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TAKING THE PULSE OF OUR PLANET FROM SPACE

Validation Study of ALH/S5p Product using Ground Based Active Remote Sensing Measurements From European Networks

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Introduction and motivation



- Develop a operational procedure for comparison between Aerosol Layer Height product derived from S5P/TROPOMI and ground based active remote sensing measurements;
- Tropomi ALH is based on absorption by oxygen in the A band; 759 770 nm;
- Complementary to UVAI aerosol products from S5P;
- EARLINET European Lidar Network;
- Neural Network Aerosol Typing Algorithm Based on Lidar Data (NATALI) was developed to estimate the most probable aerosol type from a set of multispectral lidar data. The algorithm was adjusted to run on the EARLINET 3β+2α(+1δ) profiles;
- Intensive aerosol optical parameters for each identified aerosol layer;

https://earlinet.org

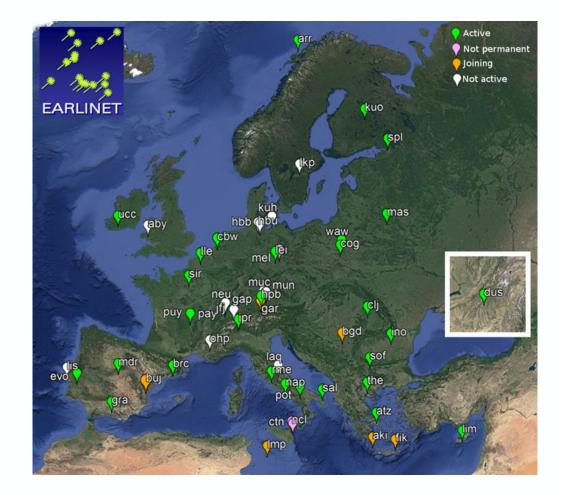
Nicolae, D., Vasilescu, J., Talianu, C., Binietoglou, I., Nicolae, V., Andrei, S., and Antonescu, B.: A neural network aerosol-typing algorithm based on lidar data, Atmos. Chem. Phys., 18, 14511–14537, https://doi.org/10.5194/acp-18-14511-2018, 2018. TROPOMI ATBD of the Aerosol Layer Height product. source: KNMI; ref: S5P-KNMI-L2-0006-RP; issue: 1.0.1; date: 2019-06-24



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European Lidar network

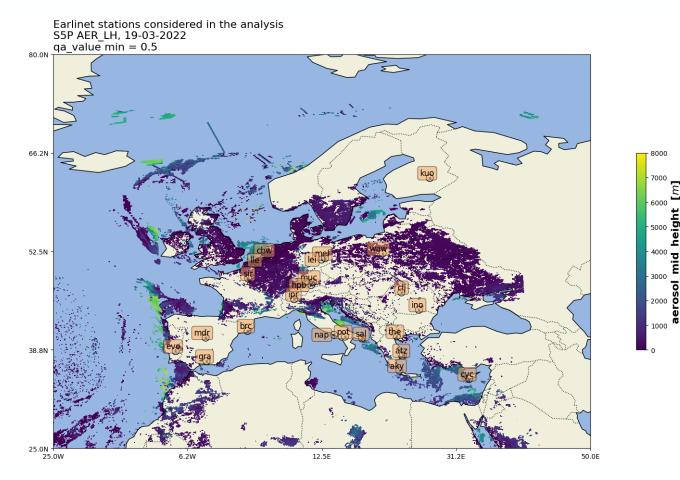




Preamble



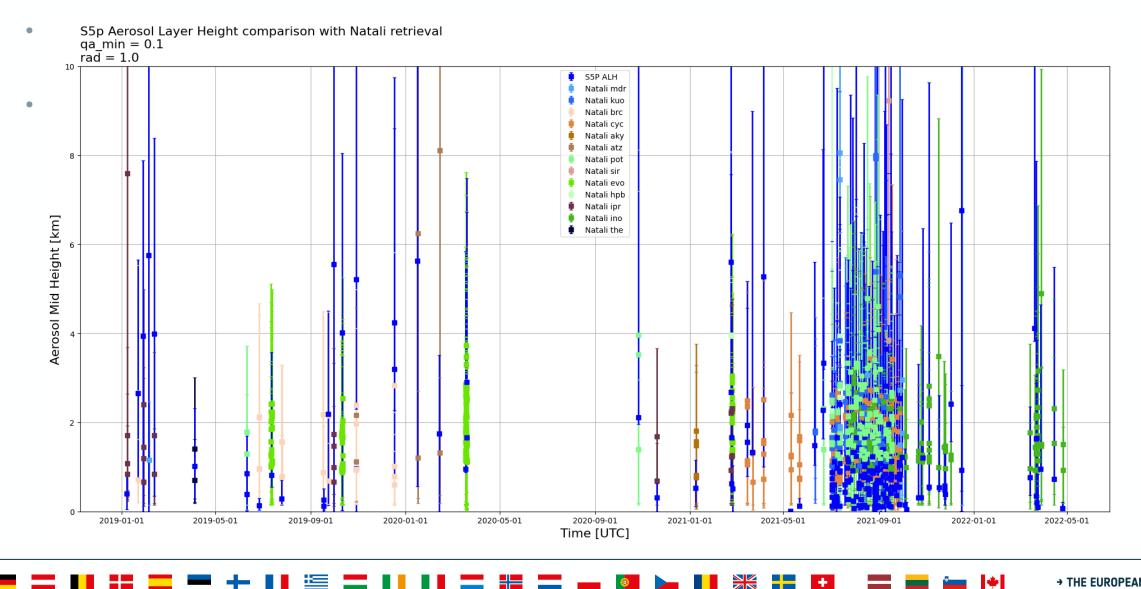
- ROI EUROPE;
 - Lat = 25 80N;
 - Lon = 25W 50E;
- Timeframe 2018 2022;
- Tropomi operational L2 ALH
 - OFFL + RPRO;
- EARLINET database
 - 24 stations;
 - 30 min average profiles regardless of the LIDAR's temporal resolution





Methodology

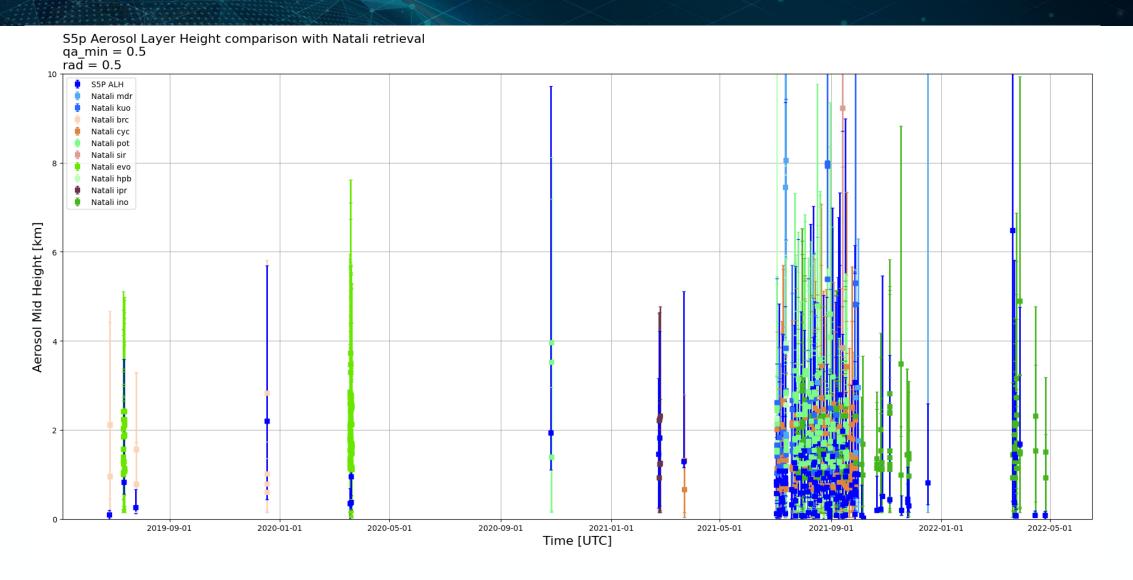




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Challenges

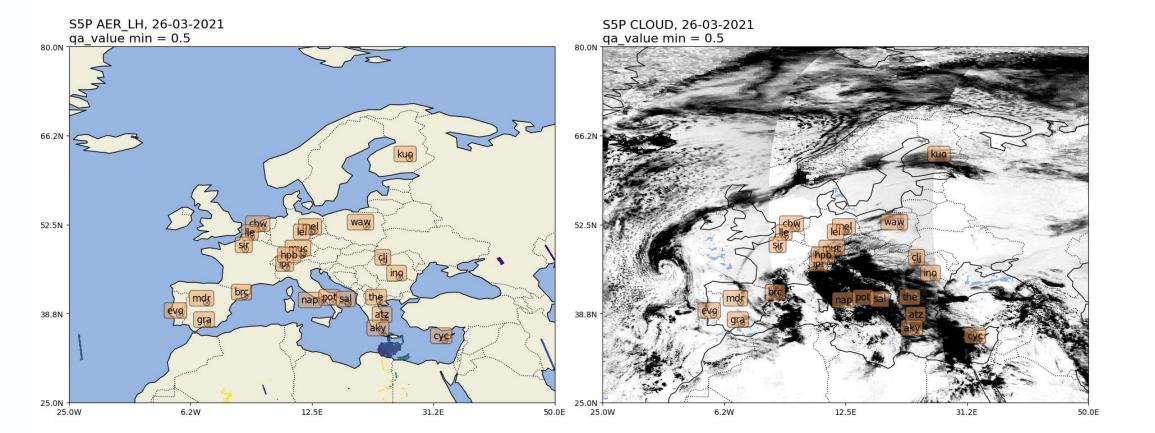


- L2 ALH processor, before and after July 2021;
- Ground based nighttime measurements;
- Time difference and profile averaging;
- Low LH values from satellite retrieval;



Challenges – stringent filter on L2 ALH

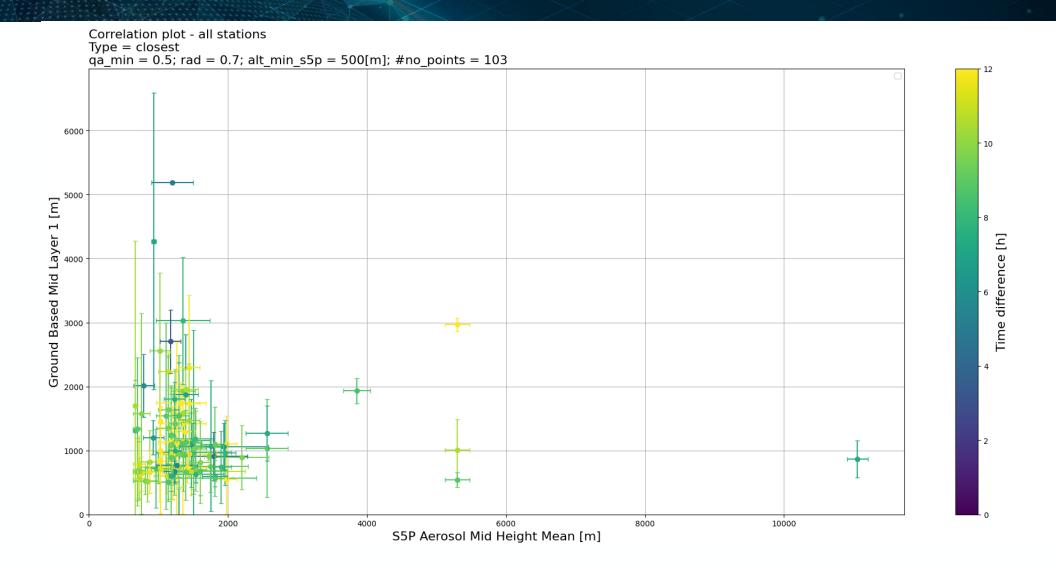




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Challenges – Nighttime ground based

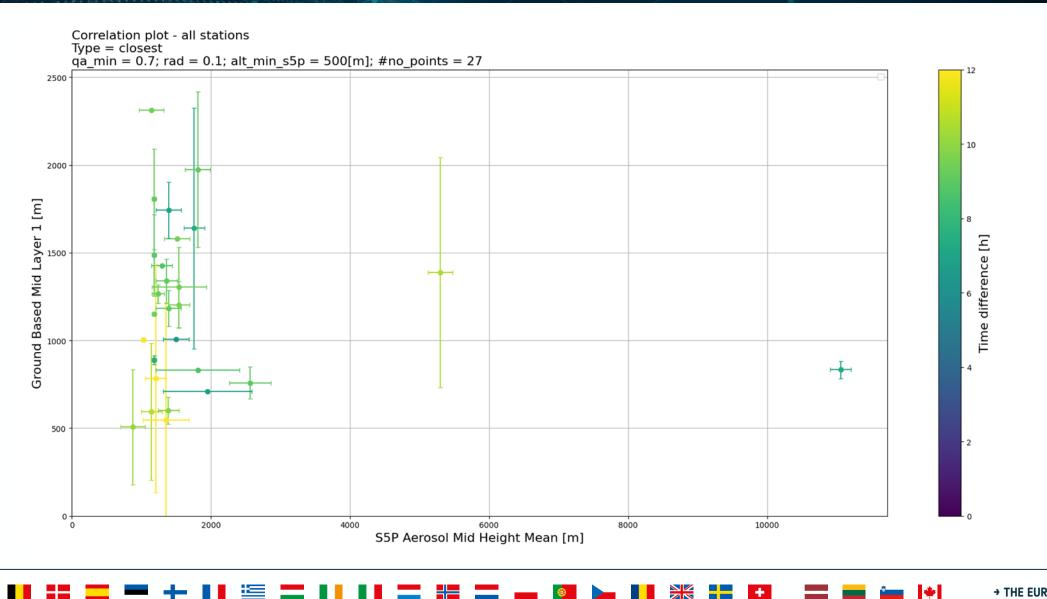






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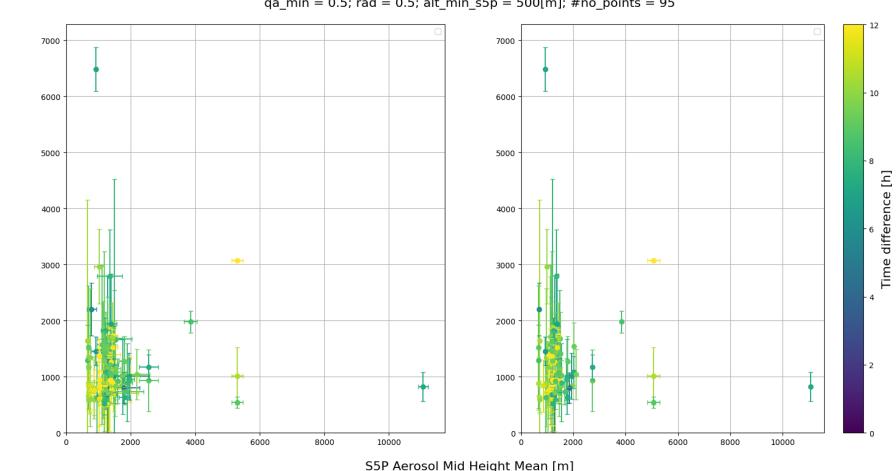
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Challenges – Nighttime ground based – average vs closest profile

Ground Based Mid Layer 1 [m]

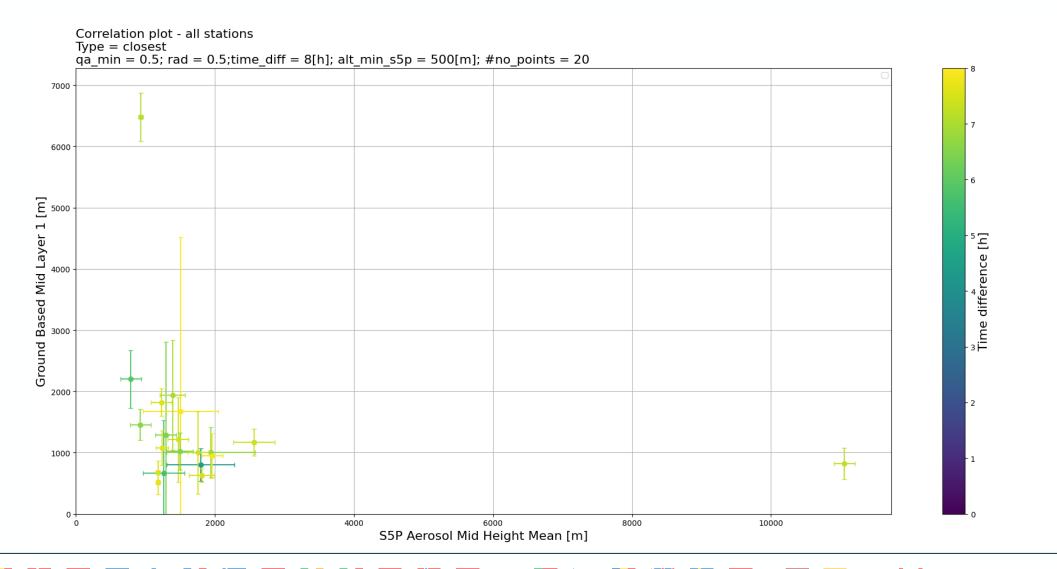


Correlation plot - all stations Type = closest + average qa_min = 0.5; rad = 0.5; alt_min_s5p = 500[m]; #no_points = 95



Time difference



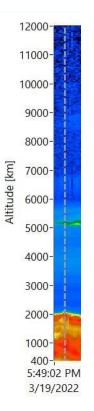


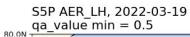
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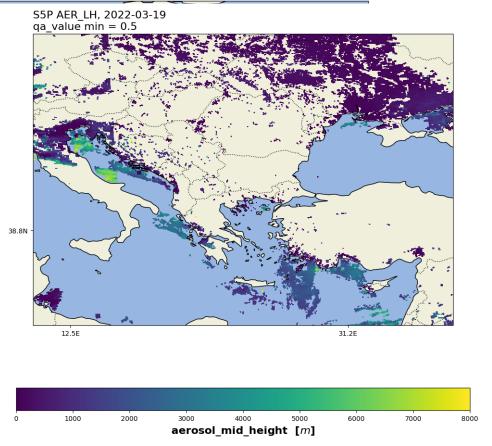
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Ongoing – Use cases









aerosol_mid_height [m]

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- On a path for developing a procedure for operational validation of TROPOMI L2 ALH product using groundbased LIDAR network -> towards statistically relevant co-locations;
- Improvement in the processor increase data availability;
- Time differences between ground based and satellite can be overcome with continuous LIDAR measurements -> adapted NATALI;
- Use of Ceilometer data E-Profile network;
- Validation based on specific events.



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