First Assessment on Potential Improvements of Sea Salt Emissions Due to Assimilation of Aeolus Wind Fields.

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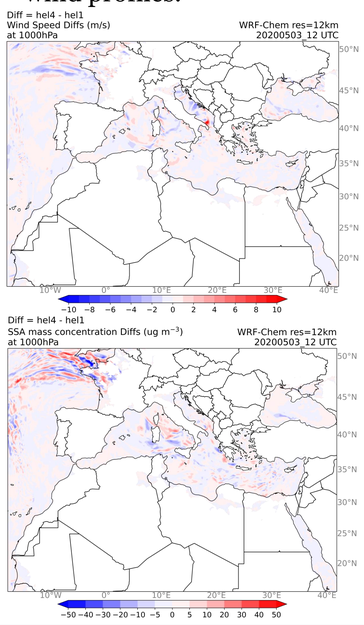
Objective

The emission of sea-salt aerosols is governed by various physical processes, with a strong dependence on wind. The present work aims to investigate possible improvements in sea salt emissions when Aeolus wind profiles are assimilated in regional scale atmospheric models. Towards this objective, two different Weather Research and Forecasting (WRF) model configuration experiments were conducted, each one was initialized with different ECMWF IFS outputs - one with (hel1) and one without (hel4) assimilation of Aeolus Rayleigh and Mie L2B wind fields.

Aeolus Assimilation

WRF output, produced by the two different initial and boundary conditions (ICs & BCs) data sets (hel1 & hel4), are compared for assessing the potential improvements in the representation of marine aerosol transport attributed to the assimilation of Aeolus wind profiles.



Example of wind speed differences (hel4 – hel1, top) and sea salt mass concentration (ug m^{-3}) differences (hel4 – hel1, bottom), at 1000hPa, on 2020-05-03_12:00:00 UTC, with a 12km horizontal resolution.

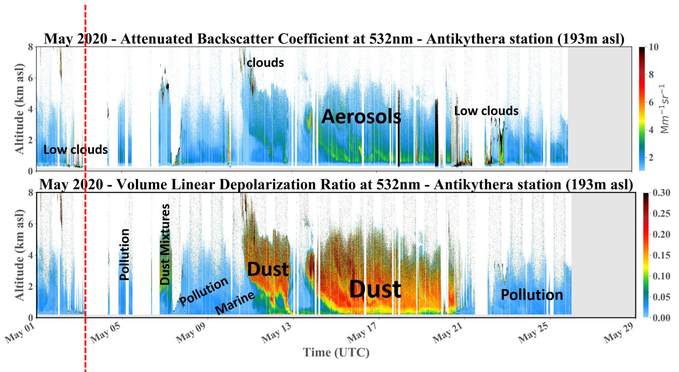
Data & Methodology

COVID-19 Campaign

EARLINET COVID-19 campaign was conducted at the PANGEA (PANhellenic GEophysical observatory of Antikythera) marine site between 01 to 29/5/2020. Observations from the PollyXT multi-wavelength Raman polarization lidar of the National Observatory of Athens (NOA) are used (Backscatter Coefficient at 532nm (upper plot); Particle Linear Depolarization Ratio at 532nm (lower plot)) along with the AERONET measurements, to derive marine concentrations using Garlic algorithm.

PANGEA Observatory

PollyXT-NOA

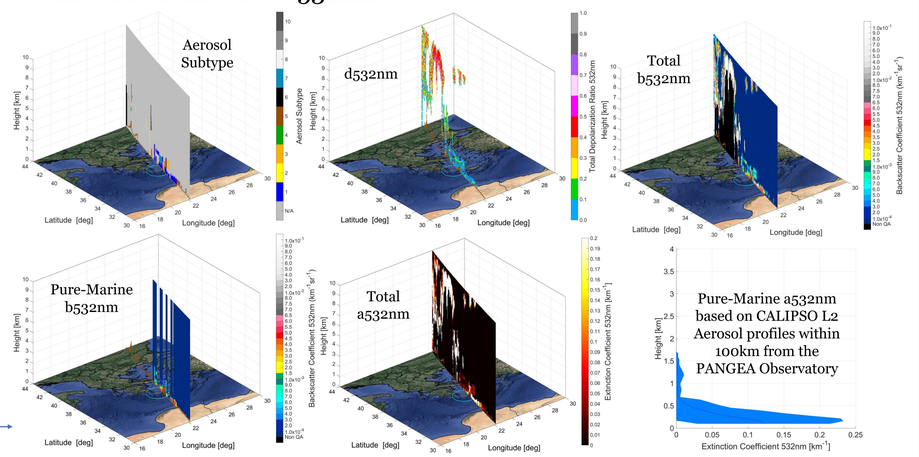


PANGEA-CALIPSO overpass: '2020-05-03T00-41-02ZN'
Closest observation: '2020/05/03 00:47:45UTC'

Study case

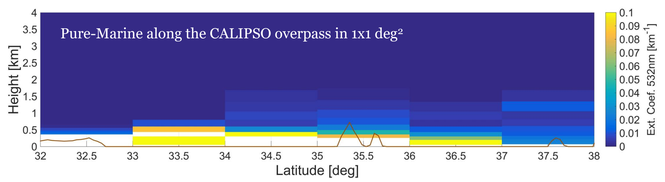
Satellite EO of Marine Aerosol

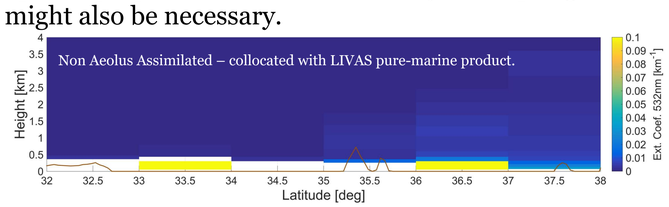
The pure-marine product is developed using CALIPSO L2 aerosol backscatter coefficient and particulate depolarization ratio profiles, the one-step POLIPHON technique, and assuming external aerosol mixtures and distinct depolarization signatures of the different aerosol categories. The pure-marine backscatter coefficient product is extracted based on the summation of the clean-marine and the marine-component of dusty marine backscatter coefficient profiles, while suitable Lidar Ratio (LR) for marine aerosols is implemented towards the estimation of the pure-marine extinction coefficient at 532nm.

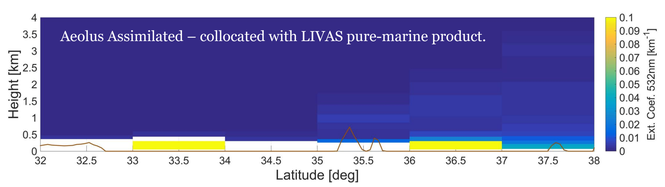


First Results

First results indicate high biases in the two WRF configuration experiments, both with and without assimilation of Aeolus Rayleigh and Mie L2B wind fields. Analysis of more CALIPSO overpasses is needed and a review of the algorithm used to calculate sea salt optical properties, that considers hydroscopic growth, might also be necessary.







Acknowledgements

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