

AEROCOM 2020

Assimilating aerosol optical properties related to size and absorption from POLDER/PARASOL with an ensemble data assimilation system

in other words...

Use satellite observations (aerosol amount, size & absorption) to “correct” the model

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Data Assimilation using AOD & AE & SSA



Retrieved



Simulated

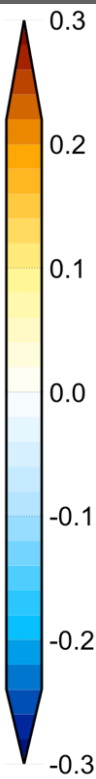
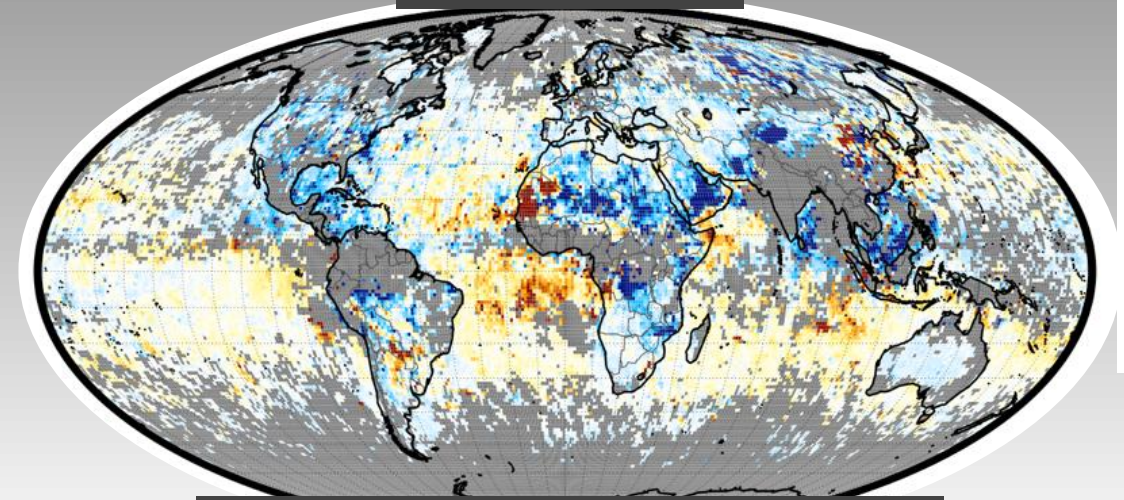
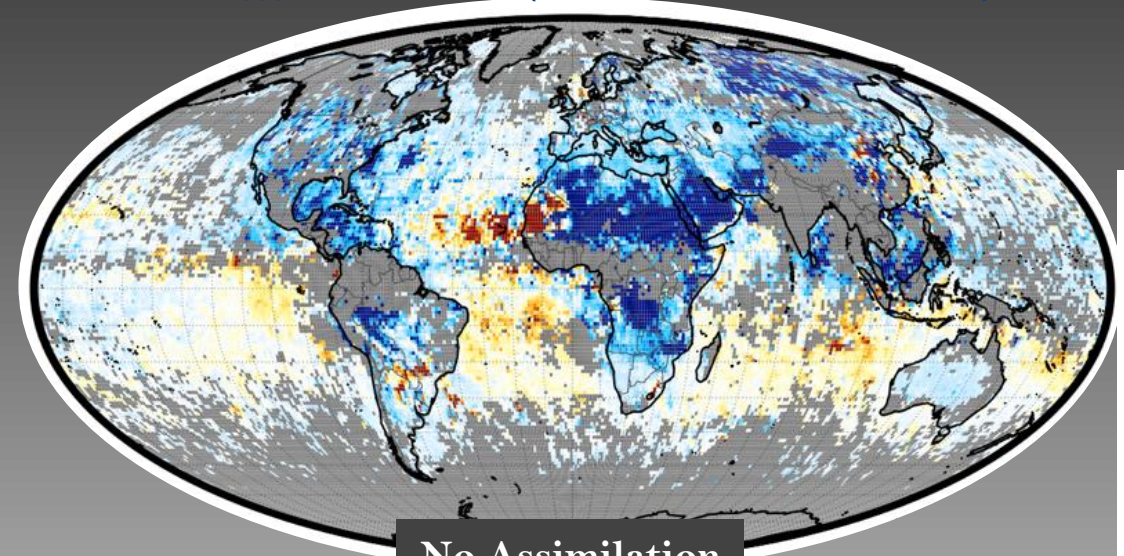
Aerosol Optical Depth (AOD) ~ Aerosol Amount
Angstrom Exponent (AE) ~ Aerosol Size
Single Scattering Albedo (SSA) ~ Aerosol Absorption

Data Assimilation

Improved Model
Aerosol Mixing Ratio



AOD₅₅₀ Differences (MODEL - SATELLITE)

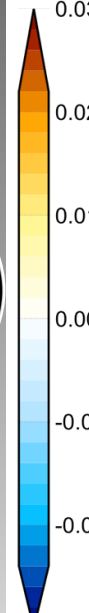
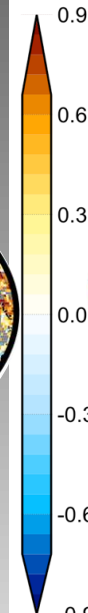
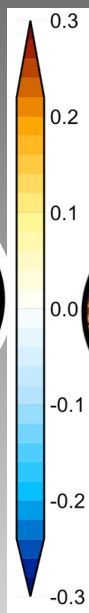
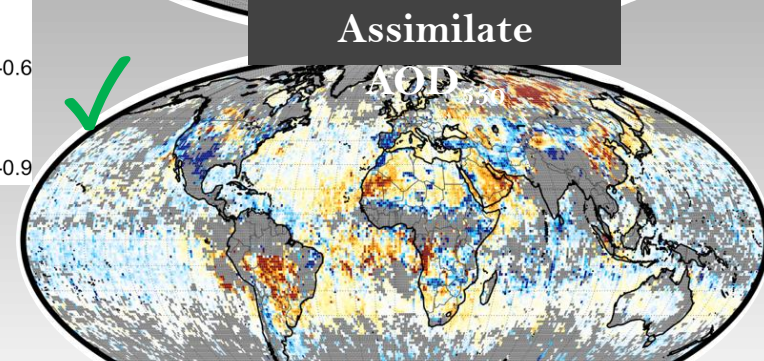
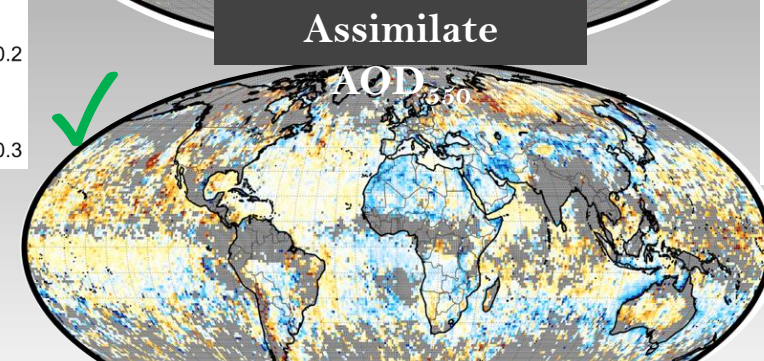
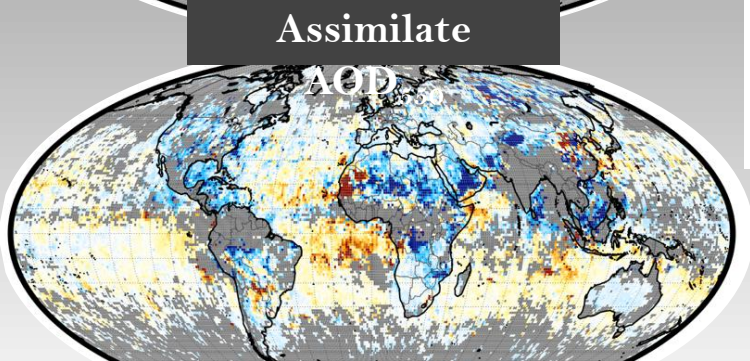
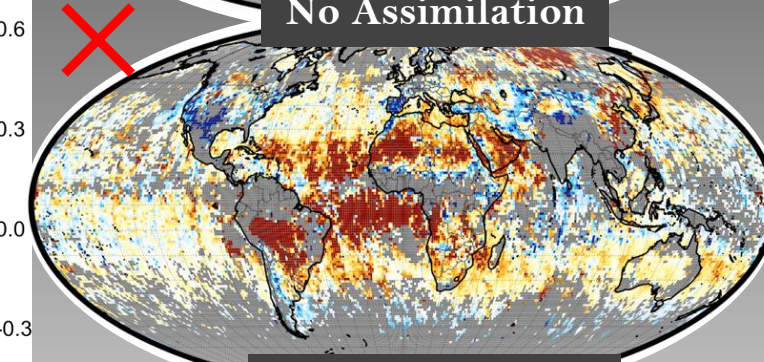
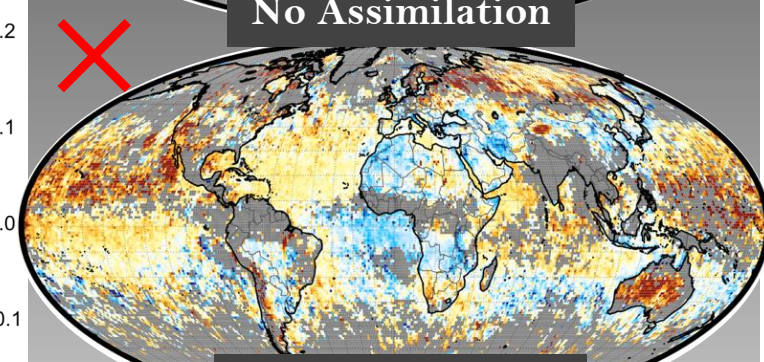
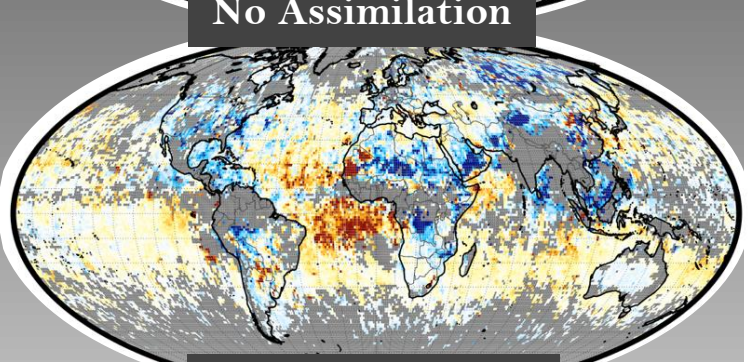
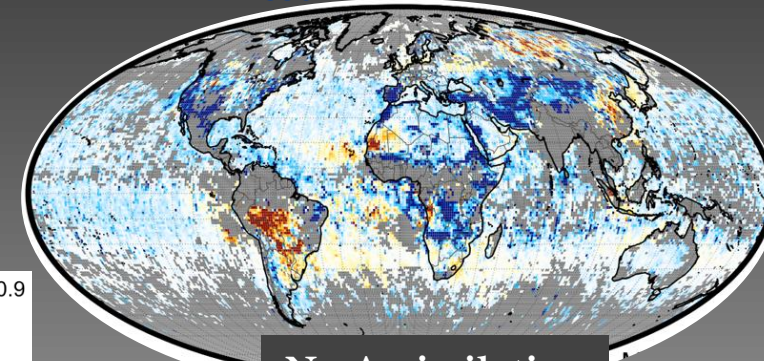
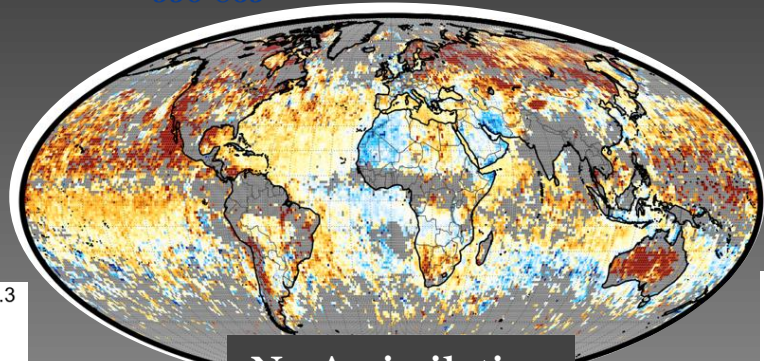
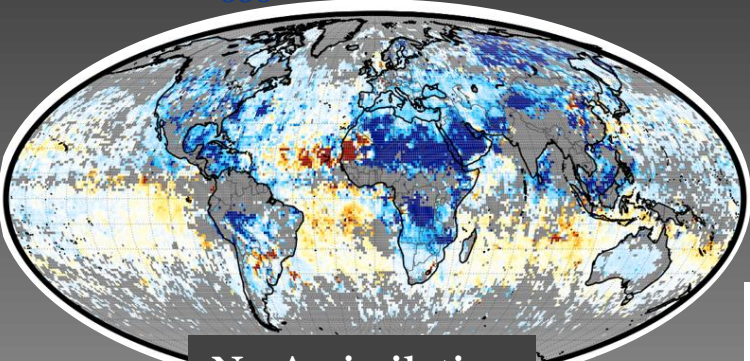


Assimilate AOD & AE & SSA - not only-AOD !

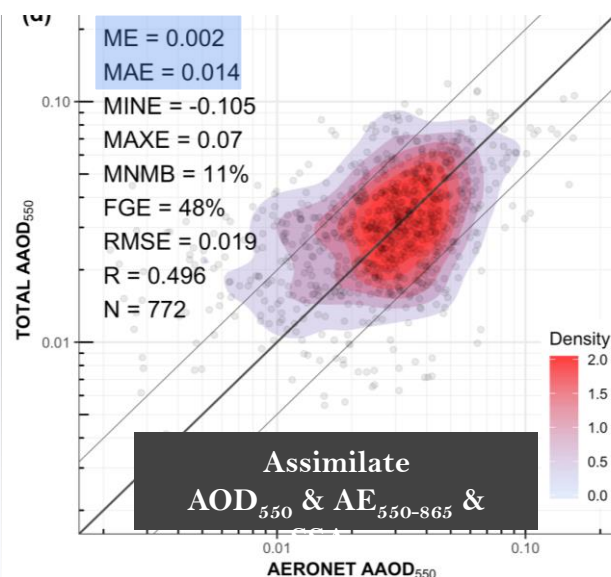
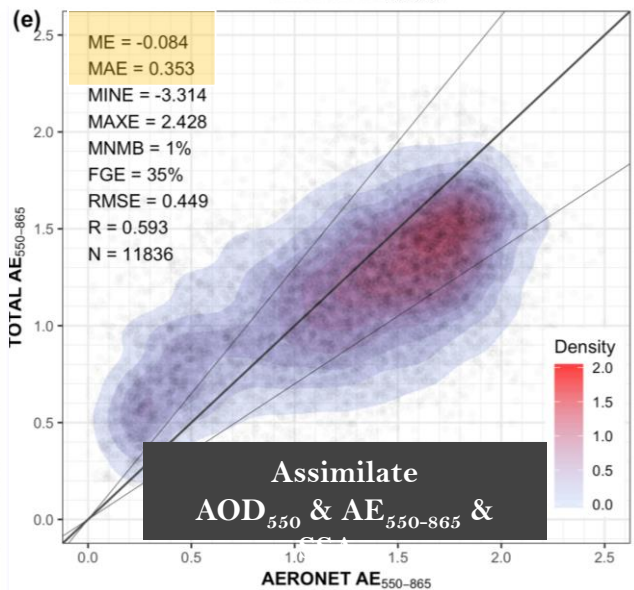
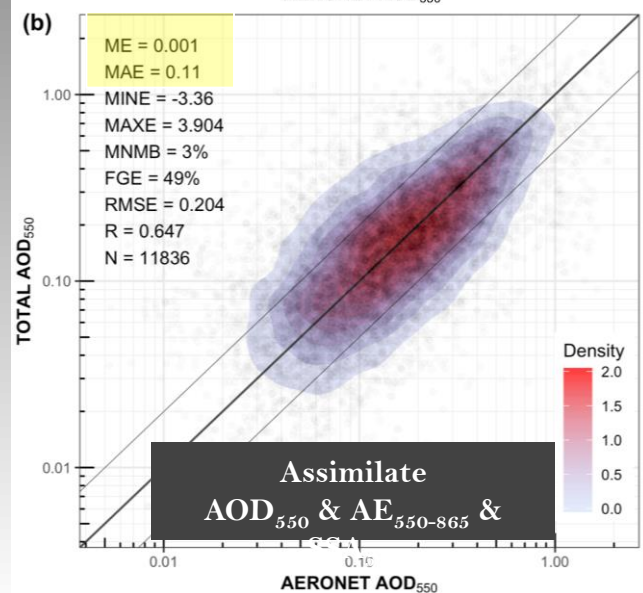
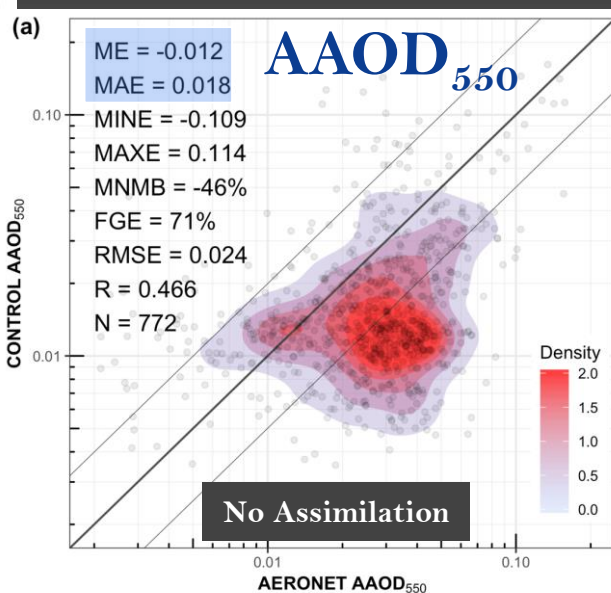
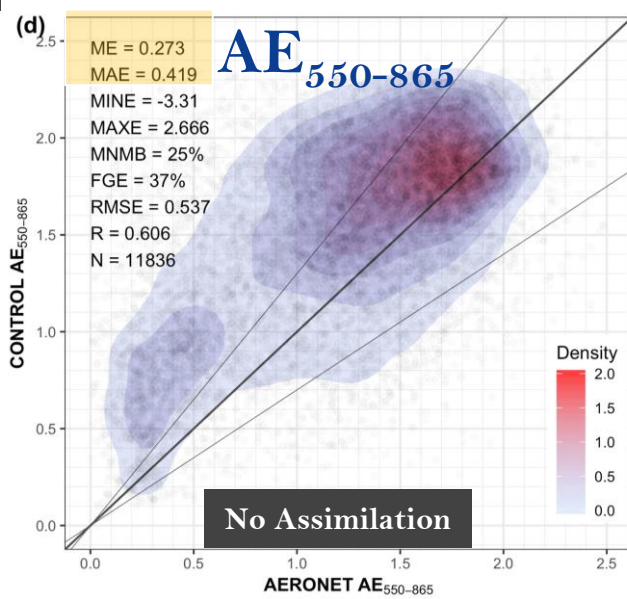
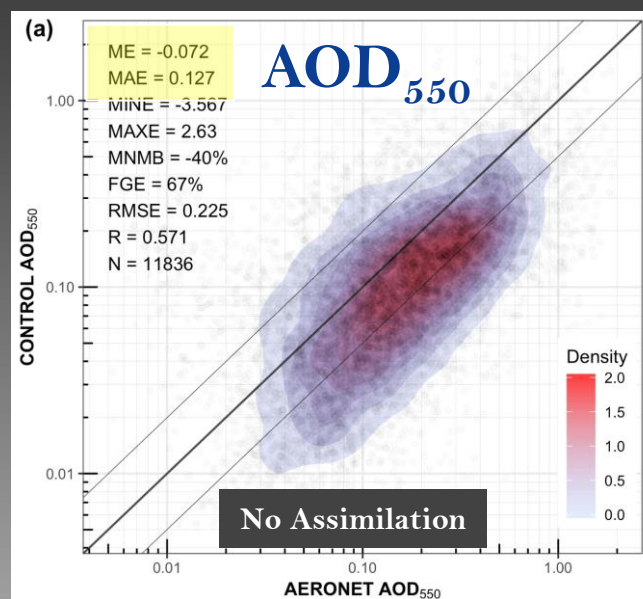
AOD₅₅₀ (MODEL - SATELLITE)

AE₅₅₀₋₈₆₅ (MODEL - SATELLITE)

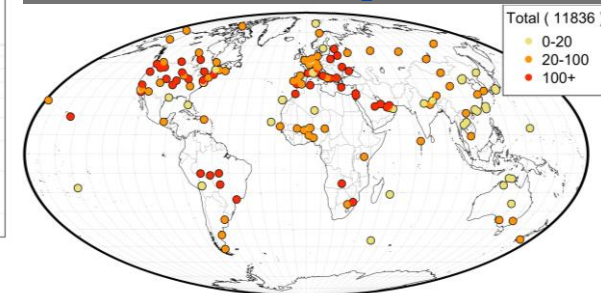
AAOD₅₅₀ (MODEL - SATELLITE)



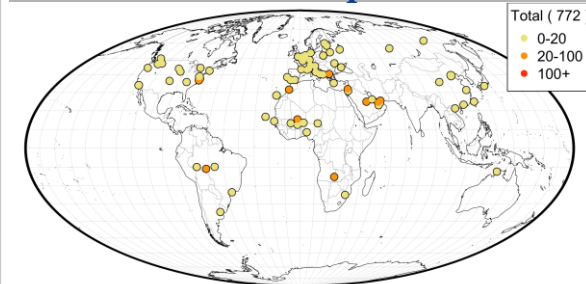
Works even with Independent Observations (e.g. AERONET)



**AOD₅₅₀ and AE₅₅₀₋₈₆₅
collocated data points used**



**AAOD₅₅₀
collocated data points used**



Conclusions

First assimilation system for the global aerosol climate model ECHAM-HAM that successfully assimilated multiple aerosol optical retrievals of POLDER-SRON using an ensemble Kalman filter.

- Assimilating a combination of aerosol optical properties simultaneously (e.g. AOD_{550} & $AE_{550-865}$ & SSA_{550}) improves the aerosol mass, size and absorption representation in the model and is preferable than AOD_{550} -only assimilation.
- The assimilation successfully reduces biases against assimilated (POLDER) and independent (AERONET) retrievals.

Full results at Atmospheric Chemistry and Physics Discussion
(open until 22 Oct 2020)

<https://acp.copernicus.org/preprints/acp-2020-468/>