

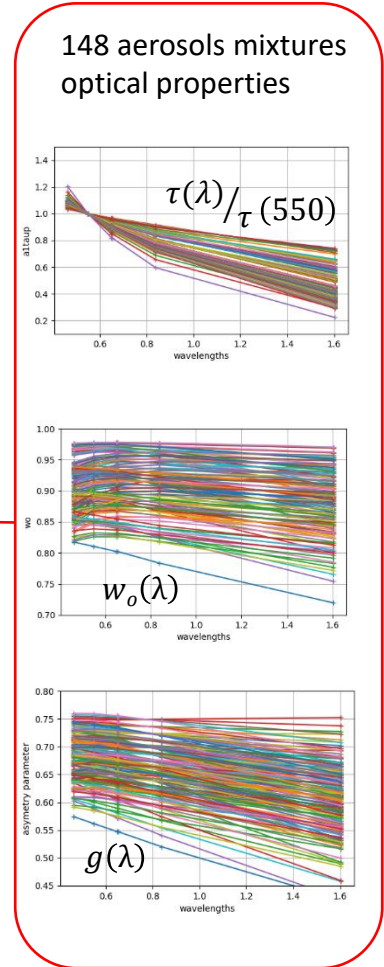
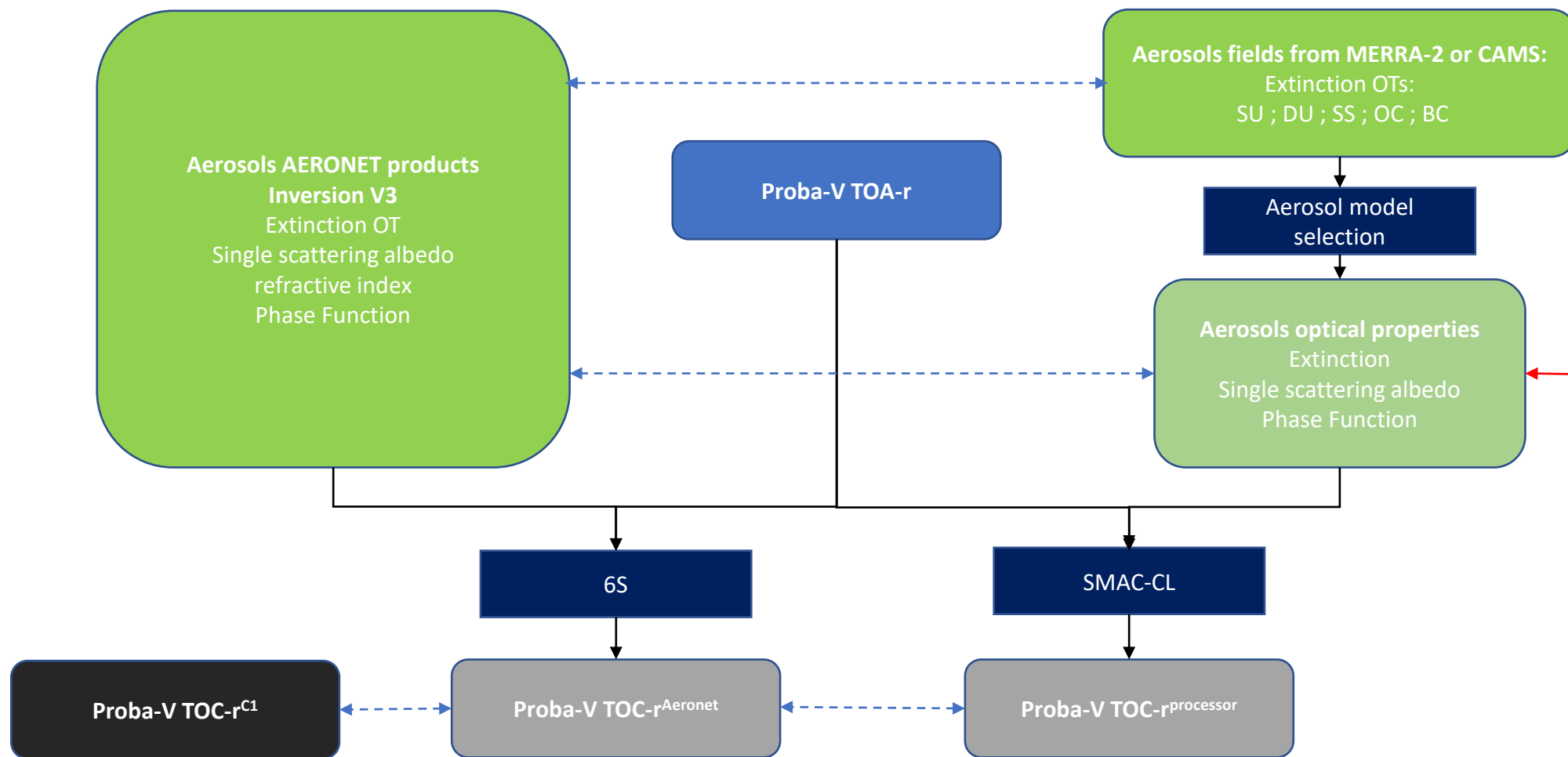
# PROBA-V reprocessing

Atmospheric Correction for C2: final baseline  
algorithm and validation results

*Didier Ramon, Dominique Jolivet, Bruno Monsterleet*

*PROBA-V QWG, 21 April, 2021*

# Validation methodology logic



# Validation methodology metrics (ACIX2)

$$A = \frac{1}{N} (\sum_{i=1}^N \Delta TOC_{r_i}),$$

Accuracy (Mean Bias)

$$P = \sqrt{\frac{1}{N-1} (\sum_{i=1}^N (\Delta TOC_{r_i} - A)^2)},$$

Precision

$$U = \sqrt{\frac{1}{N} \sum_{i=1}^N (\Delta TOC_{r_i})^2},$$

Uncertainty

With  $\Delta TOC_{r_i} = (TOC_{r_i}^{processor} - TOC_{r_i}^{Aeronet})$ ,

We compute also:

$$MAB = \frac{1}{N} (\sum_{i=1}^N |\Delta TOC_{r_i}|),$$

Mean Absolute Bias

47 Aeronet sites, Proba-V 1 km 9x9 pixels boxes, Year 2018

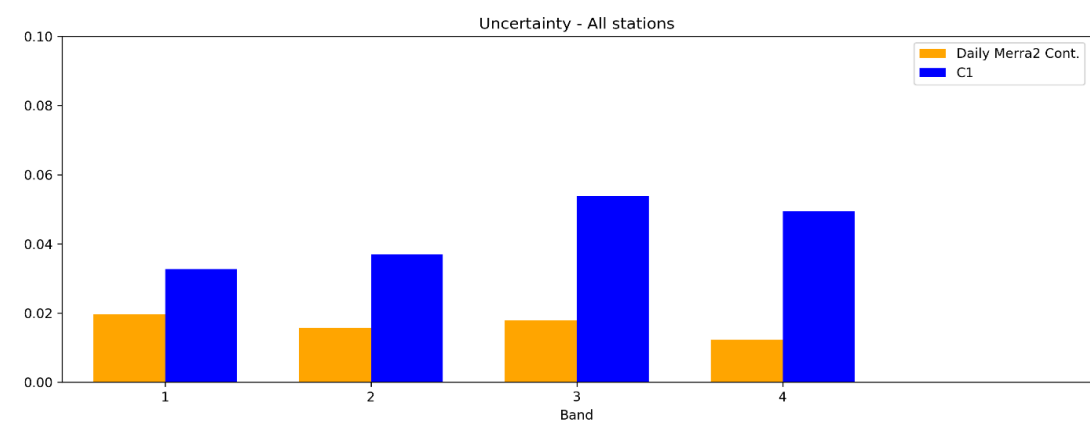
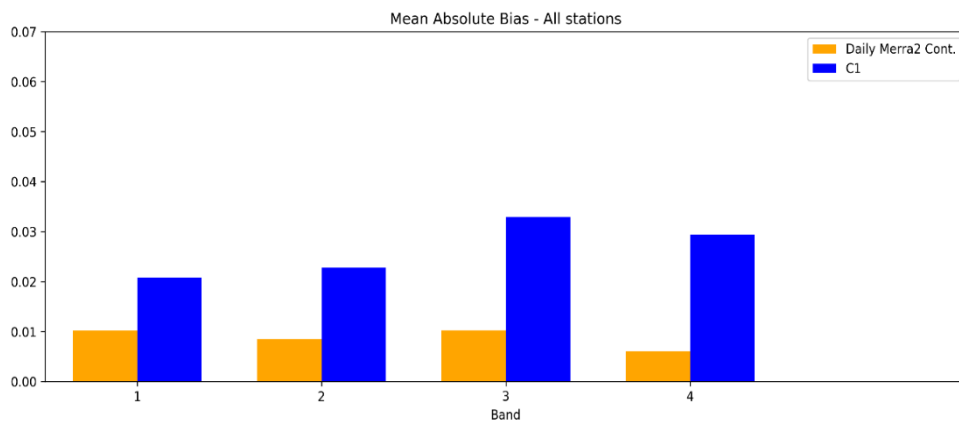
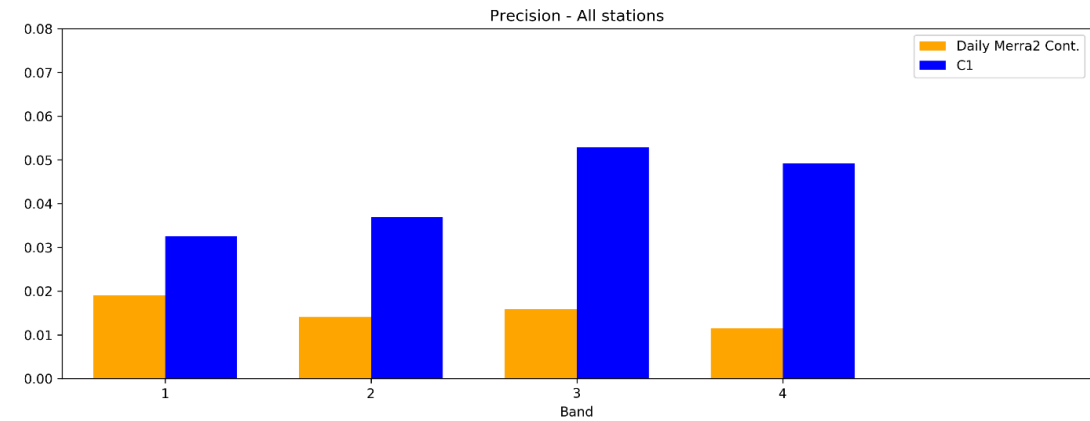
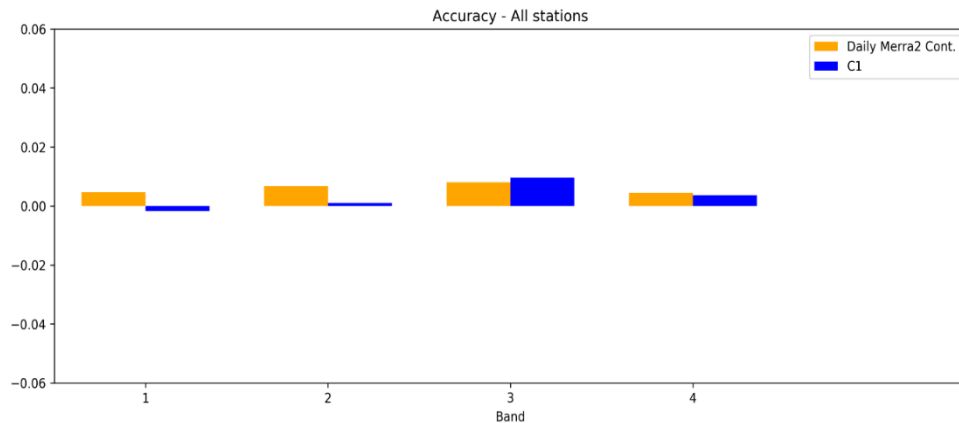
# AC Processor variants

- Daily MERRA-2 data and a varying aerosol model,
- Daily MERRA-2 data and a fixed 'Continental' aerosol model,
  
- Daily CAMS data and a varying aerosol model.
- Daily CAMS data and a fixed 'Continental' aerosol model,
  
- CAMS decadal climatology for AOD at 550 nm, 30<sup>th</sup> percentile and a fixed 'Continental' aerosol model,
- CAMS decadal climatology for AOD at 550 nm, 50<sup>th</sup> percentile and a fixed 'Continental' aerosol model,

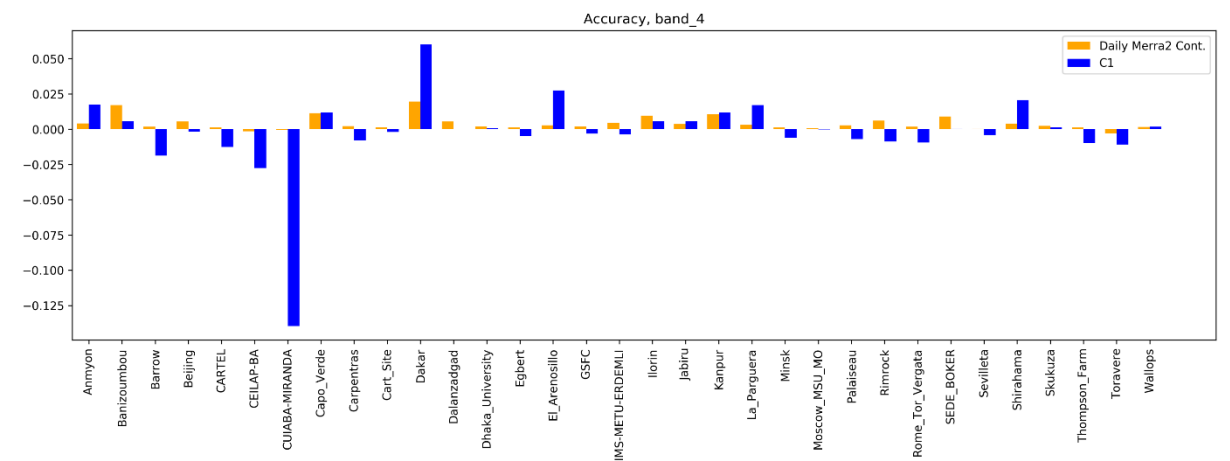
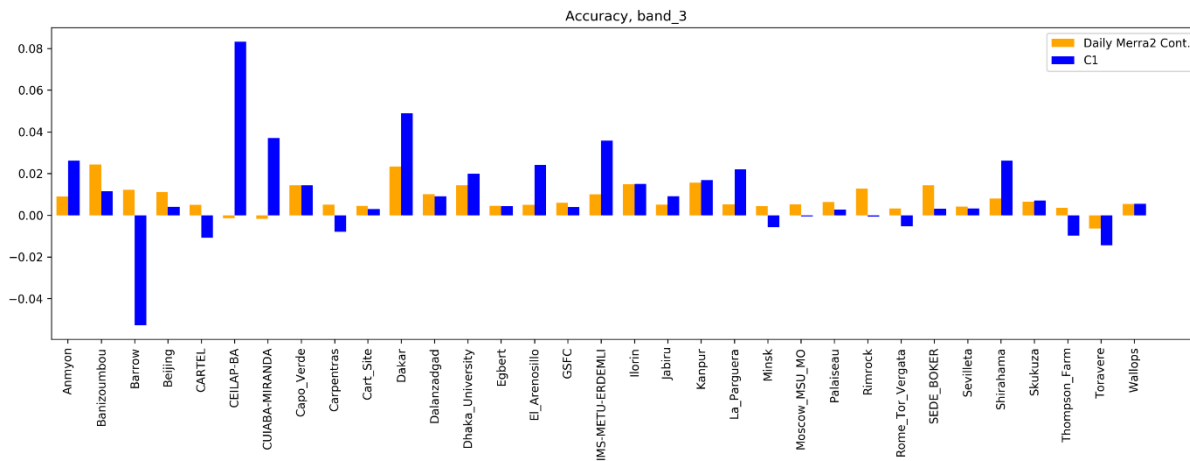
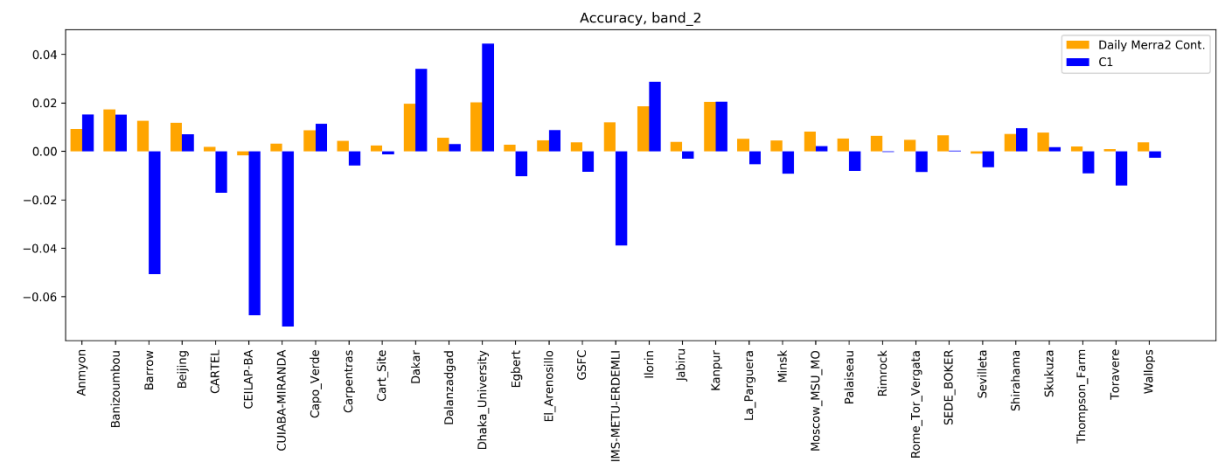
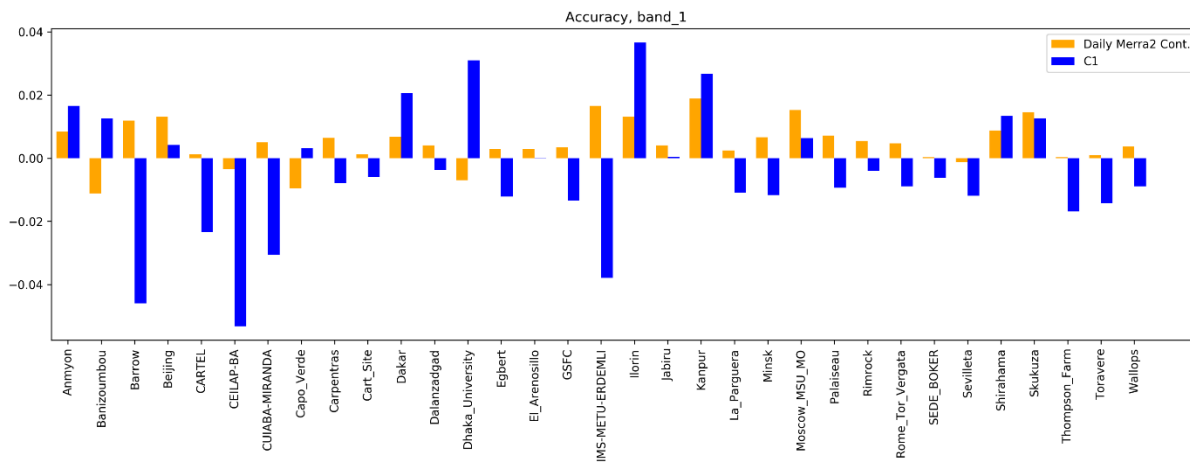
# (C2 vs C1) vs Aeronet

For one particular processor variant

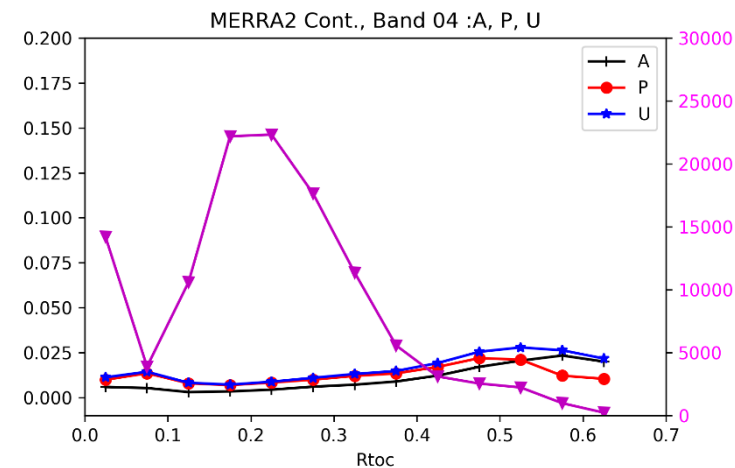
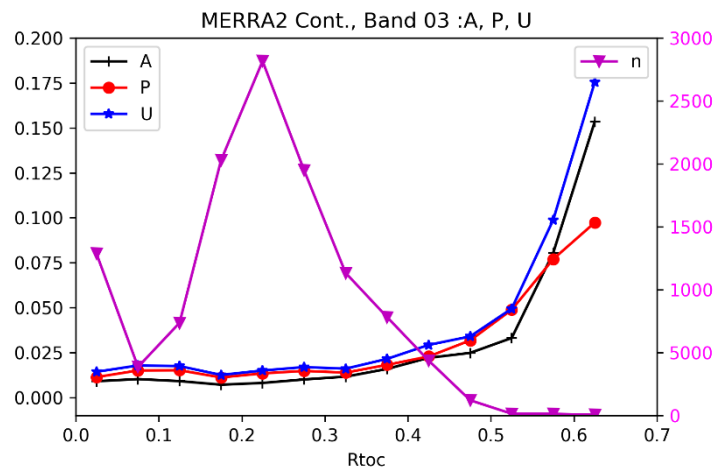
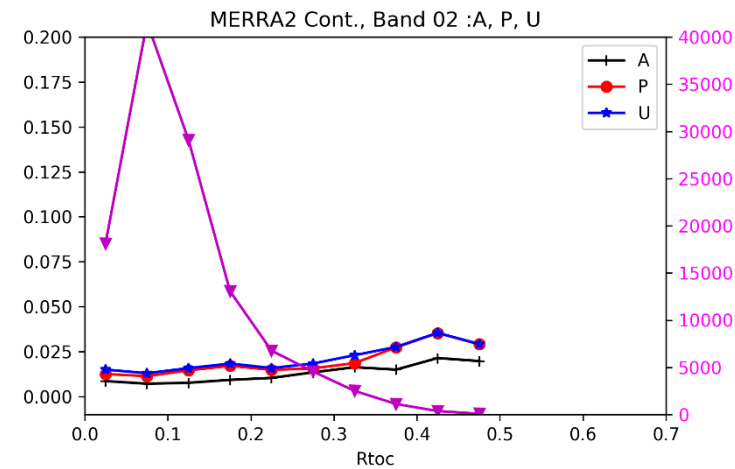
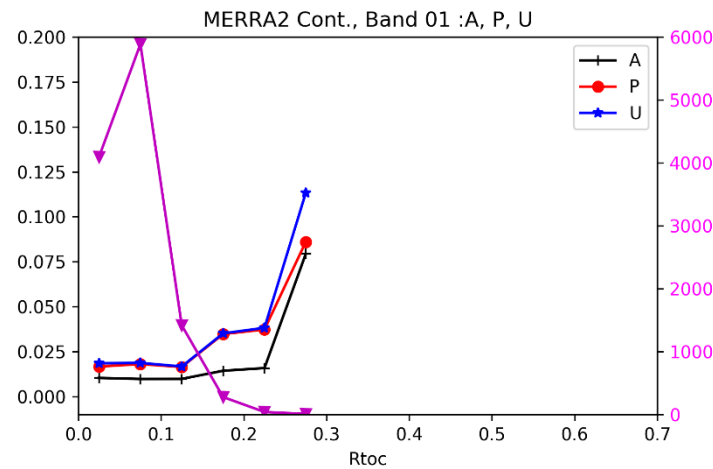
# C2-Daily-MERRA-CONT vs C1 : APU globally



# C2-Daily-MERRA-CONT vs C1 : A per station

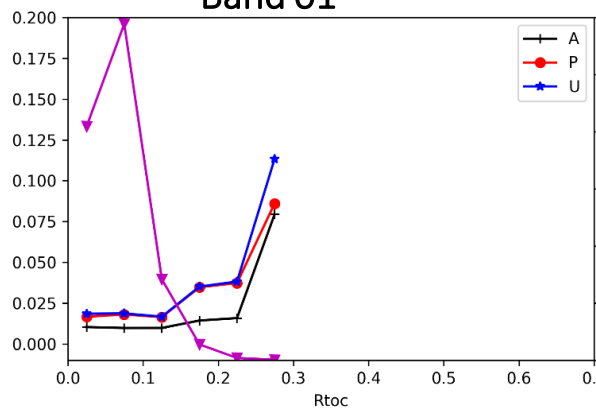
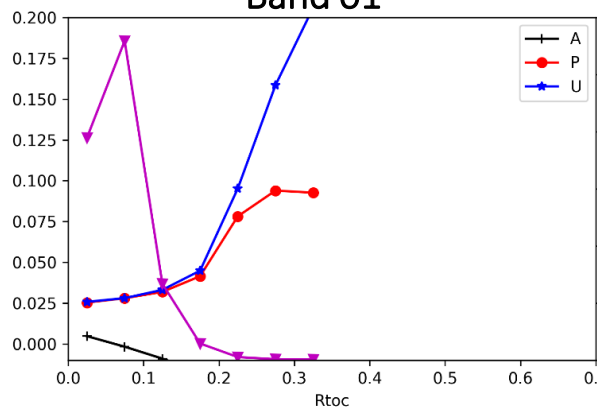
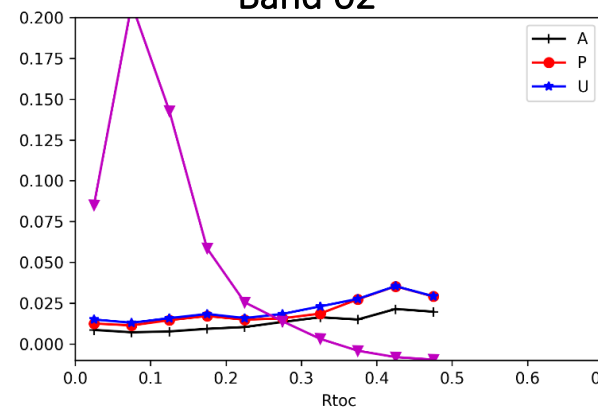
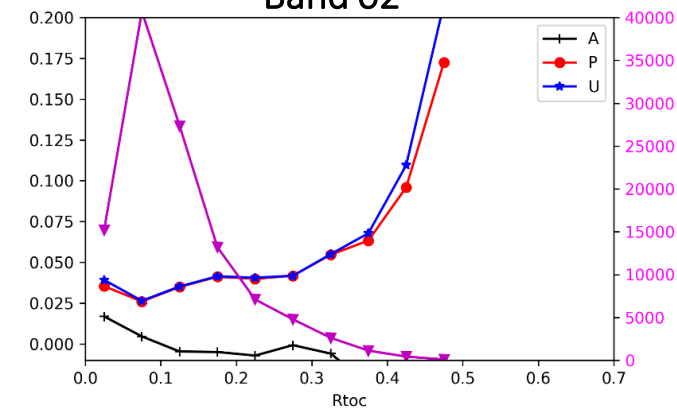
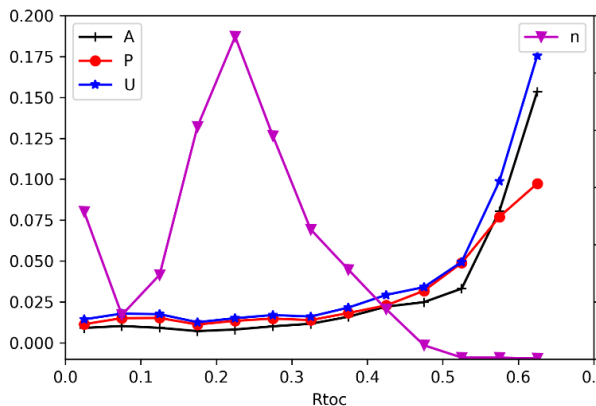
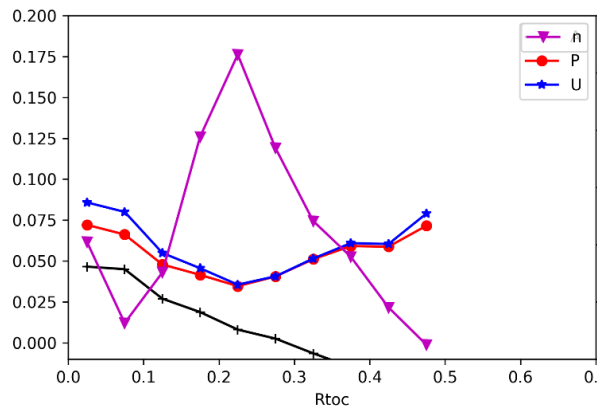
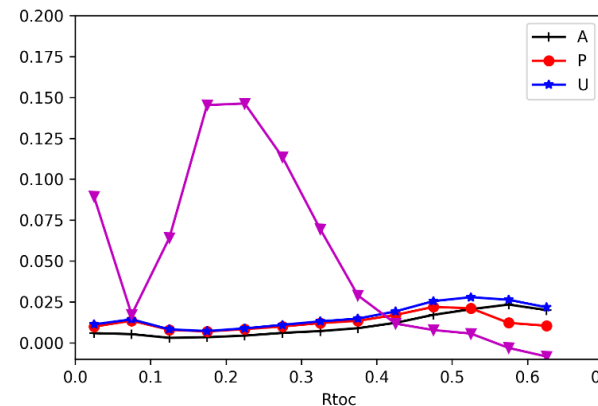
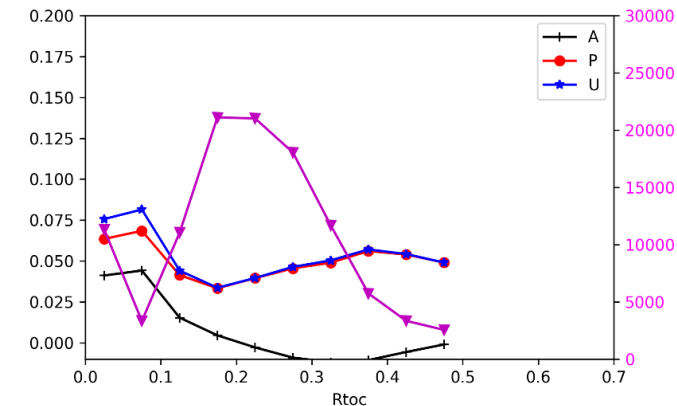


# C2-Daily-MERRA-CONT : APU vs TOC-r globally

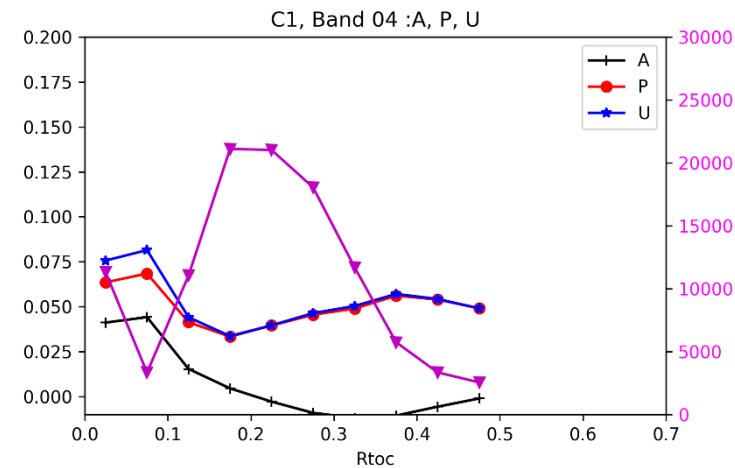
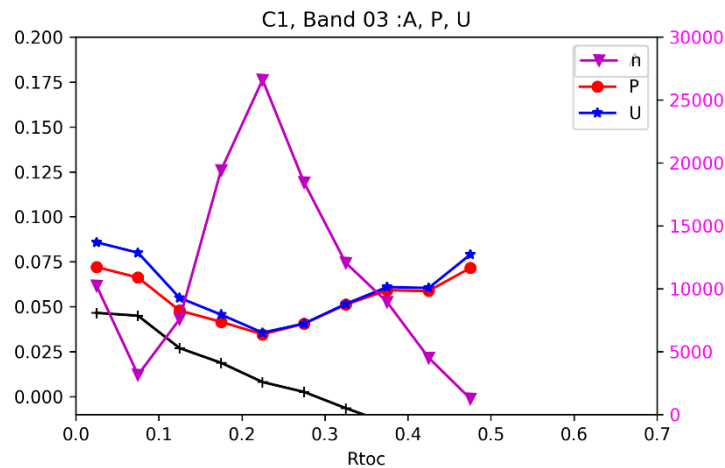
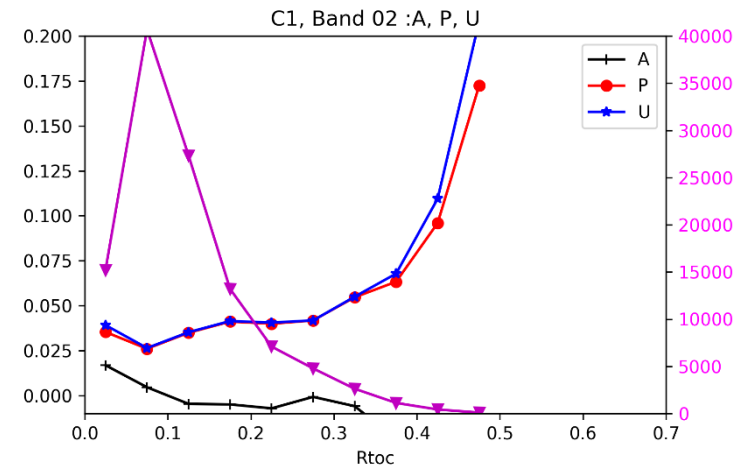
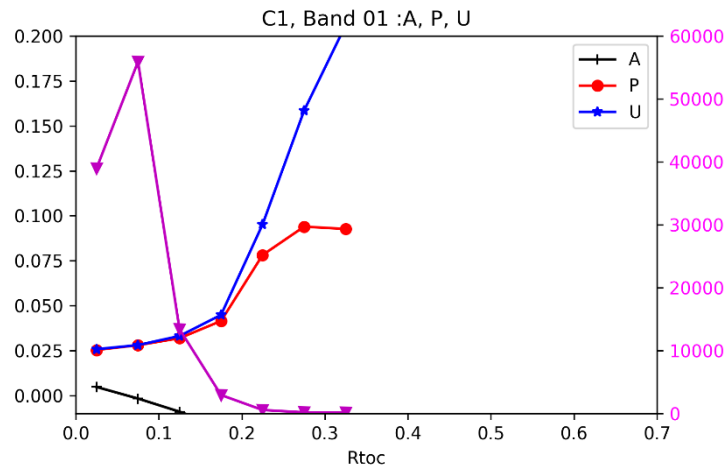




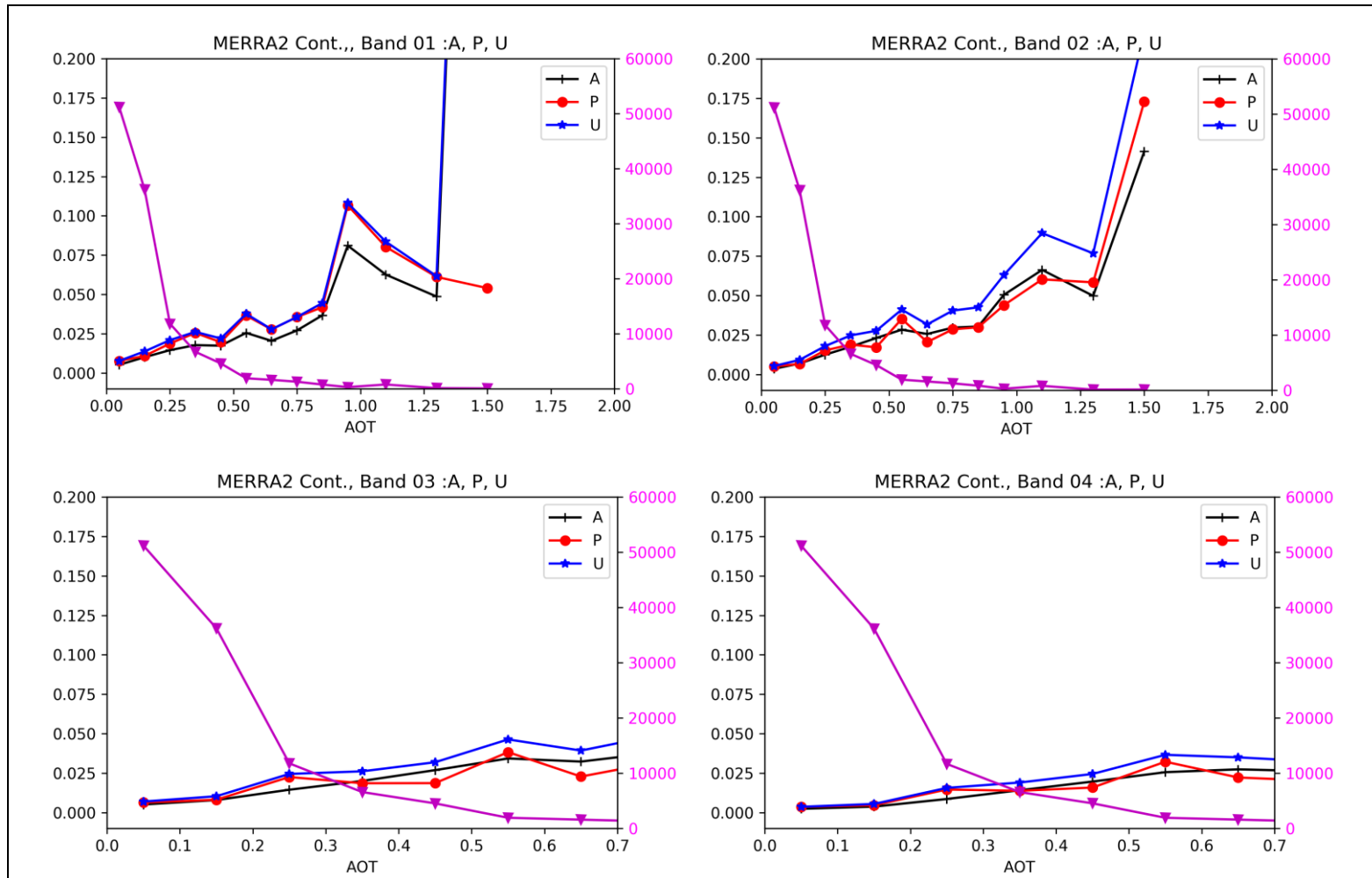
# APU vs TOC-r

**C2-Daily-MERRA-CO2**
**Band 01**

**C1**
**Band 01**

**C2-Daily-MERRA-CO2**
**Band 02**

**C1**
**Band 02**

**Band 03**

**Band 03**

**Band 04**

**Band 04**


# C1 : APU vs TOC-r



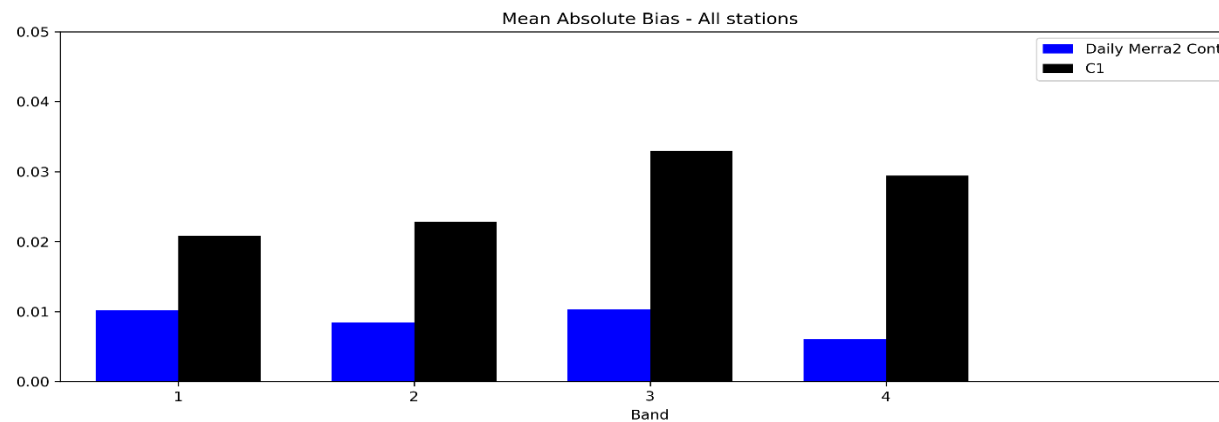
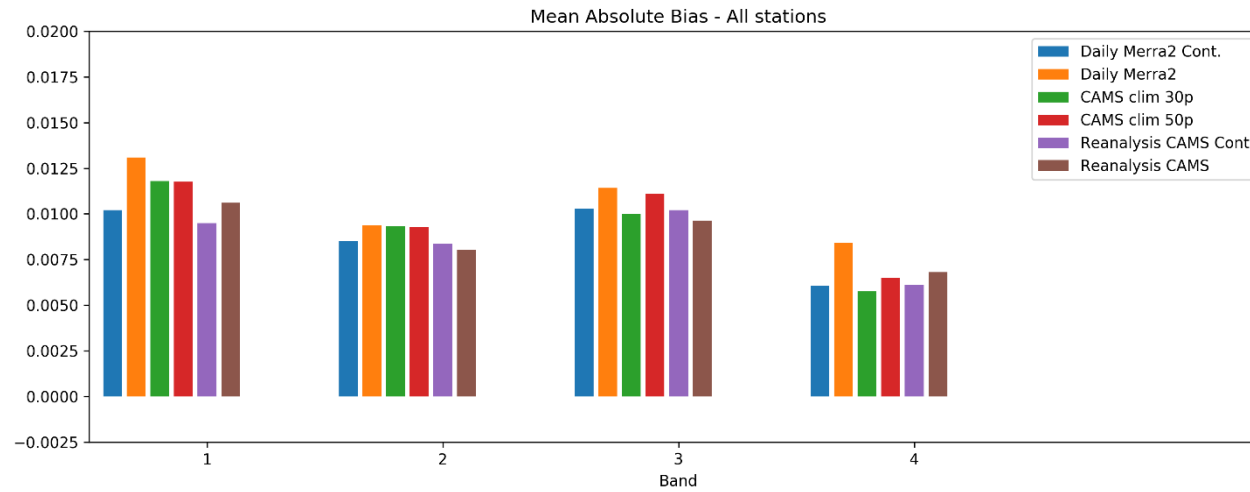
# C2-Daily-MERRA-CONT : APU vs AOT@550



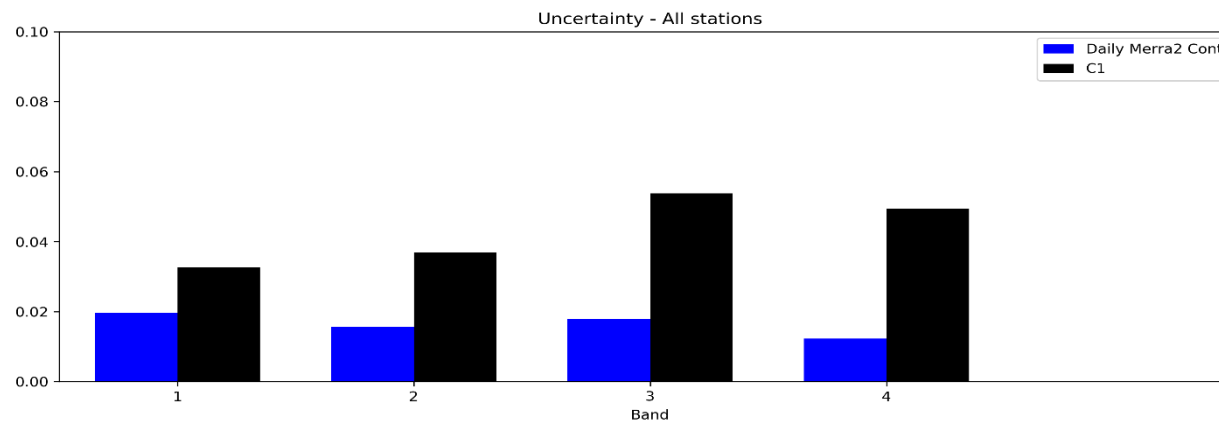
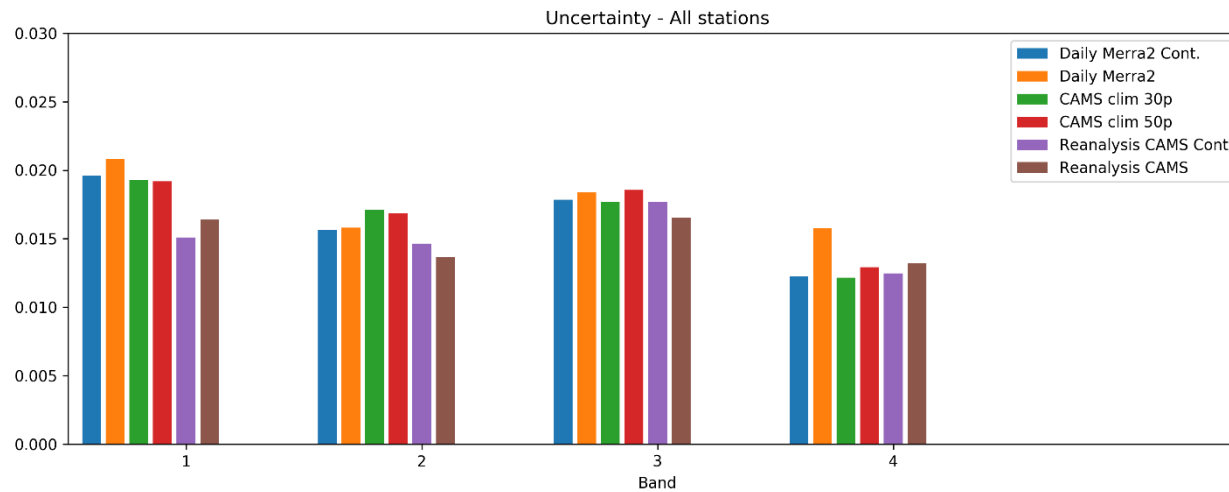
# C2 round robin exercise

Finding the best processor (i.e. ancillary data source)

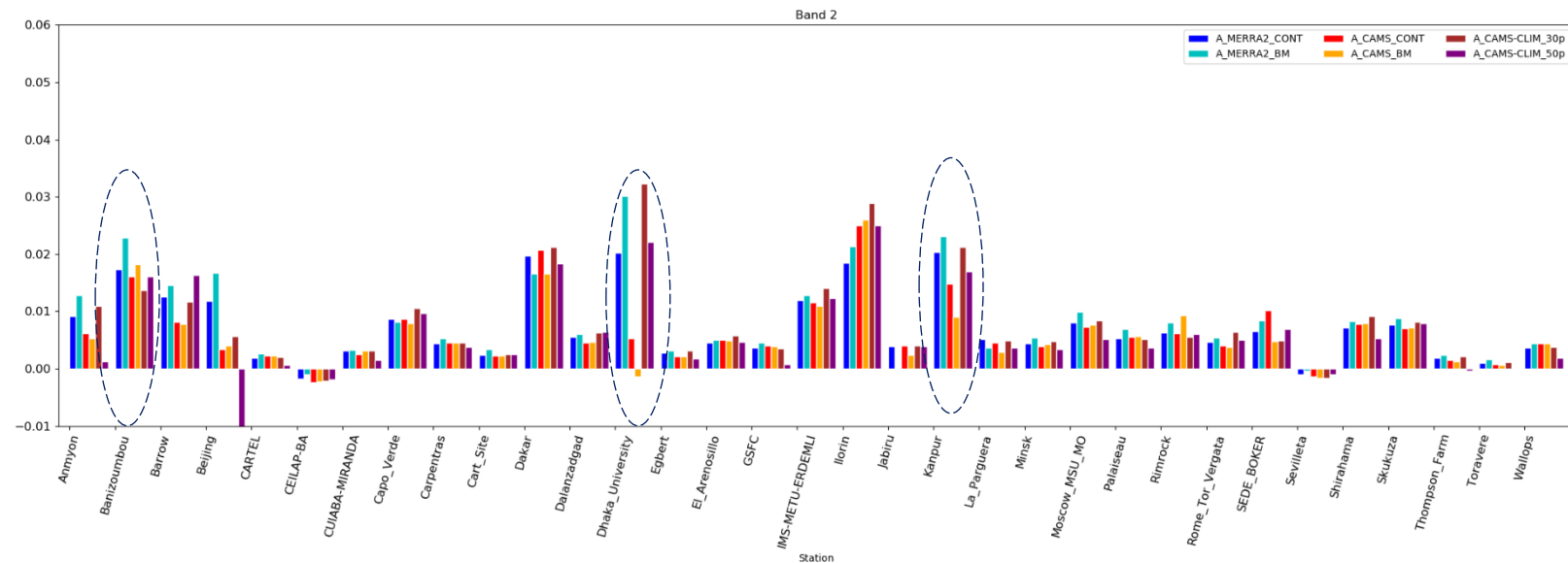
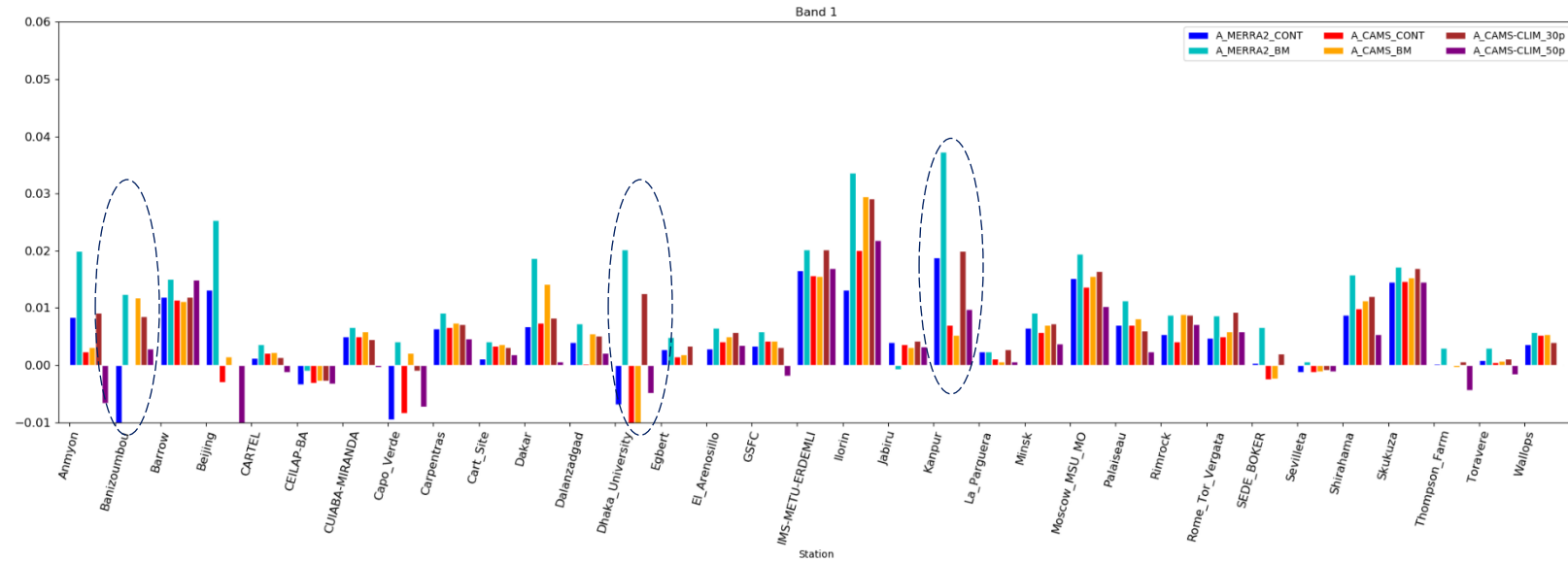
# C2 : MAB globally



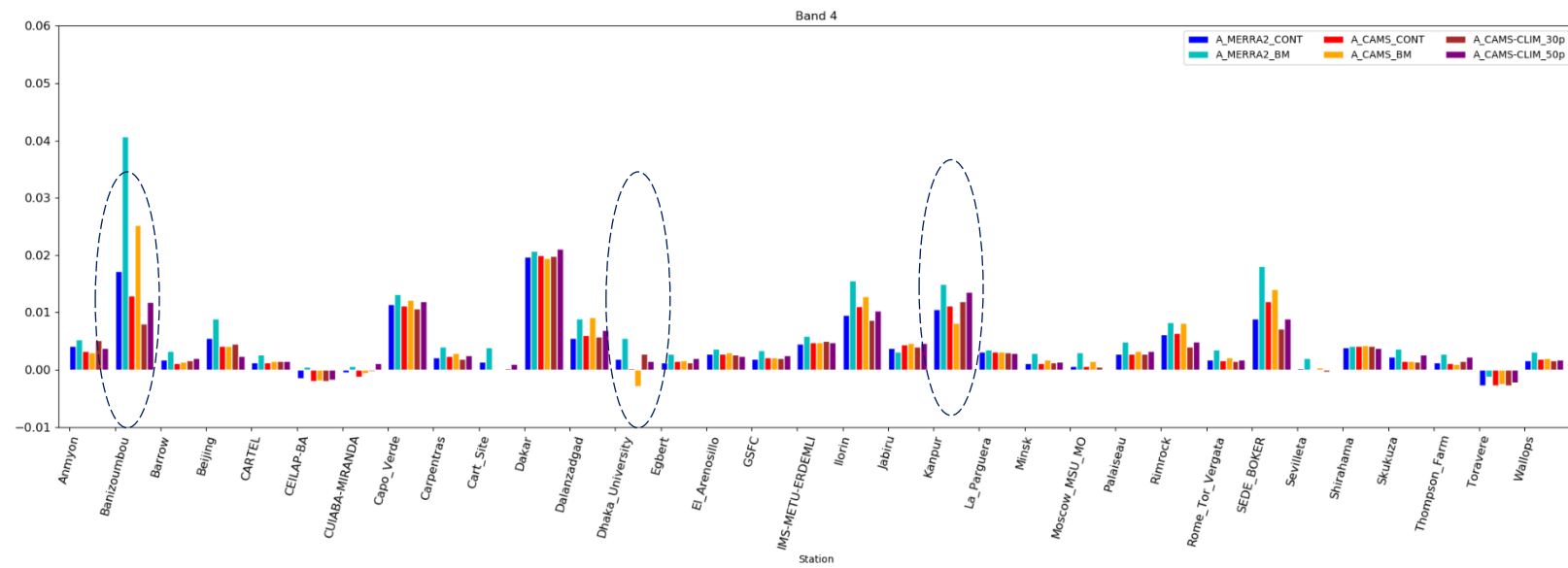
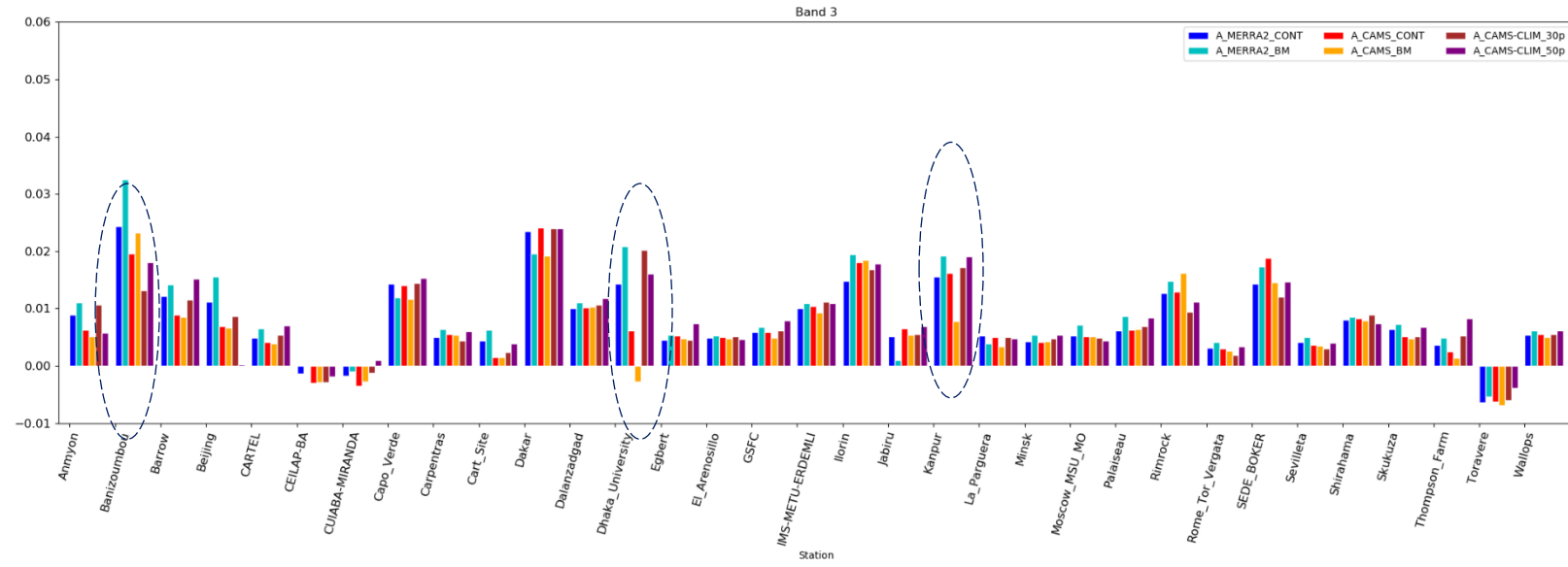
# C2 : U globally



# C2 : A per station



# C2 : A per station



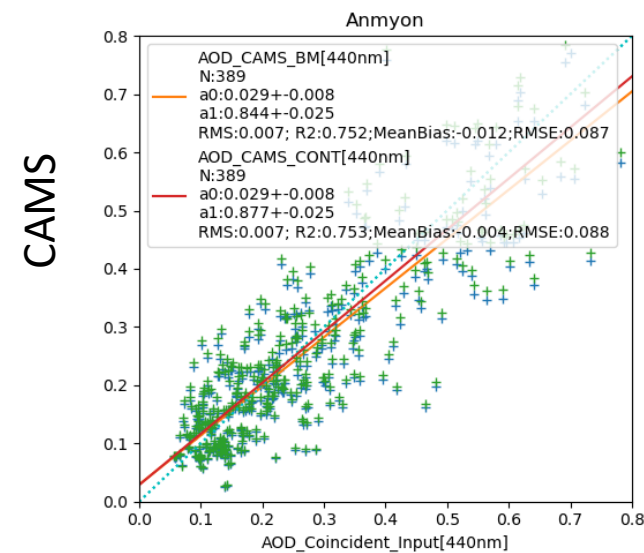
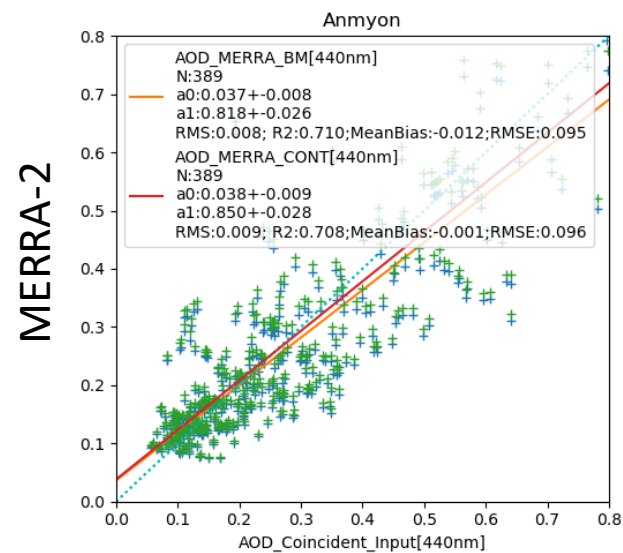
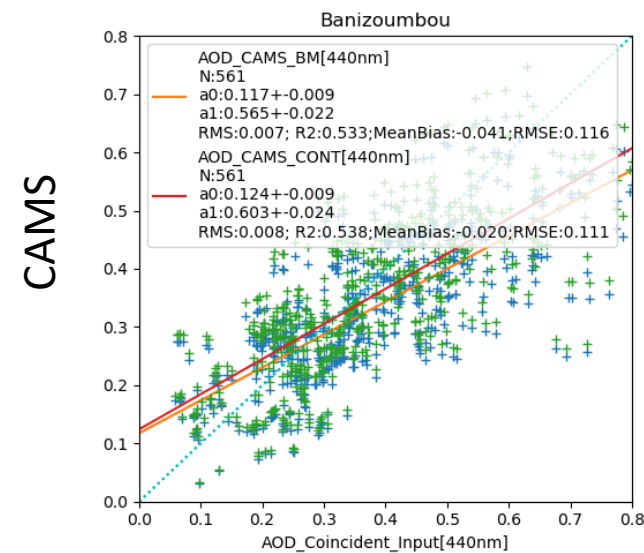
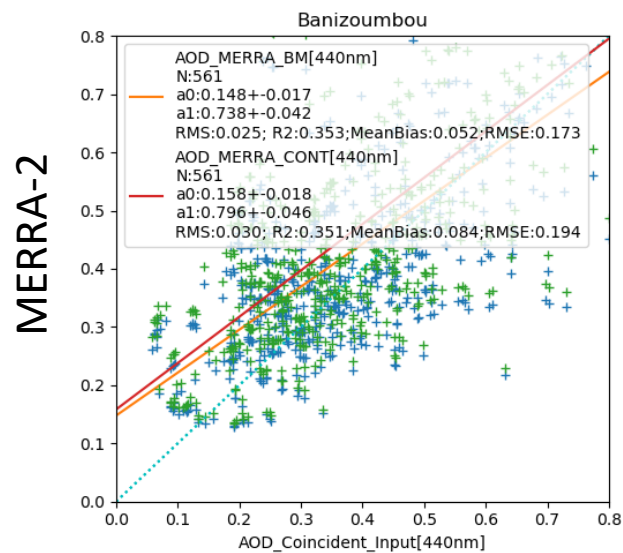


# Aerosol optical properties validation

On going, large validation activity: Example for 2 Aeronet sites

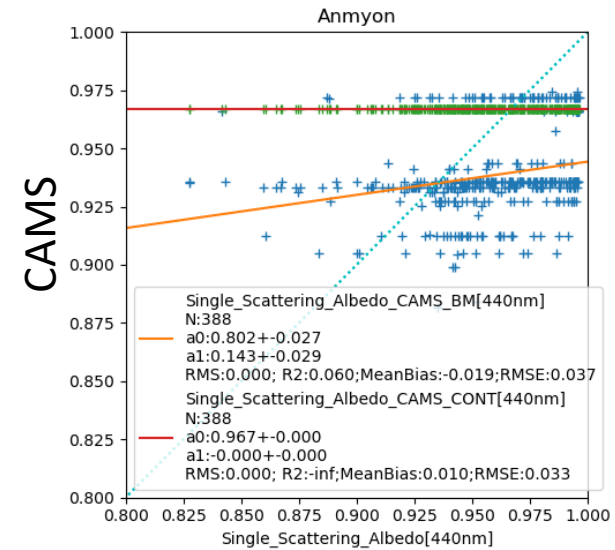
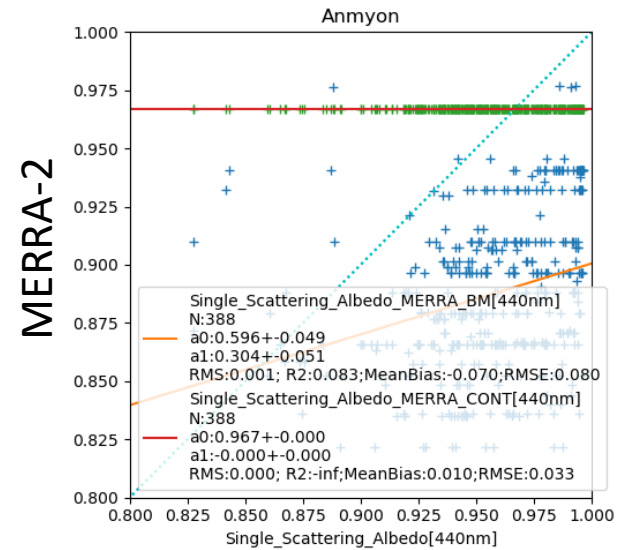
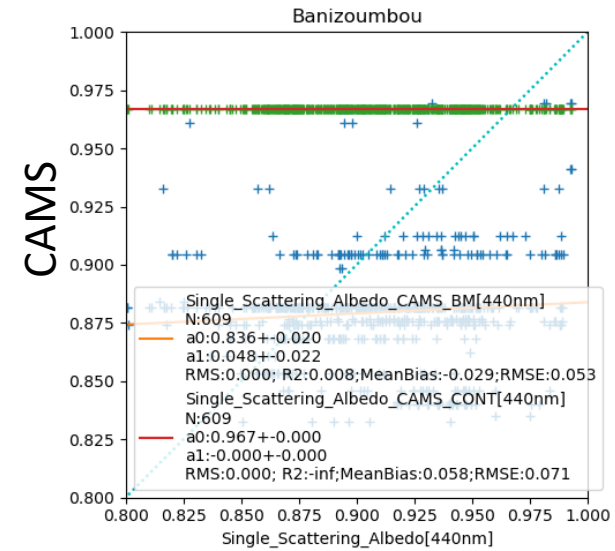
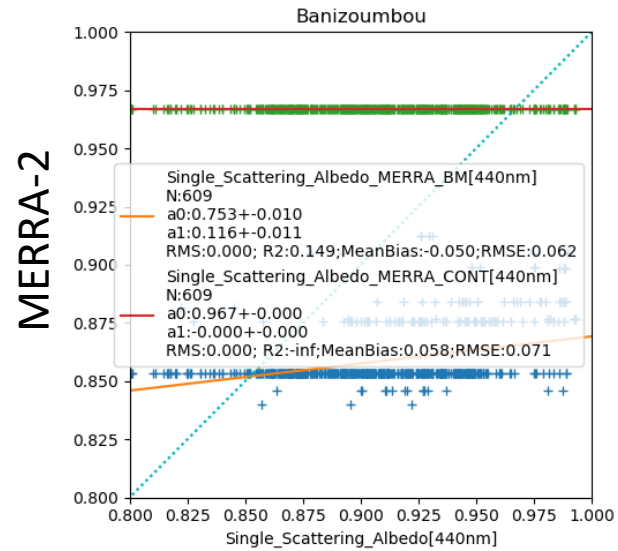
# AOD@440

- (+) Dynamic model
- (+) Fixed Continental model



Aeronet

# Single Scattering Albedo @440

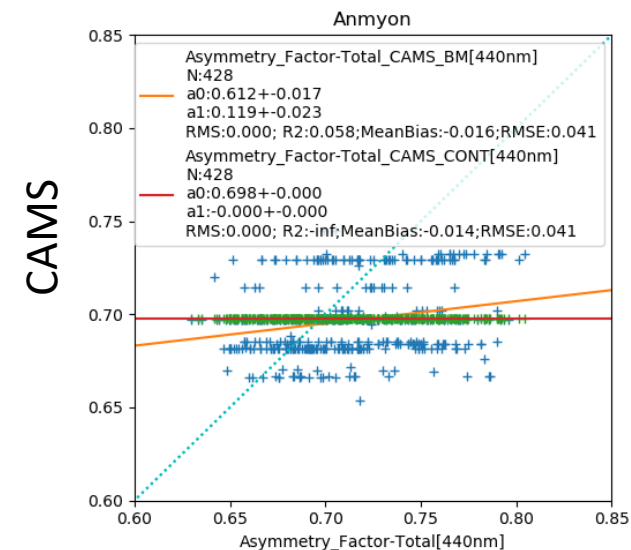
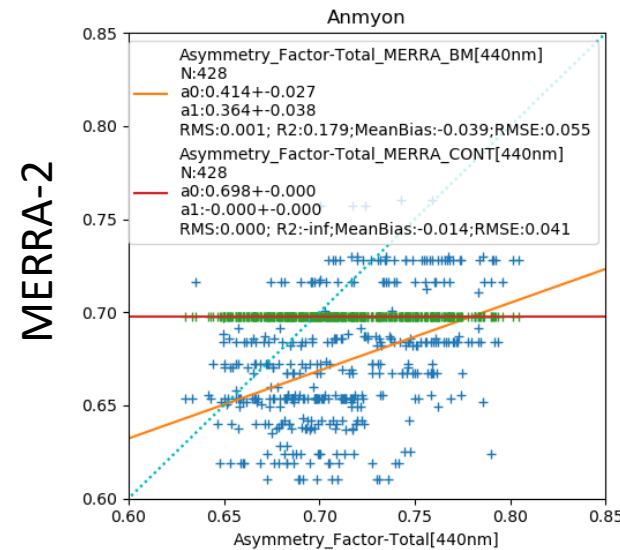
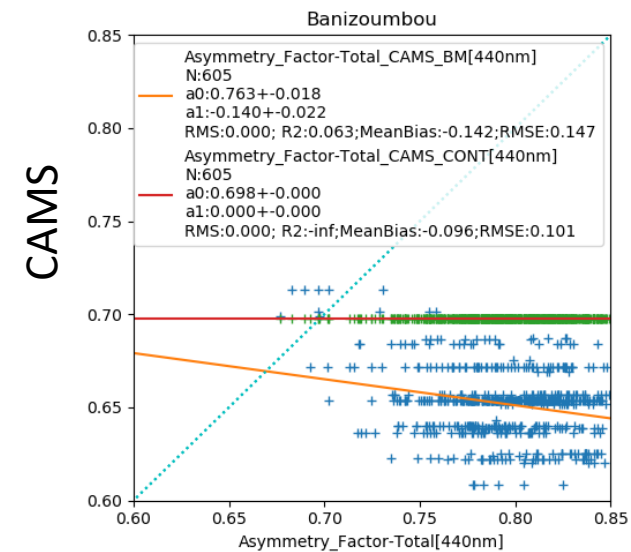
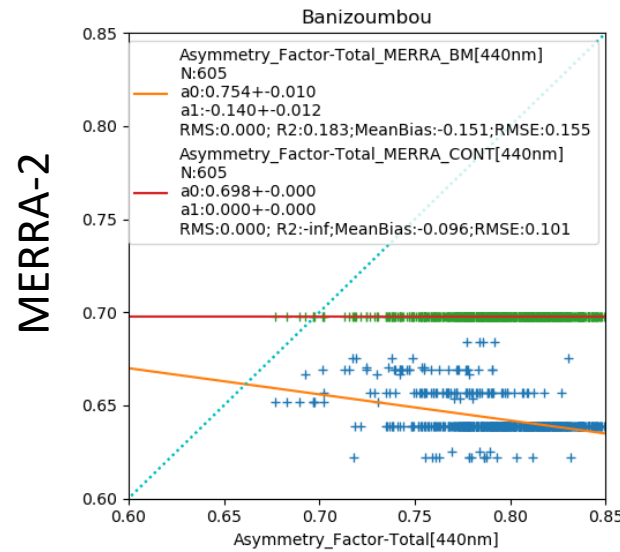


- (+) Dynamic model
- (+) Fixed Continental model

Aeronet

# Asymmetry Factor @440

- (+) Dynamic model
- (+) Fixed Continental model



Aeronet

# Conclusions & recommendations

- C2 vs C1
  - Larger variability (x3) of Accuracy for C1
  - Low dependency of Mean Bias of C2 on AOT and TOC-r.
- No clear winner of the round-robin exercise concerning the choice of the best aerosol ancillary data.
- Aerosols optical properties slightly better (*TBC*) for the CAMS reanalysis BUT CAMS data not yet available for the entire 2020 year.
  - As the operational processor at VITO is interfaced with the daily MERRA-2 dataset, we suggest to start operation with the setup : **SMAC + MERRA2 (daily at 1-hour resolution) with continental model.**
- In future consolidation work it may be possible to improve the aerosols optical properties representation for some locations, and in particular in strong pollution environments or deserts.