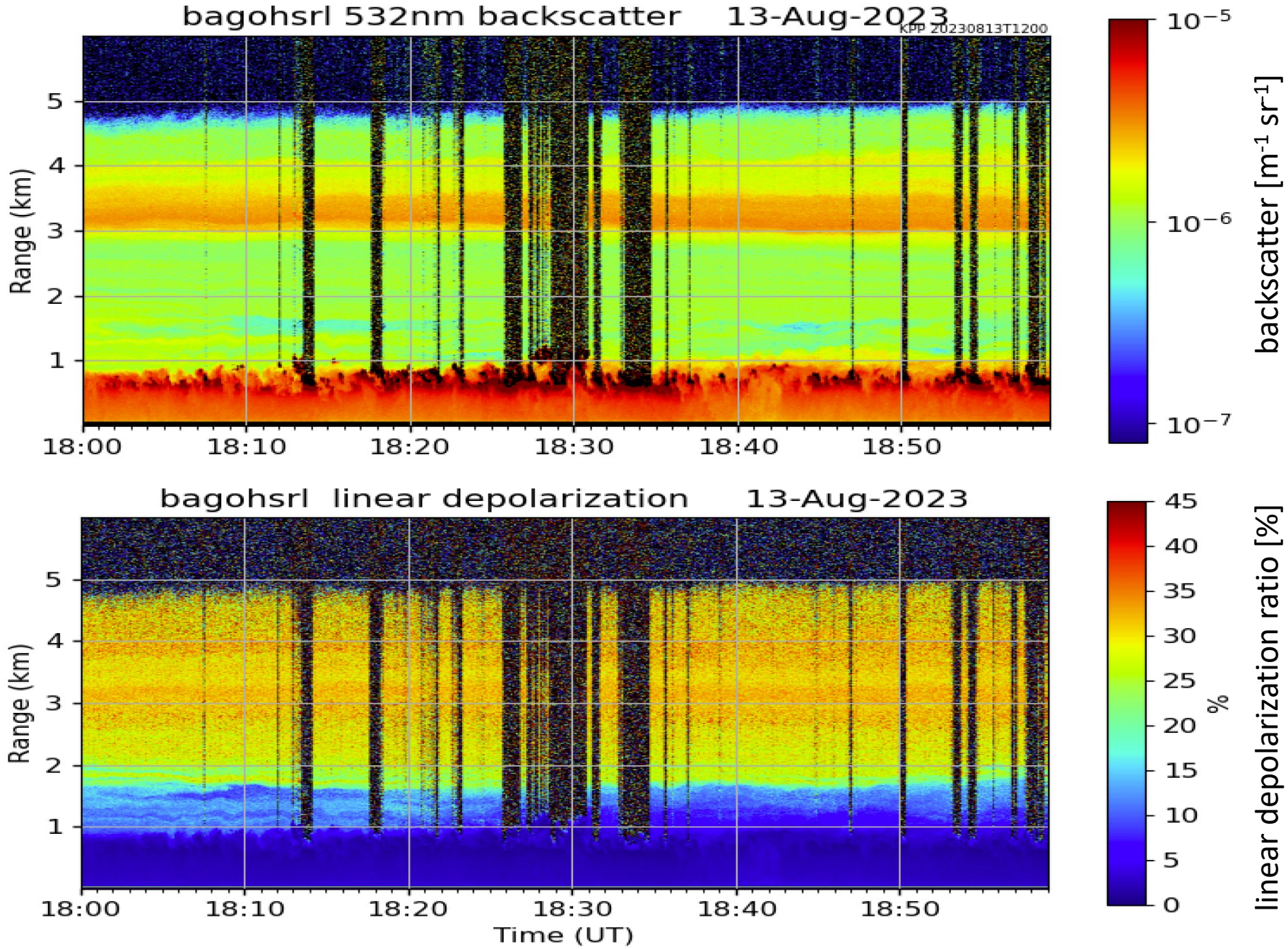


Sponsor:

Data access: hsrl.ssec.wisc.edu

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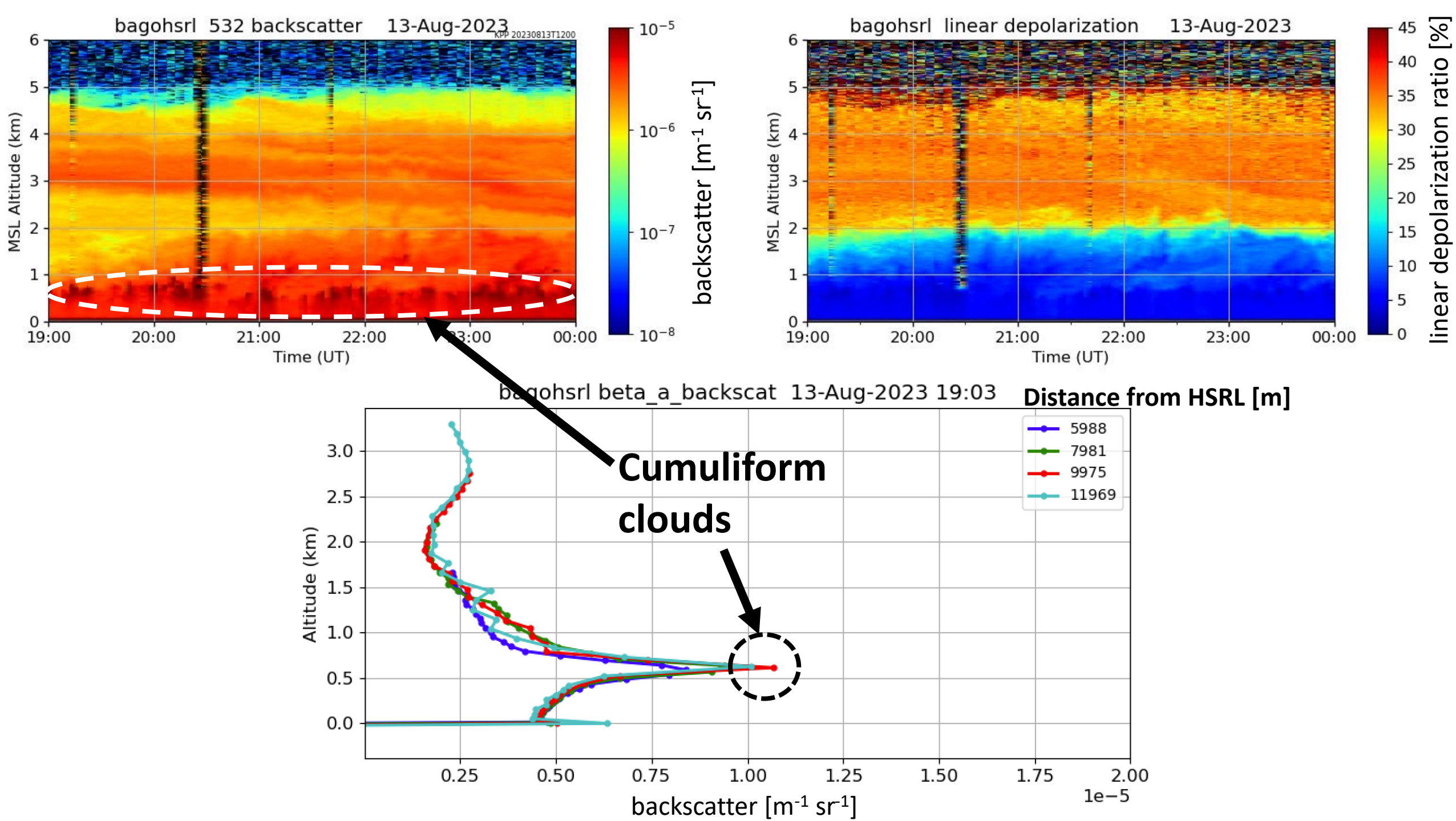
KPP 20230813T1200
Range (km)
1
2
3
4
5
18:00
18:10
18:20
18:30
18:40
18:50
10^{-5}
10^{-6}
10^{-7}
backscatter [m^{-1} sr^{-1}]
bagohsrl linear depolarization 13-Aug-2023
Range (km)
Time (UT)
45
40
35
30
25
20
15
10
5
0
%
linear depolarization ratio [%]


bagohsrl 532 backscatter 13-Aug-2023
KPP 20230813T1200
MSL Altitude (km)
Time (UT)
backscatter [m-1 sr-1]
bagohsrl linear depolarization 13-Aug-2023
linear depolarization ratio [%]
bagohsrl beta_a_backscat 13-Aug-2023 19:03
Distance from HSRL [m]
5988
7981
9975
11969
Cumuliform clouds
Altitude (km)
backscatter [m-1 sr-1]
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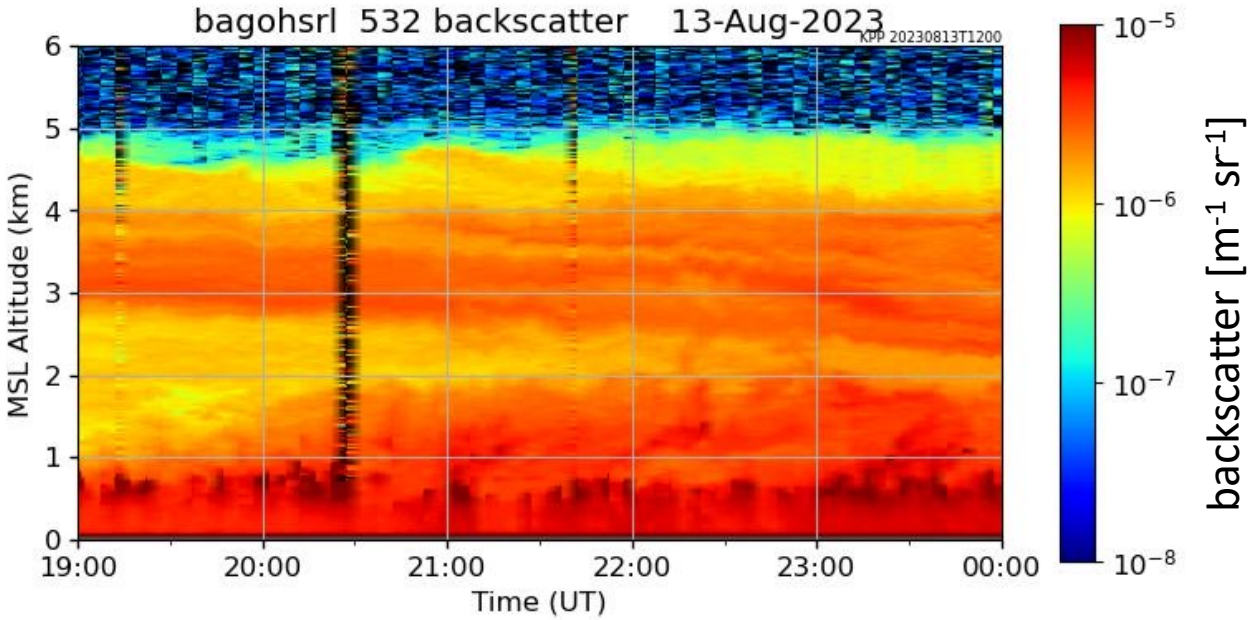
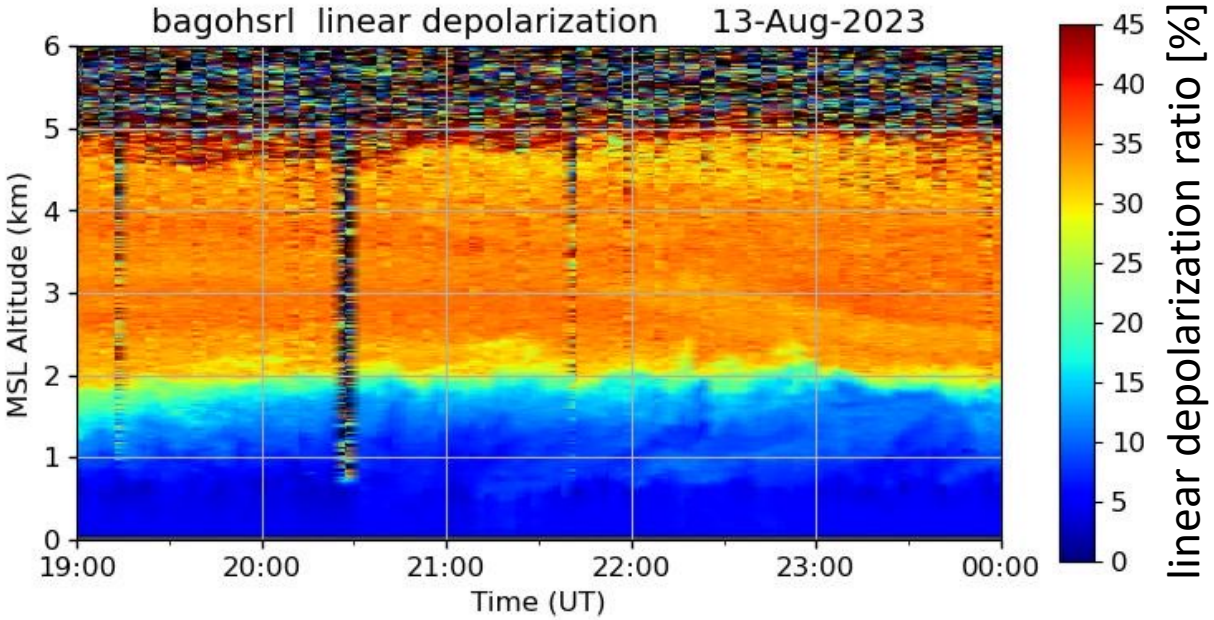

bagohsrl 532 backscatter 13-Aug-2023
KPP 20230813T1200
MSL Altitude (km)
Time (UT)
19:00
20:00
21:00
22:00
23:00
00:00
backscatter [m-1 sr-1]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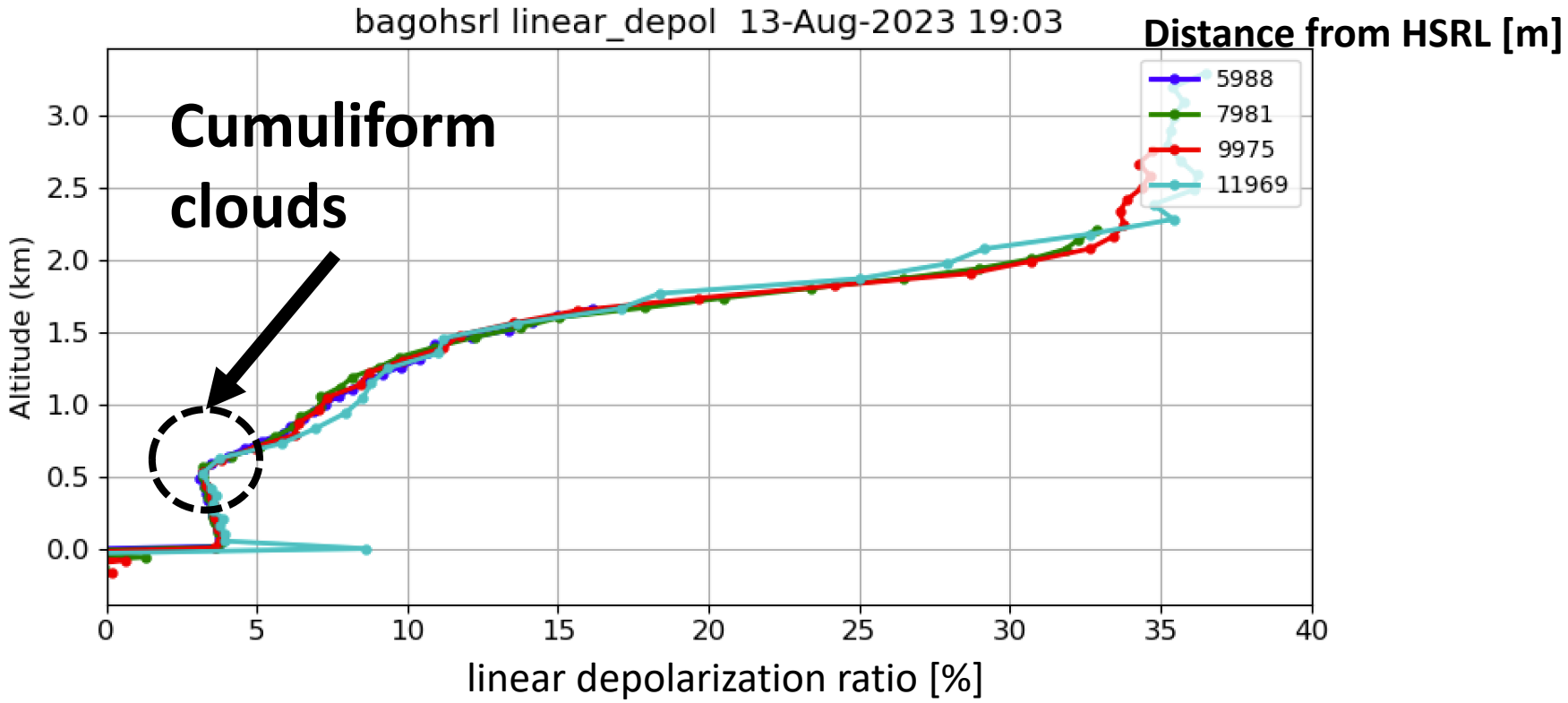
MSL Altitude (km)
Time (UT)
linear depolarization ratio [%]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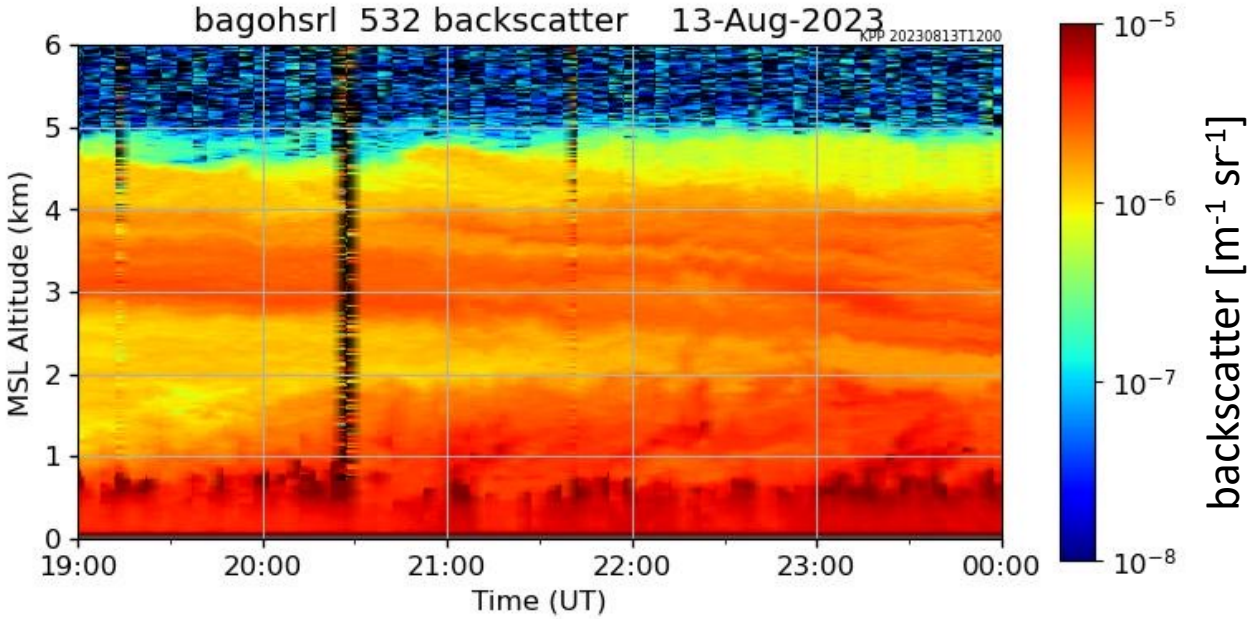
Distance from HSRL [m]
5988
7981
9975
11969
Cumuliform clouds
Altitude (km)
linear depolarization ratio [%]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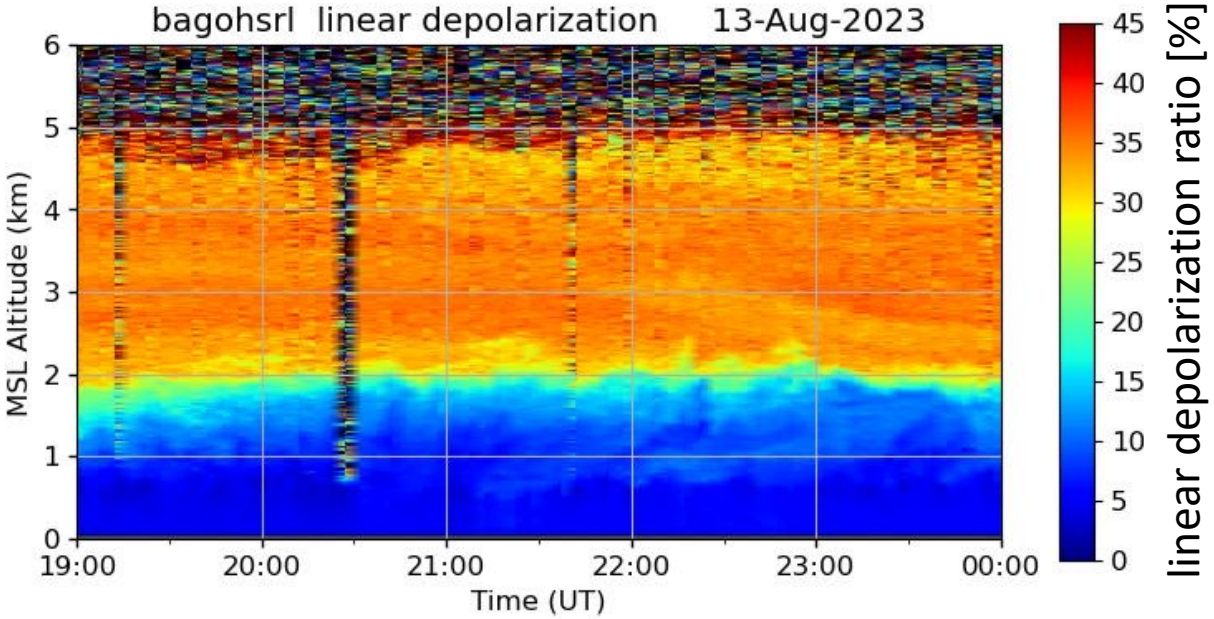
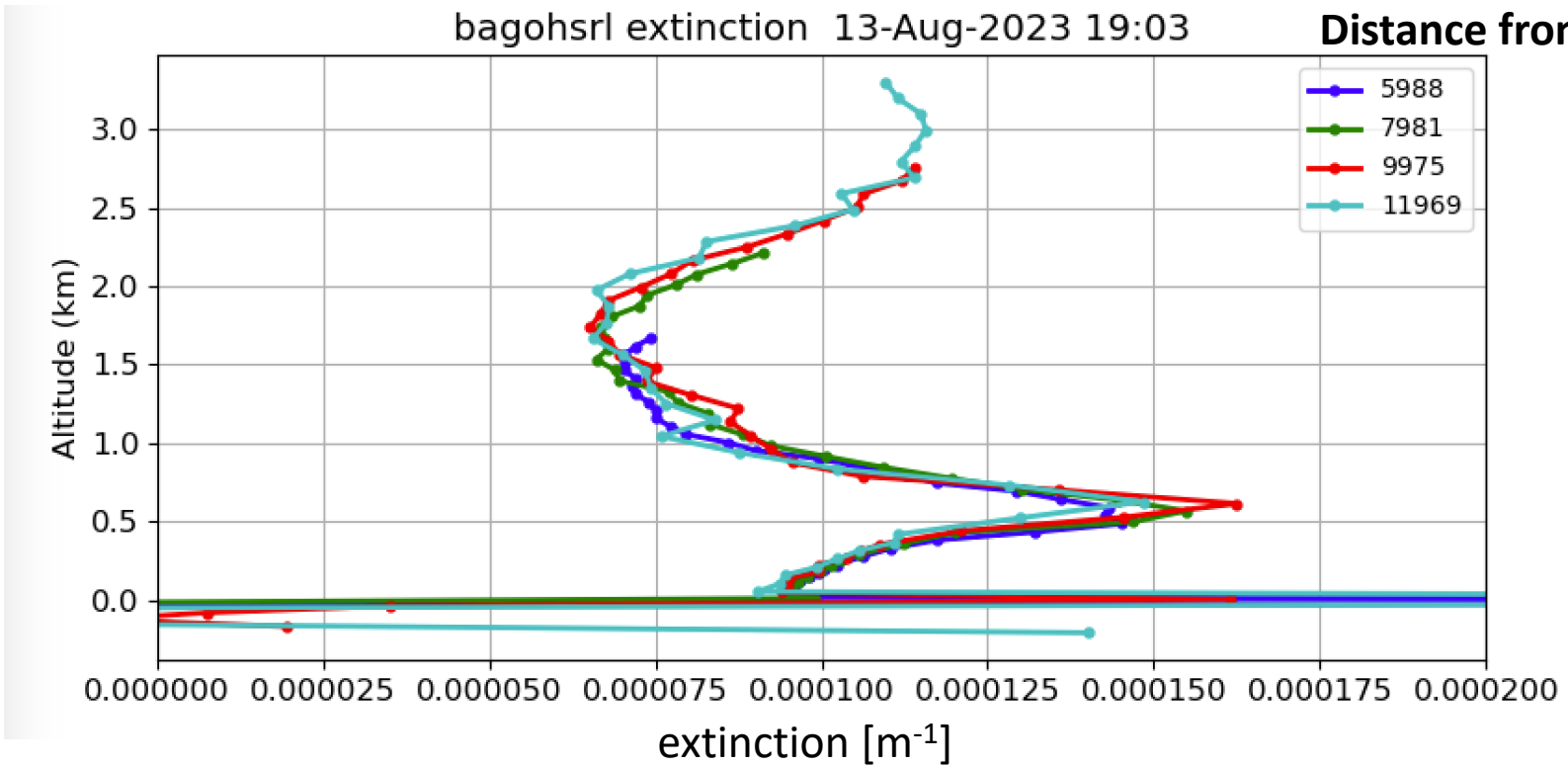
KPP 20230813T1200
MSL Altitude (km)
Time (UT)
19:00
20:00
21:00
22:00
23:00
00:00
backscatter [m-1 sr-1]


bagohsrl linear depolarization 13-Aug-2023
MSL Altitude (km)
Time (UT)
linear depolarization ratio [%]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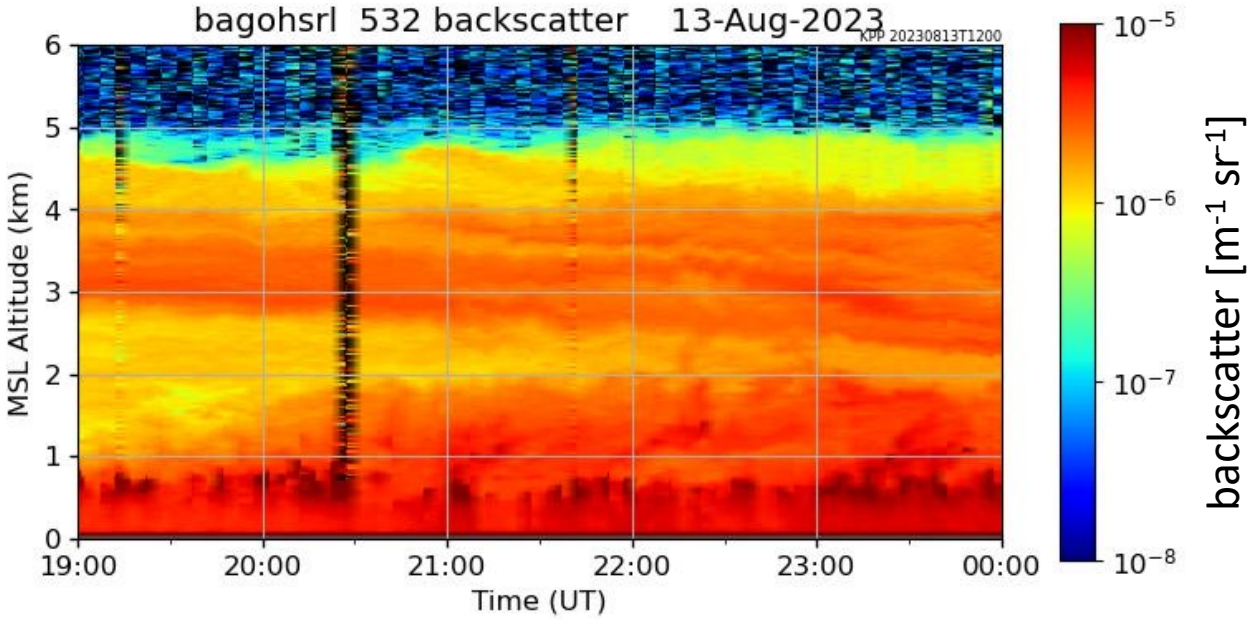
Altitude (km)
extinction [m-1]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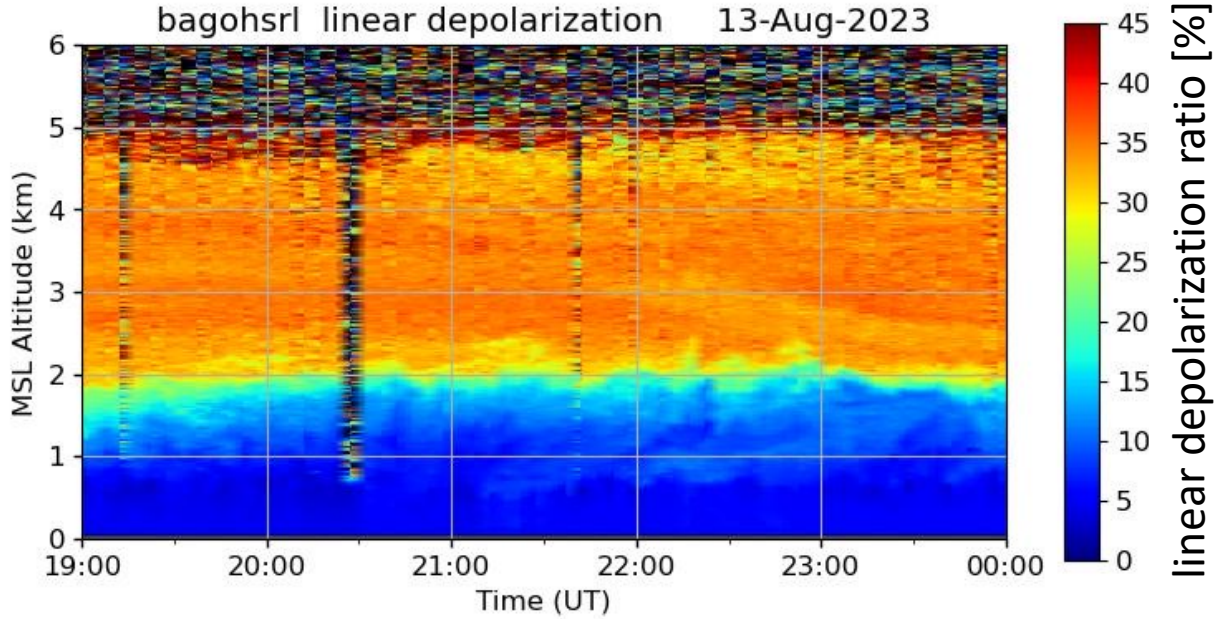
KPP 20230813T1200
MSL Altitude (km)
Time (UT)
backscatter [m-1 sr-1]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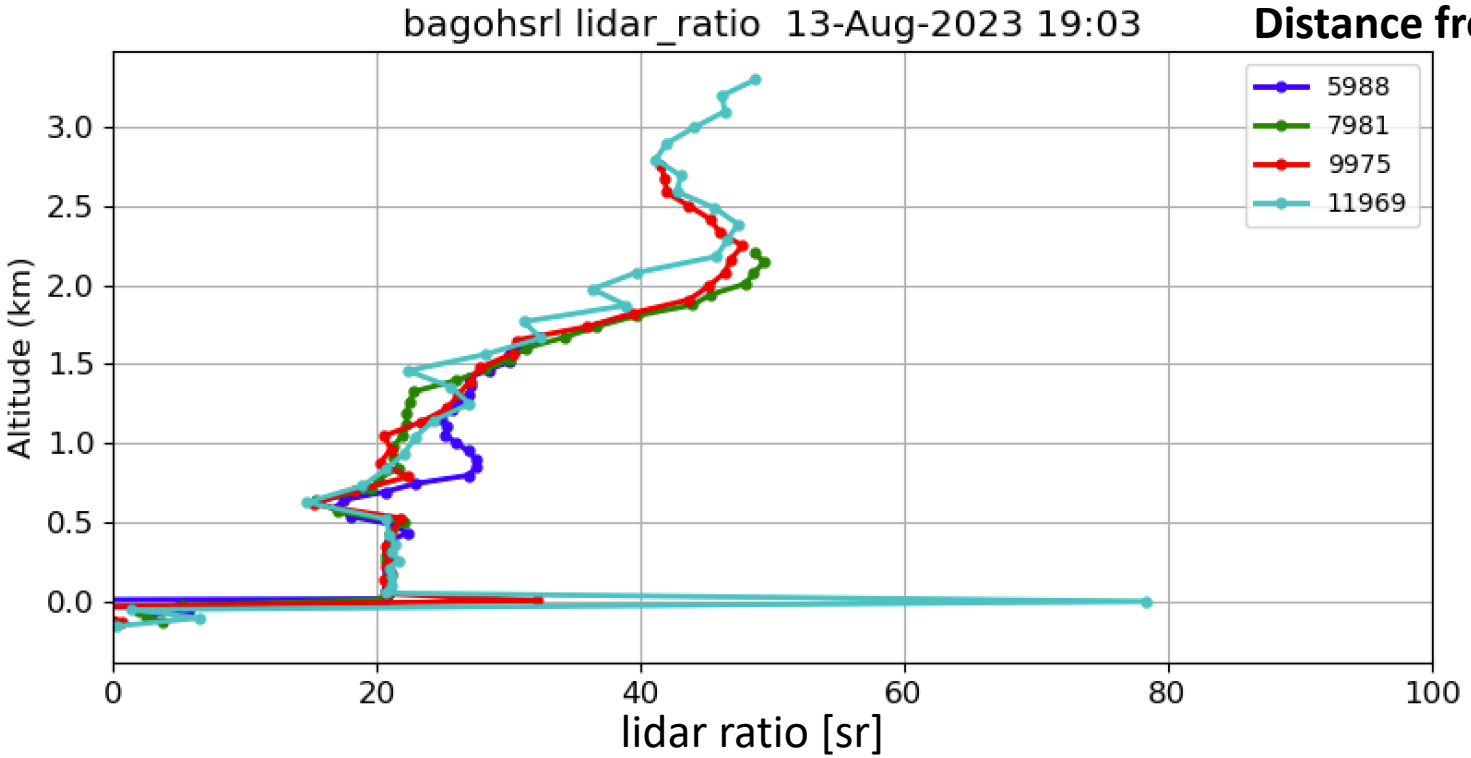
MSL Altitude (km)
Time (UT)
linear depolarization ratio [%]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9975
11969
Altitude (km)
lidar ratio [sr]