AEROCOM/AEROSAT: remote sensing experiment

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Overview: a tale of three papers

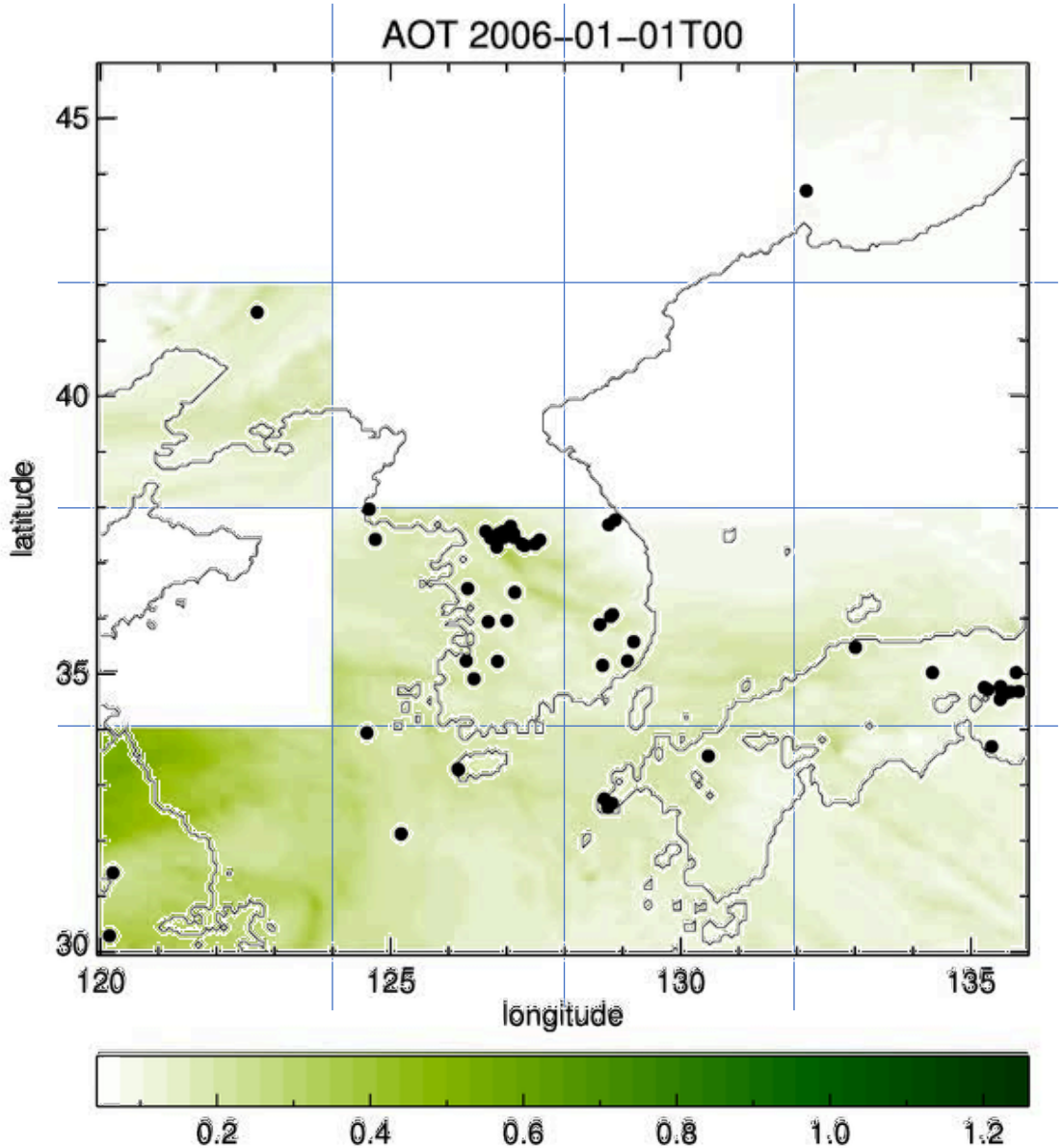
- Representativity of AERONET sites
- Evaluation and intercomparison of satellite AAOT
- Evaluation and intercomparison of satellite AOT

Representativity of AERONET sites

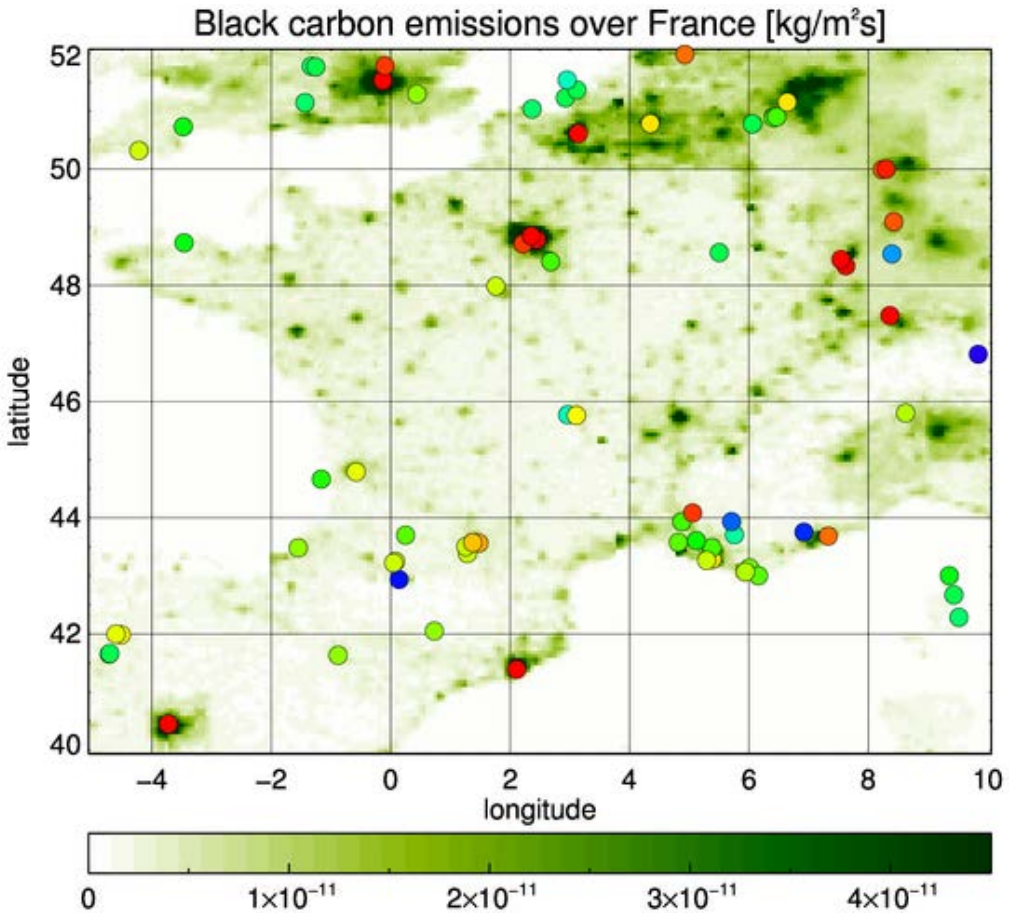
GEOS-5 Nature Run

GEOS5 is a two-year global simulation at high resolution: 0.0625° or ~ 7 km near the equator, produced by NASA GMAO and freely available.

Representation error = point value – area average



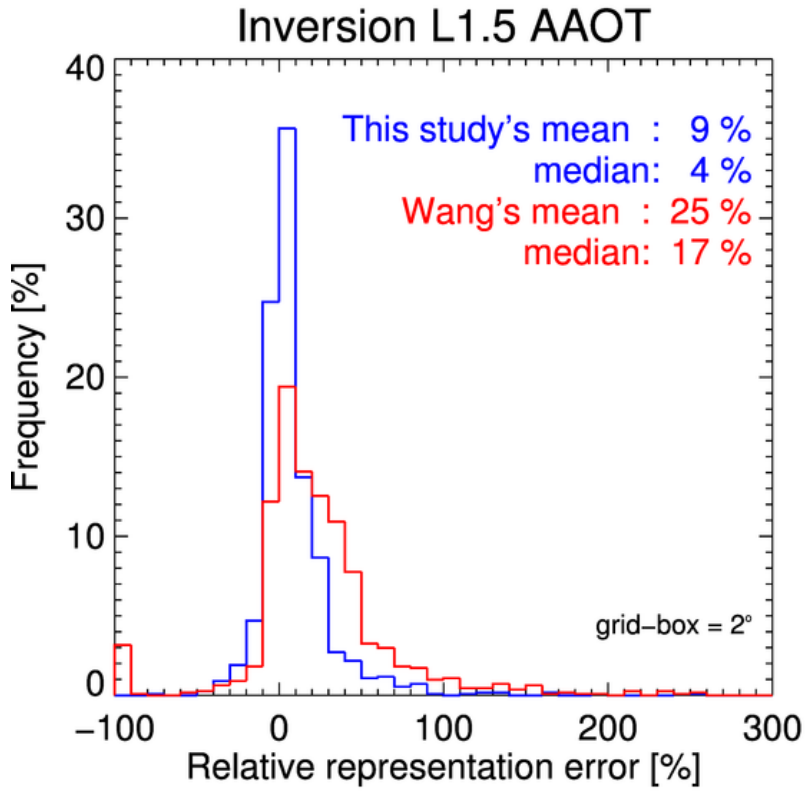
Absorptive AOT



AAOT representation errors range from

-25% to **+25%**

Wang et al. *GRL* 2018:
representation error in AERONET AAOT causes a 30 % “underestimation” of model AAOT (Bond et al. *JGR* 2013)



Evaluation of satellite AAOT

POLDER-GRASP

POLDER-SRON

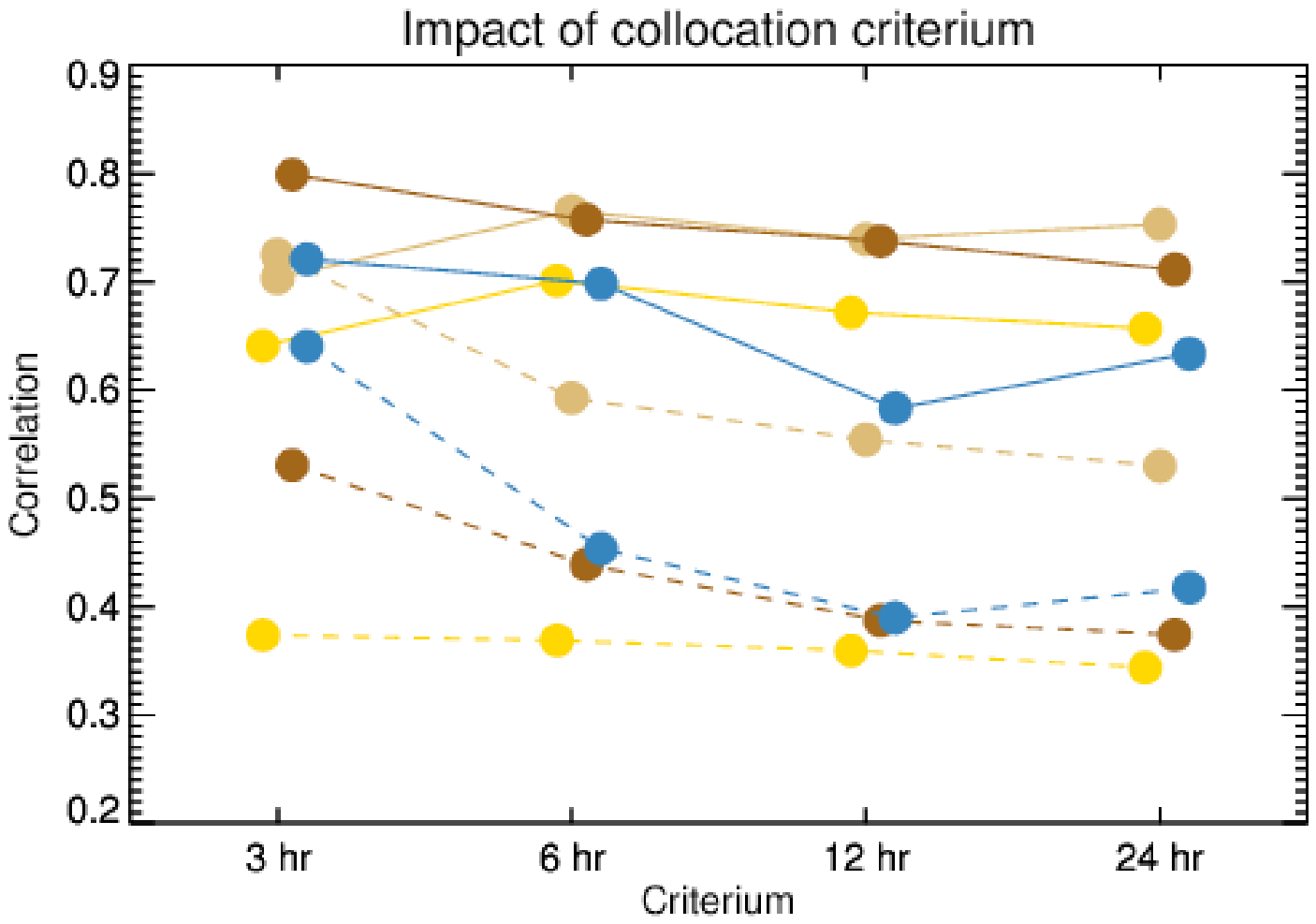
OMAERUV (OMI-MODIS)

FLMOC (MODIS-CALIOP)

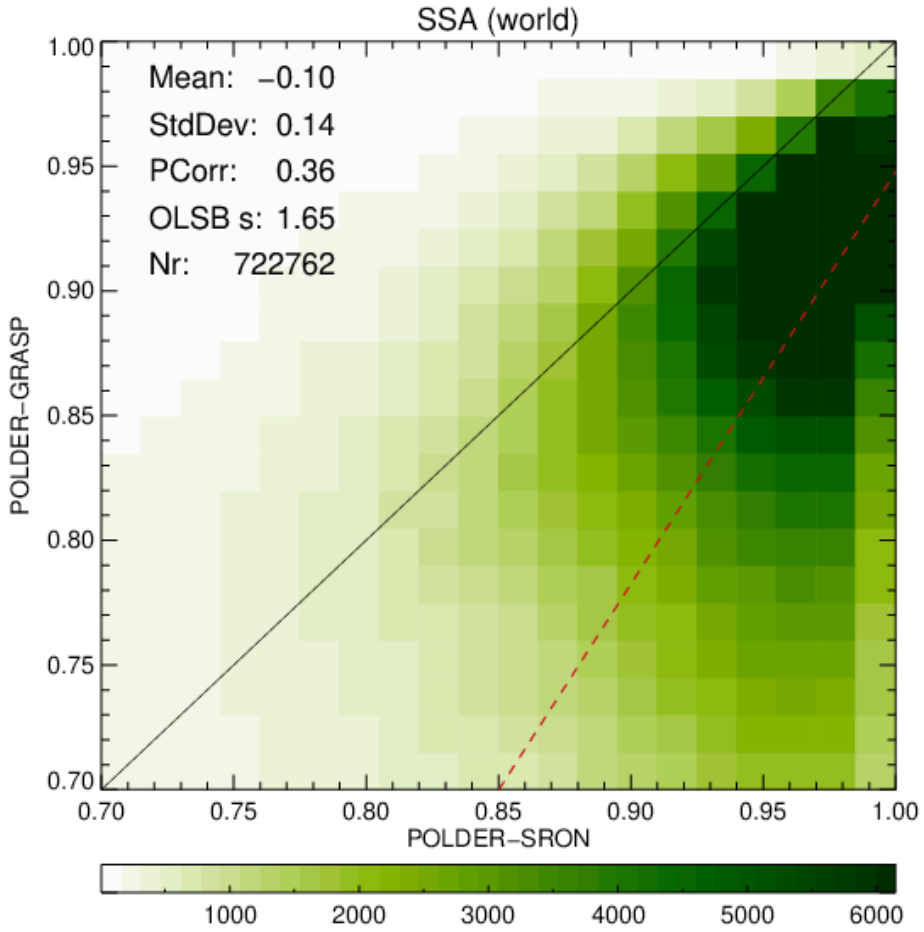
All data are 1^{o} degree time-stamped aggregates

AAOT requires tighter collocation

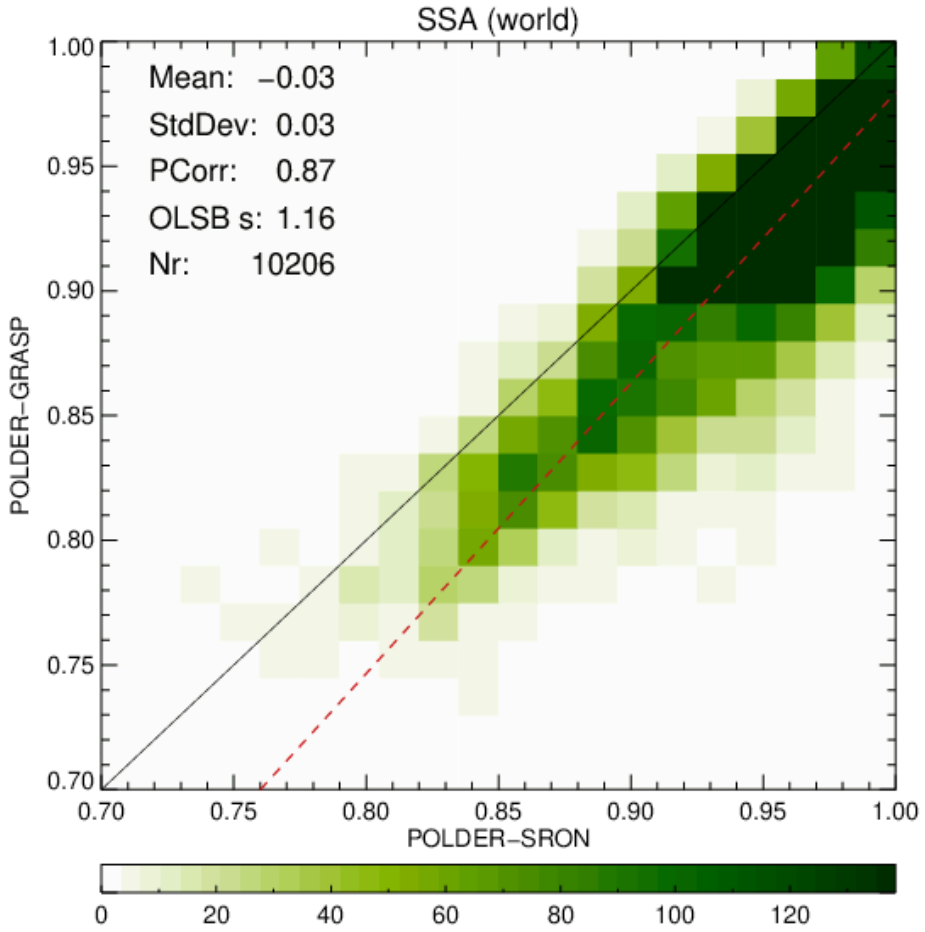
Evaluated with AERONET Inversion V3 L2.0



AAOT intercomparison

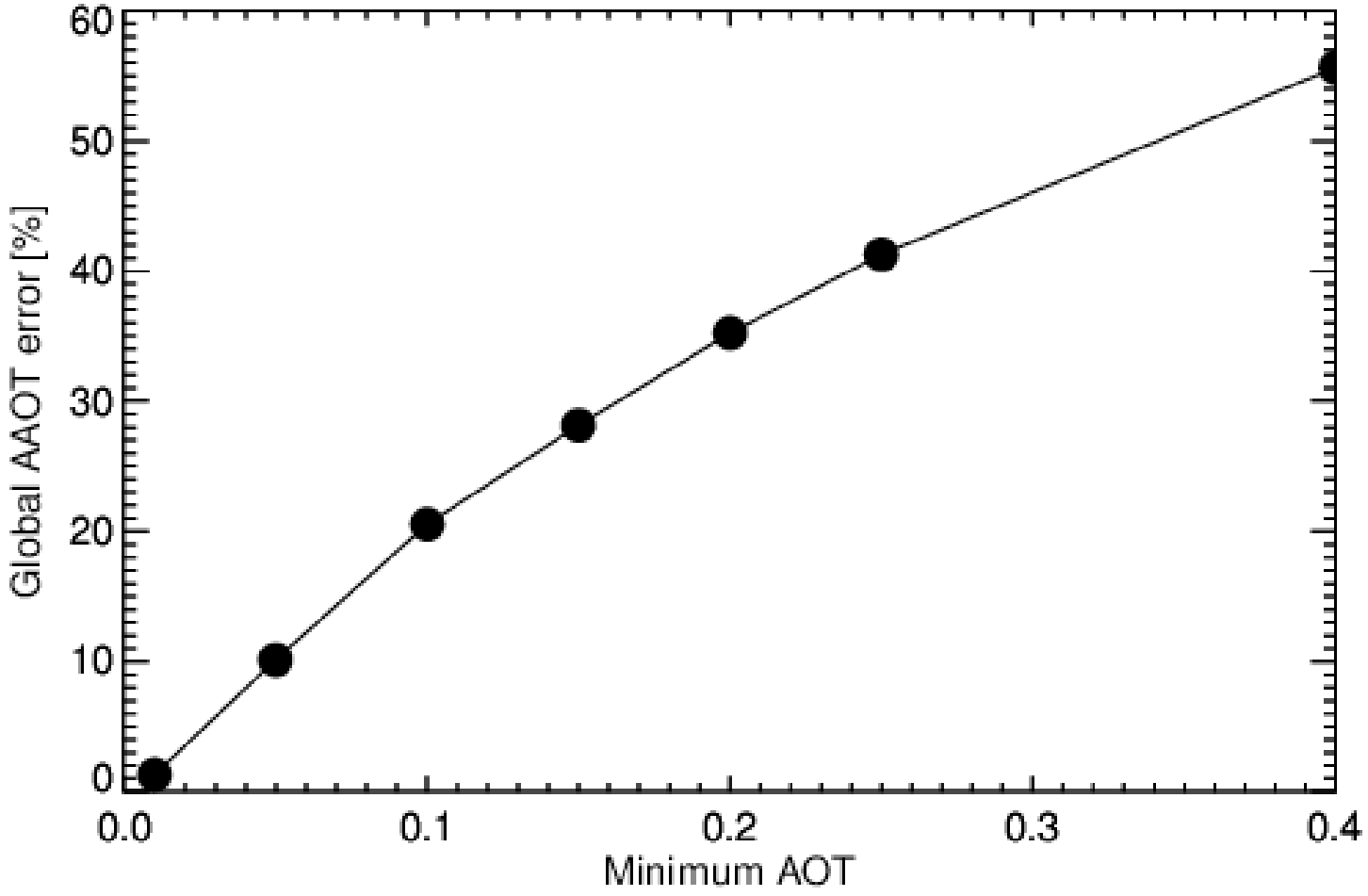


AOT > 0.0



AOT > 0.8

Expected uncertainty in evaluation global AAOT



Evaluation of satellite AOT

Aqua/Terra-DT

Aqua/Terra-DB

Aqua/Terra-MAIAC

Aqua/Terra-BAR

AVHRR-SOAR-DB

SeaWiFS-SOAR-DB

OMAERUV

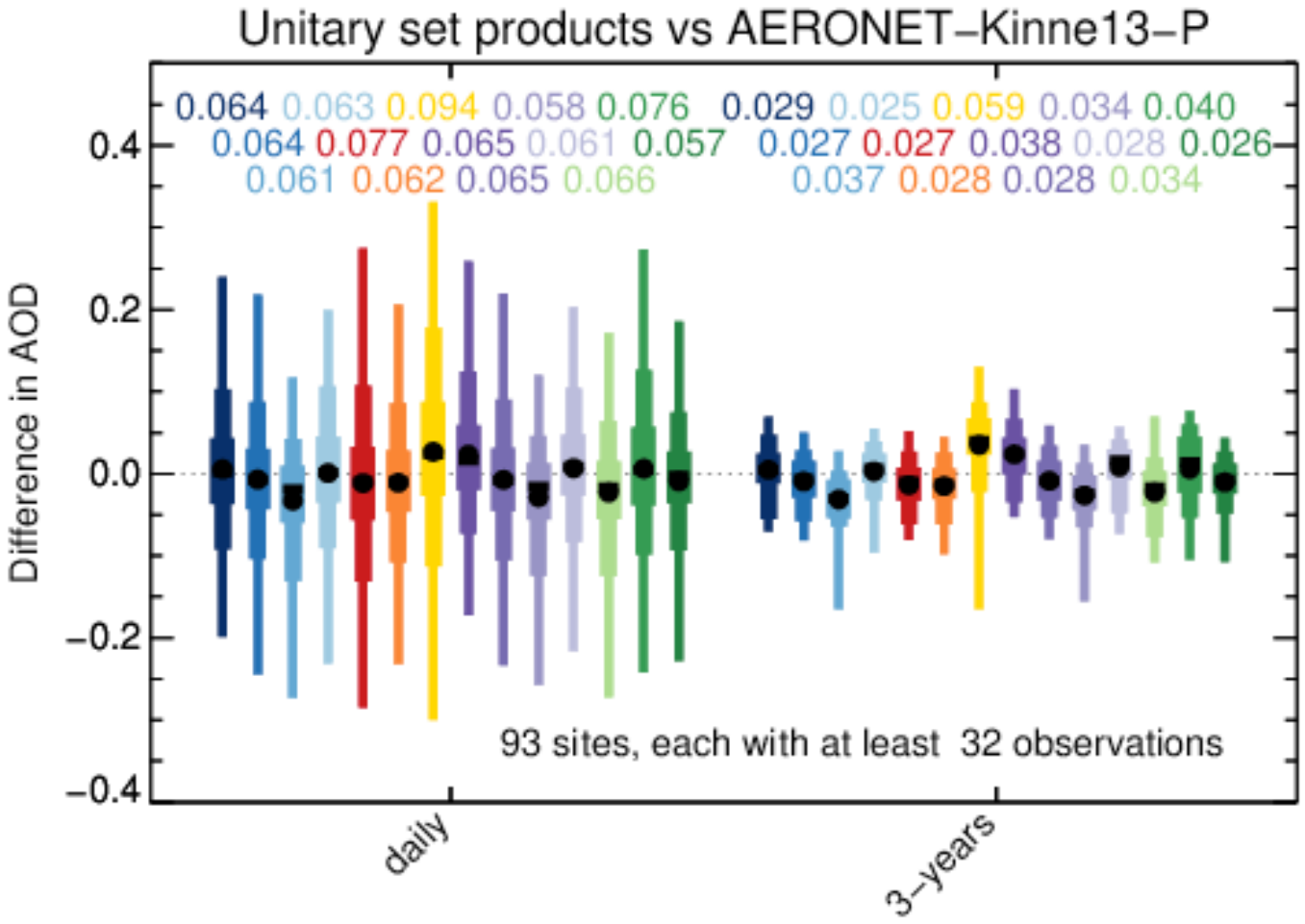
AATSR-FMI

AATSR-RAL

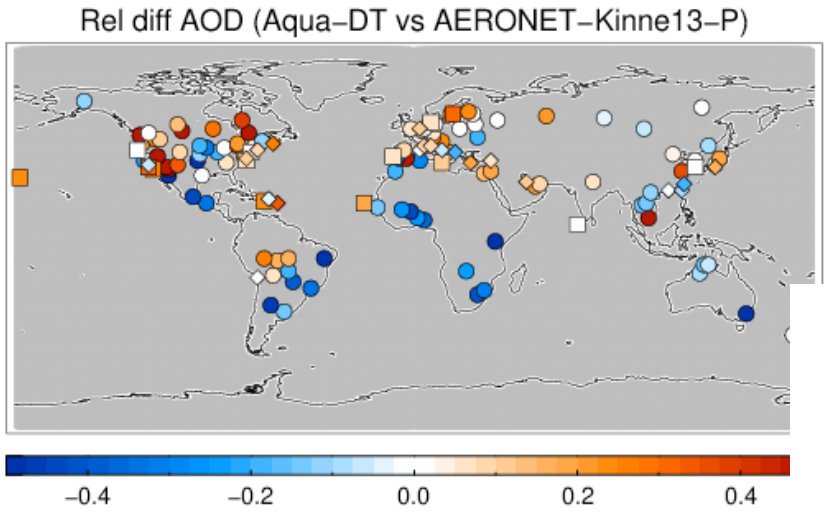
AATSR-SU

All data are 1^{o} degree time-stamped aggregates

Random errors and biases

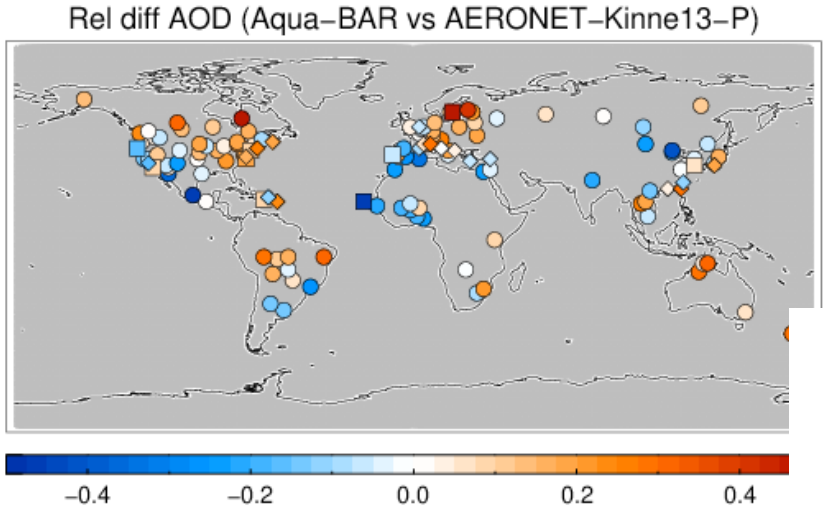


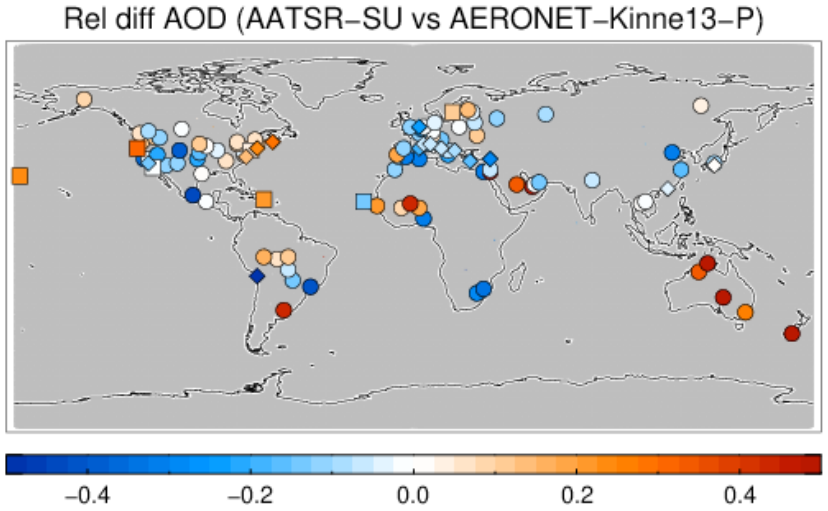
Biases vs AERONET



A typical bias per site is 15-25%, depending on product

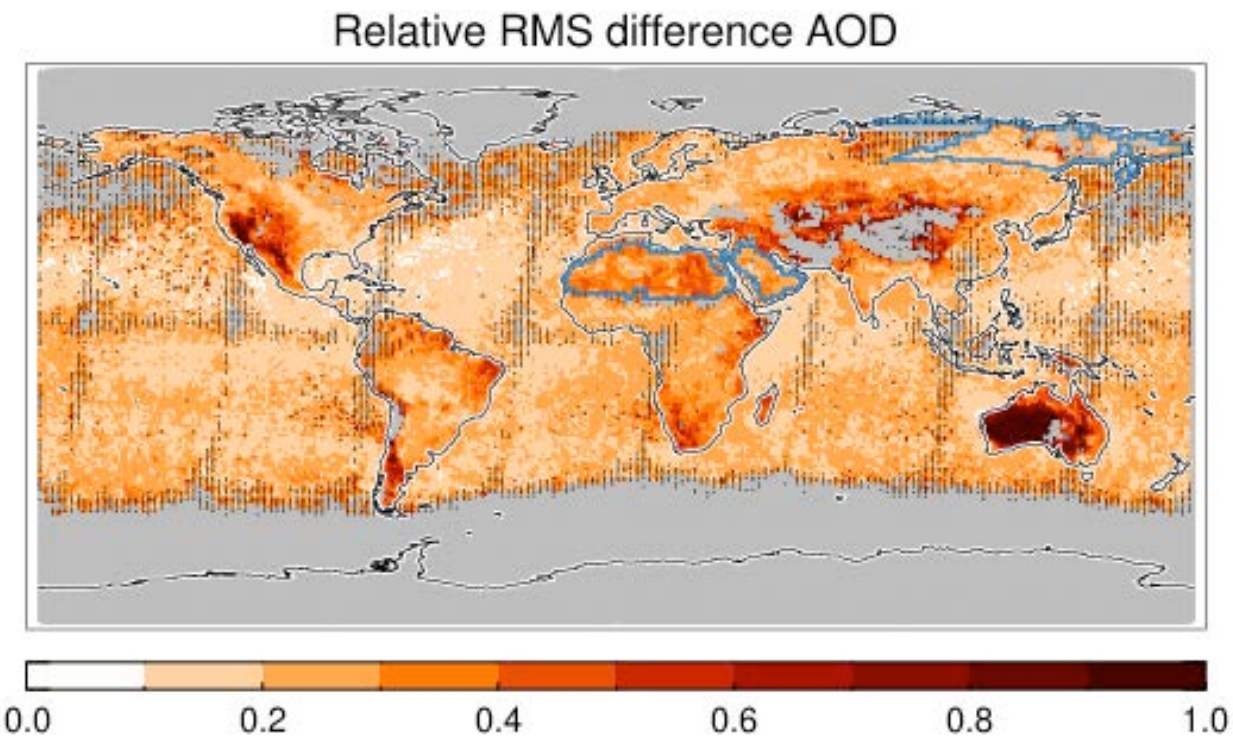
Likely, this is skewed by the geographical distribution of AERONET sites



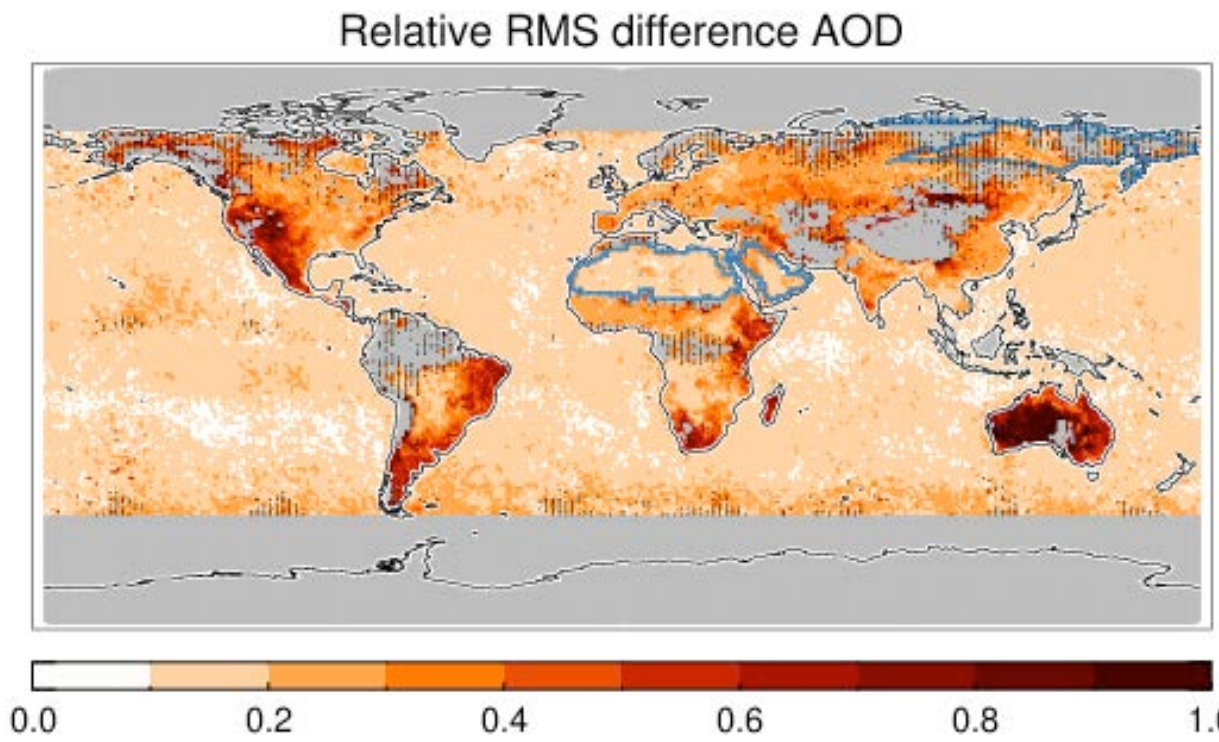


At least 32 observations per site

Diversity

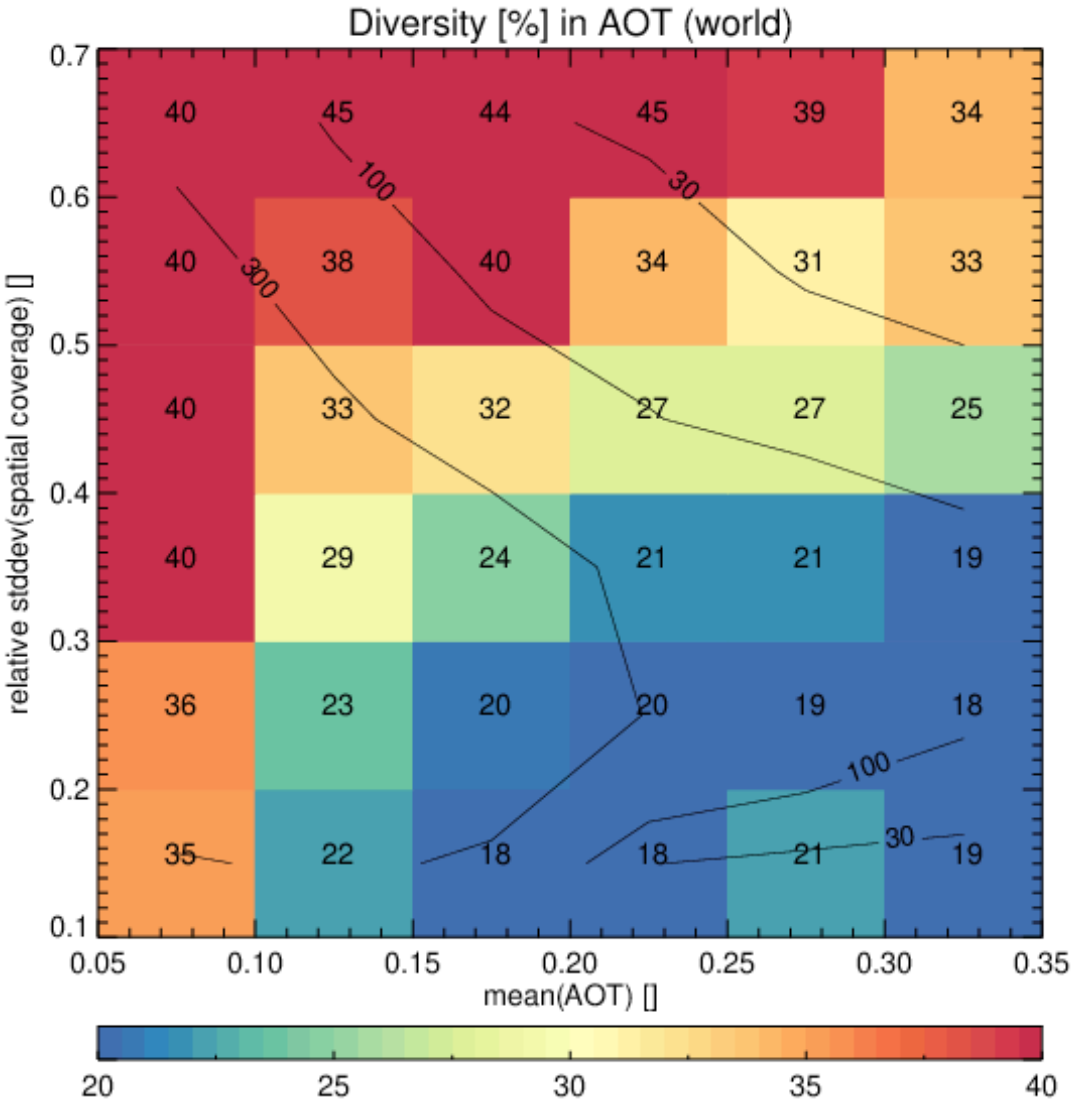


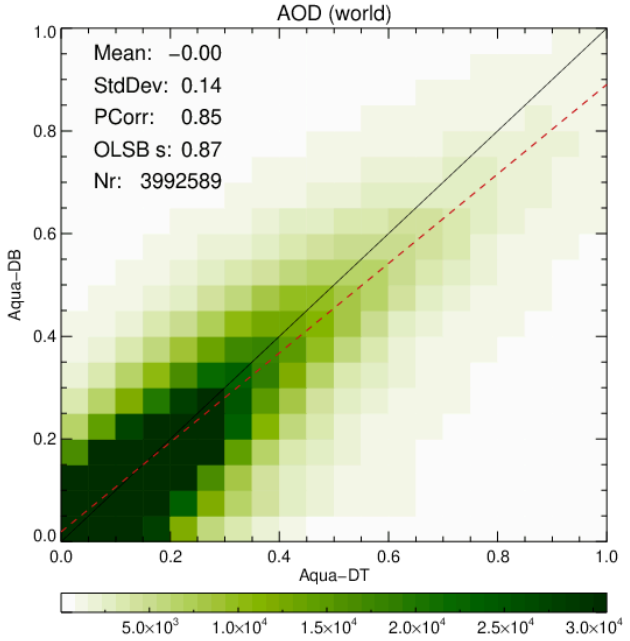
Morning platforms

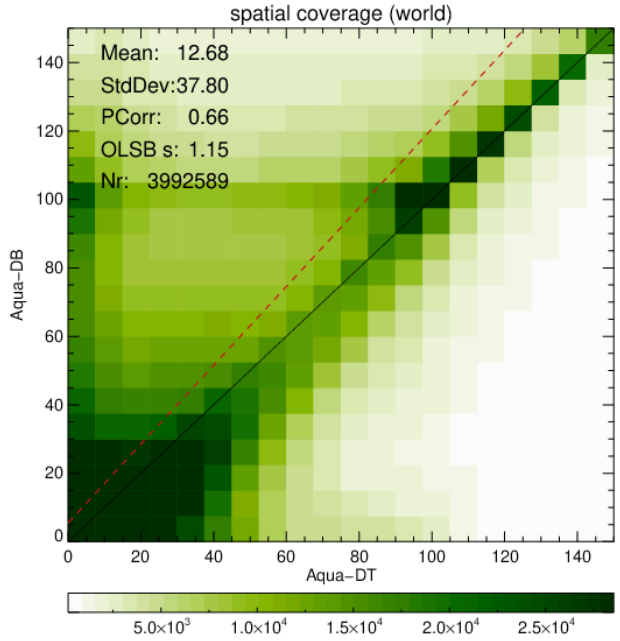


Afternoon platforms

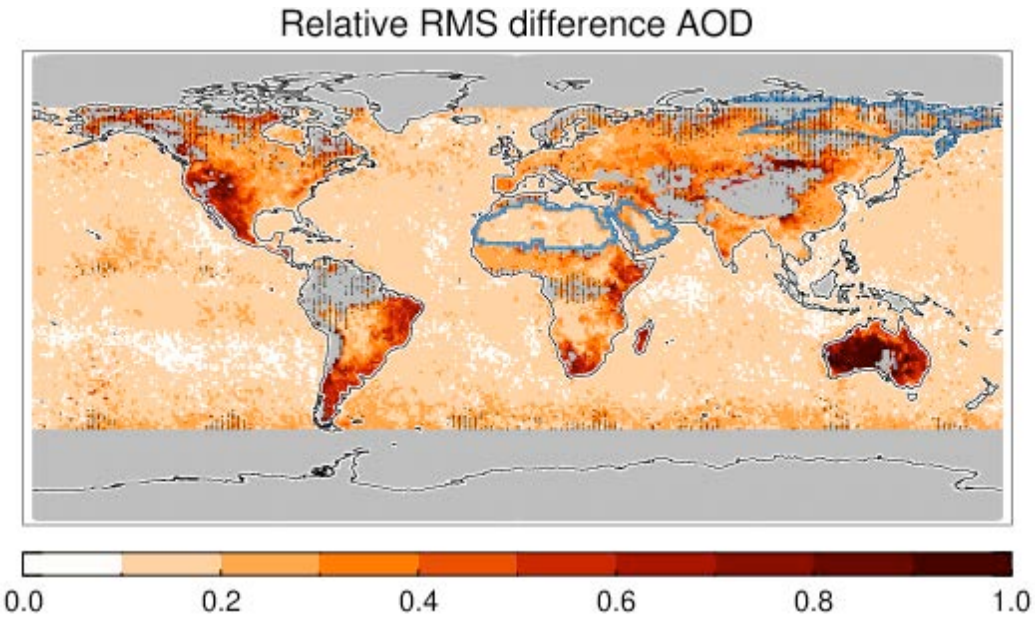
Diversity “explained”

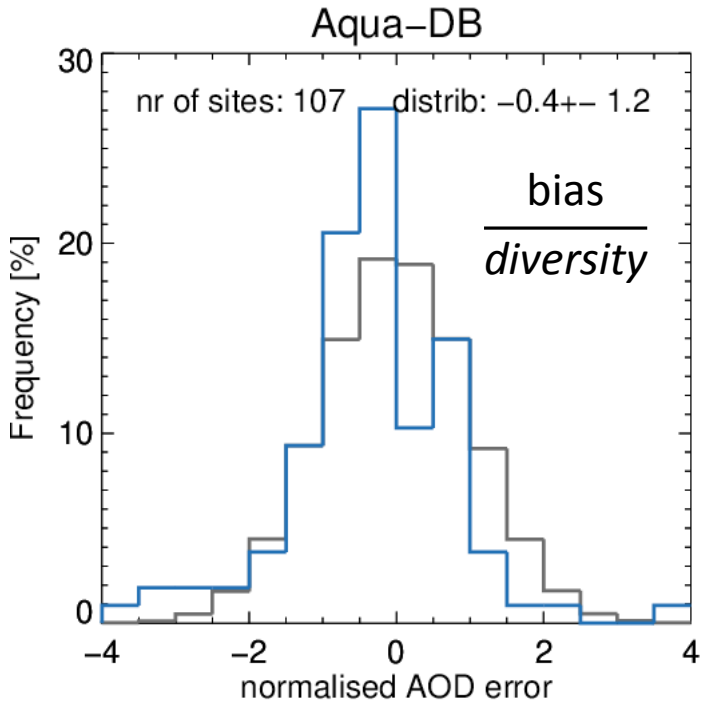


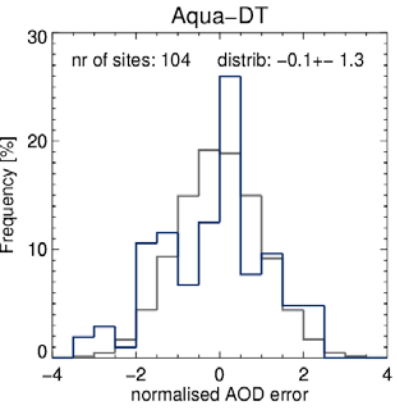


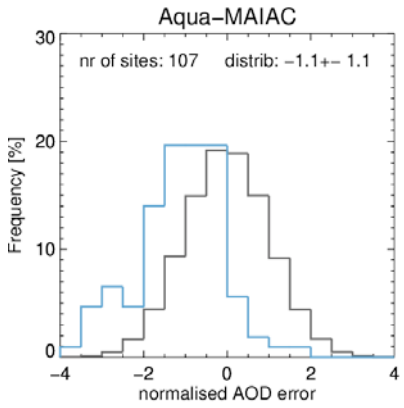


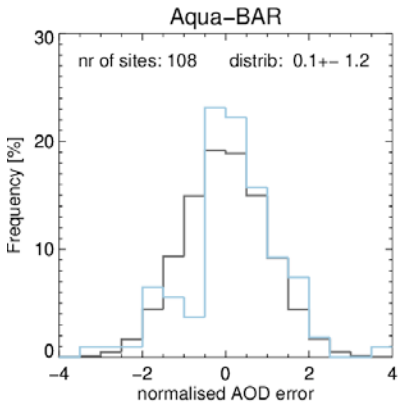
Diversity ≅ uncertainty

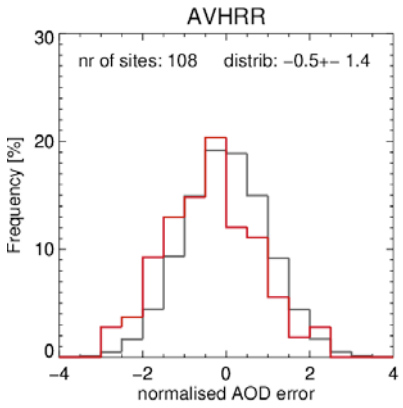


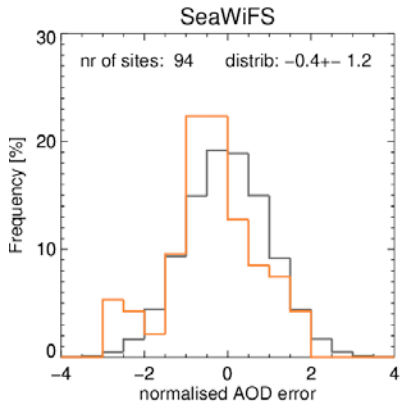


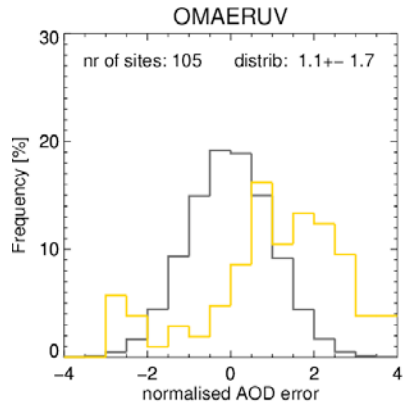












Summary

- **In DISCUSSION:** Representativity of AERONET sites
  - Ranked list of sites

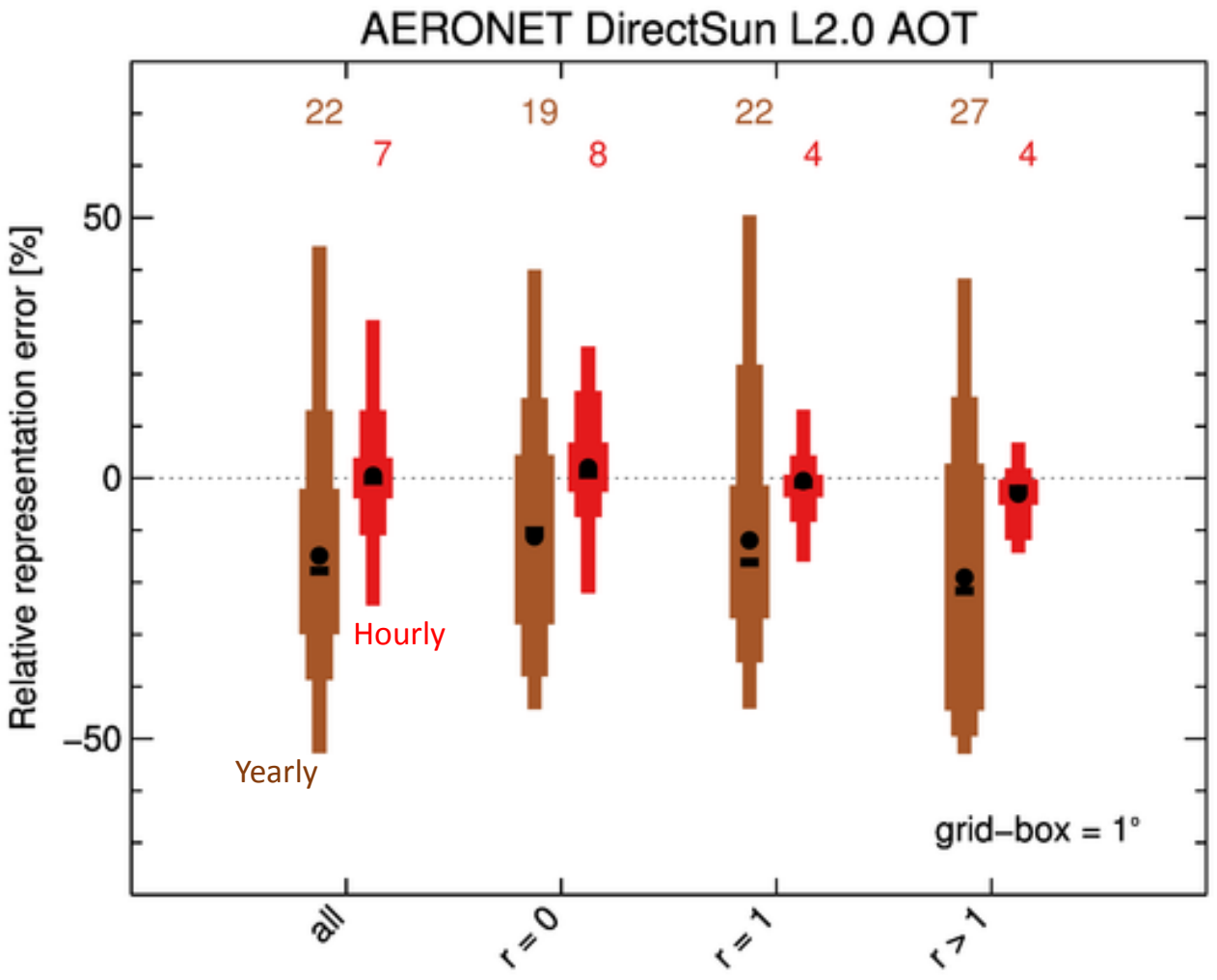
- **WRITE-UP:** Satellite AAOT evaluation

- **FIRST DRAFT:** Satellite AOT evaluation
  - Map of satellite diversity/uncertainty in AOT

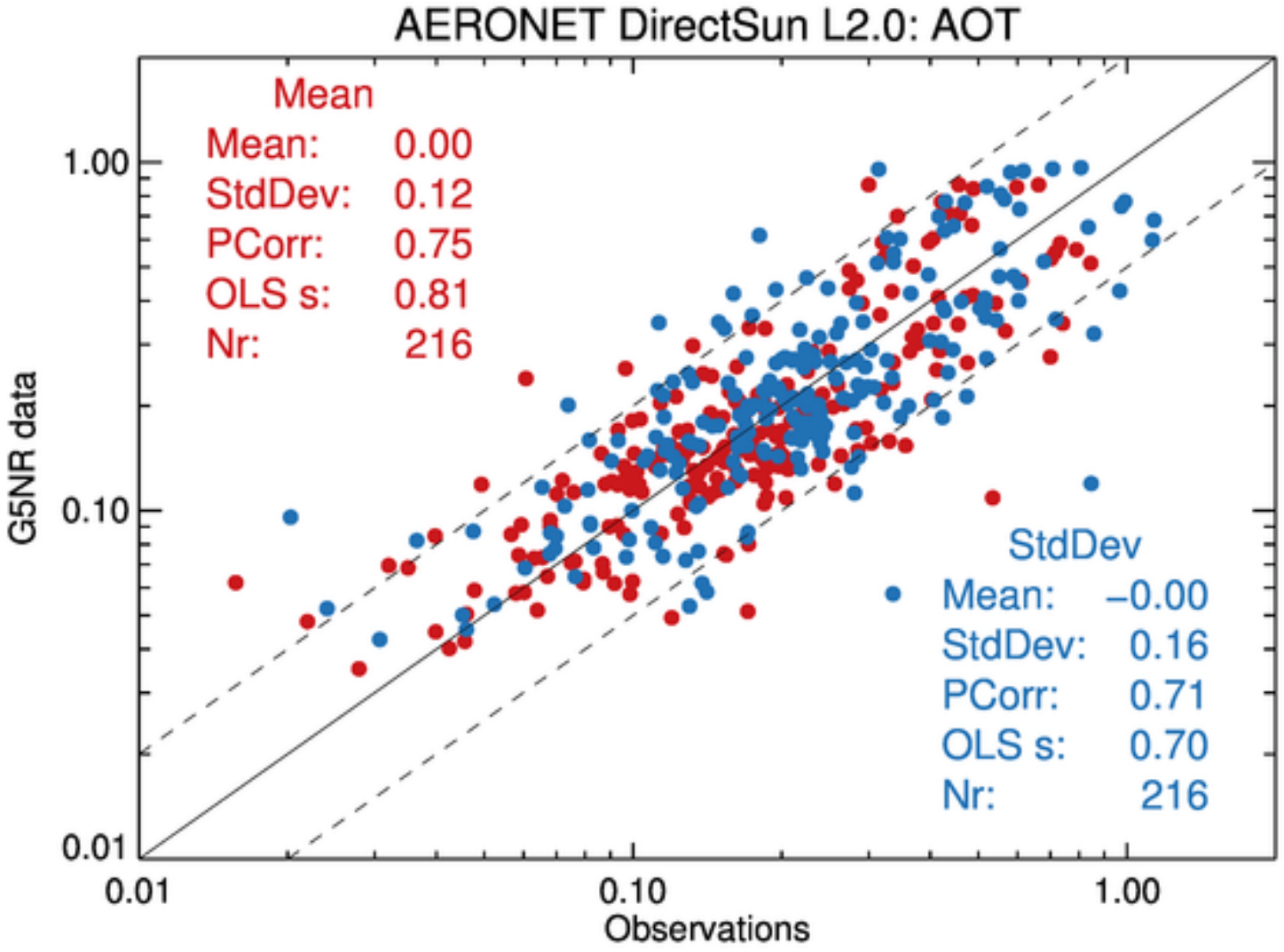
Comparison to subjective ranking of sites

Rank	Representative domain [km]	Nr of sites
0	100	120
1	300	106
2	500	28
3	900	6

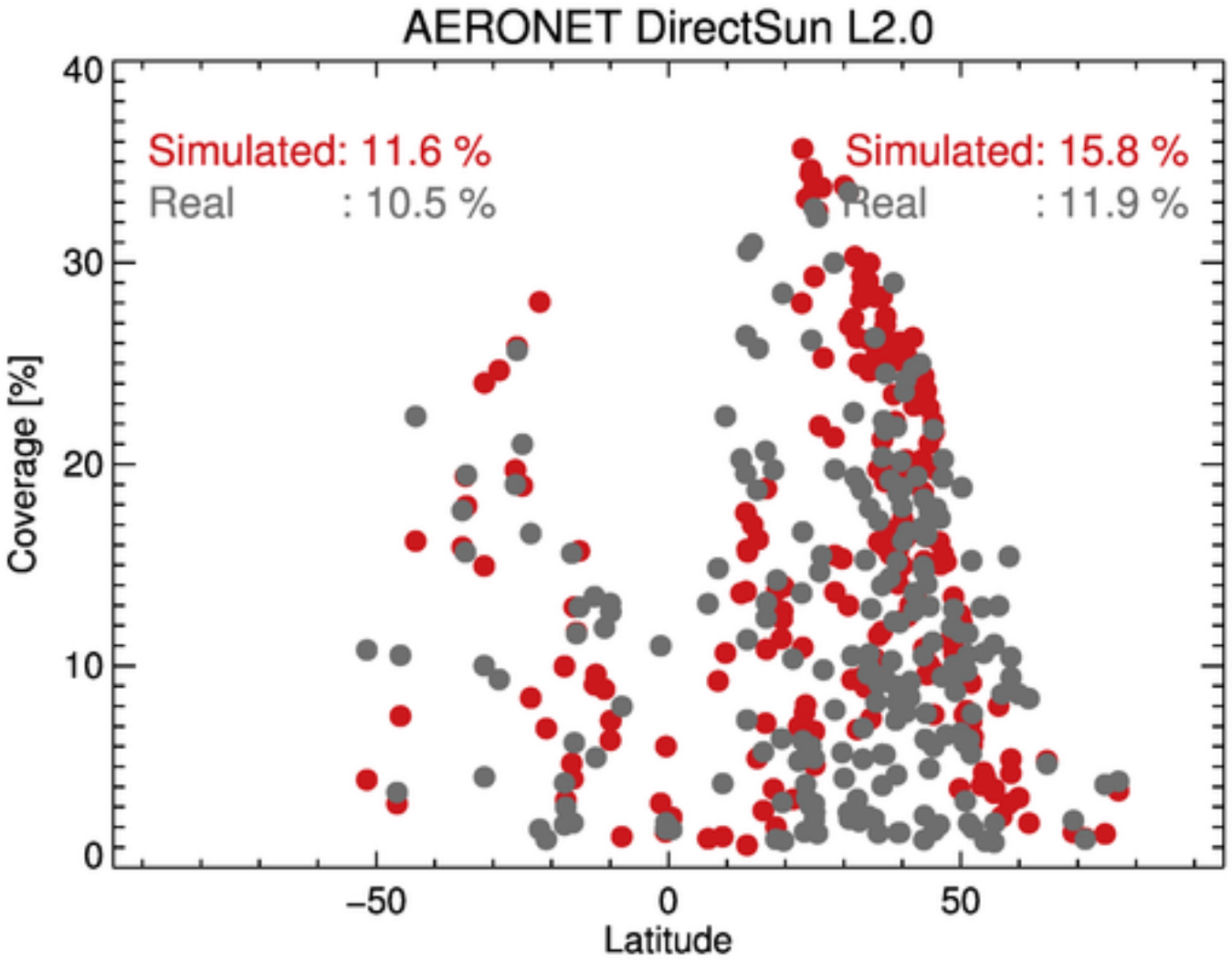
Kinne et al. *JAMES* 2013



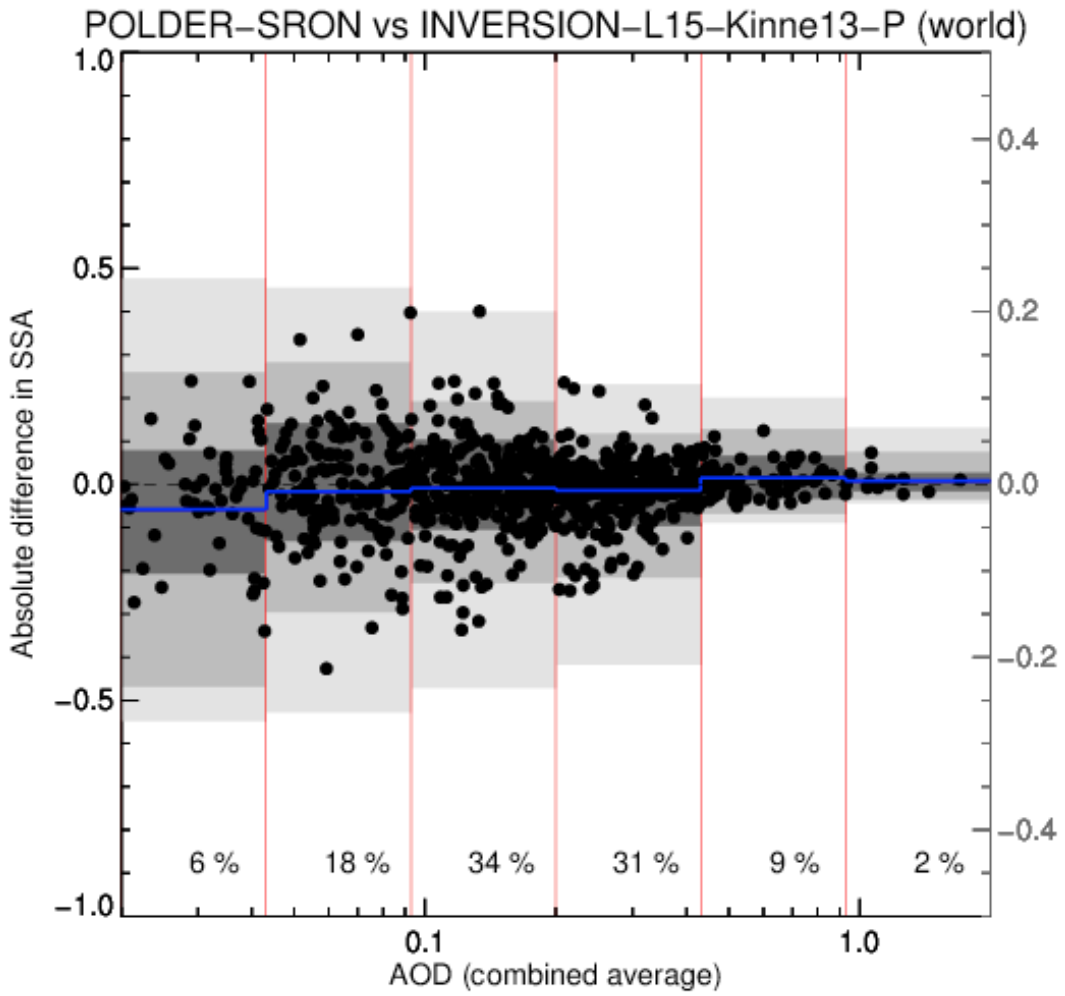
Evaluation of GEOS-5 Nature Run: AOT

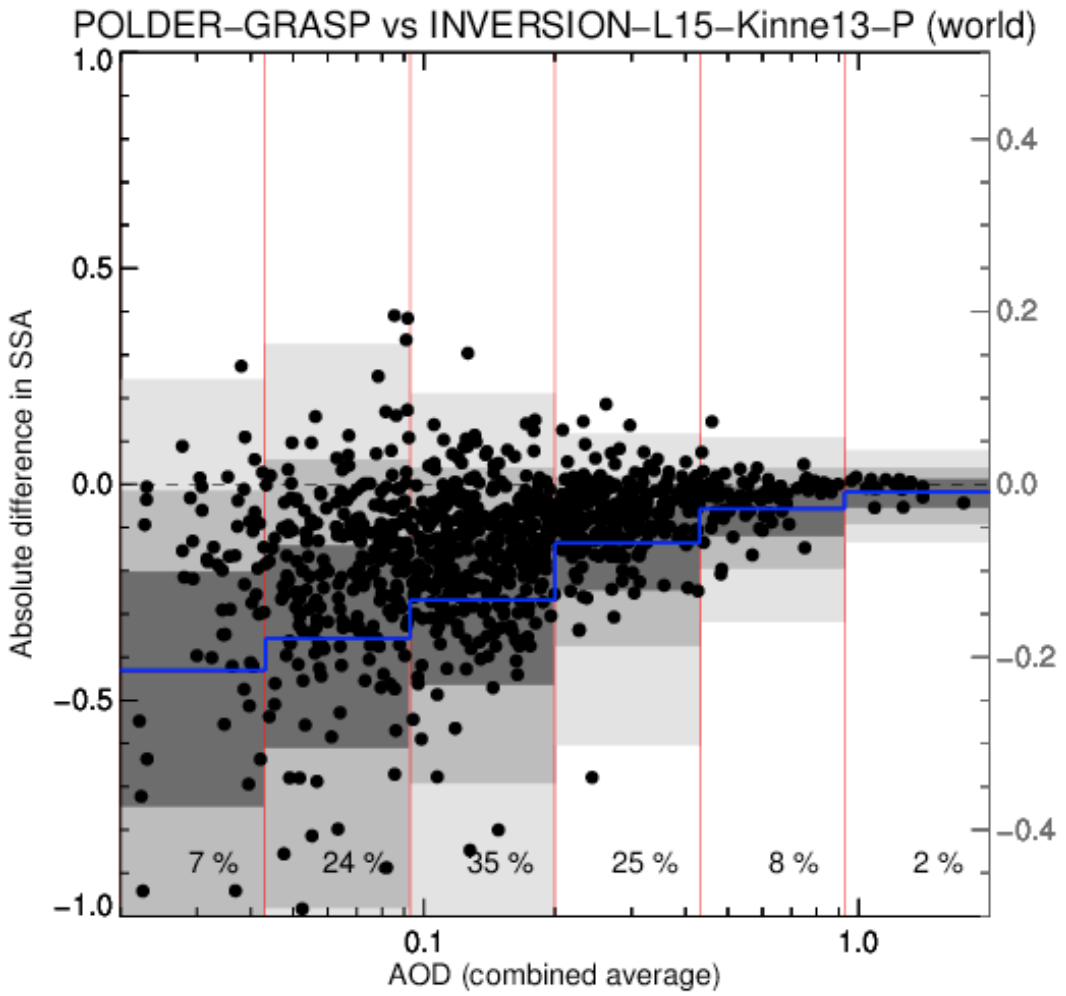


Evaluation of GEOS-5 Nature Run: coverage

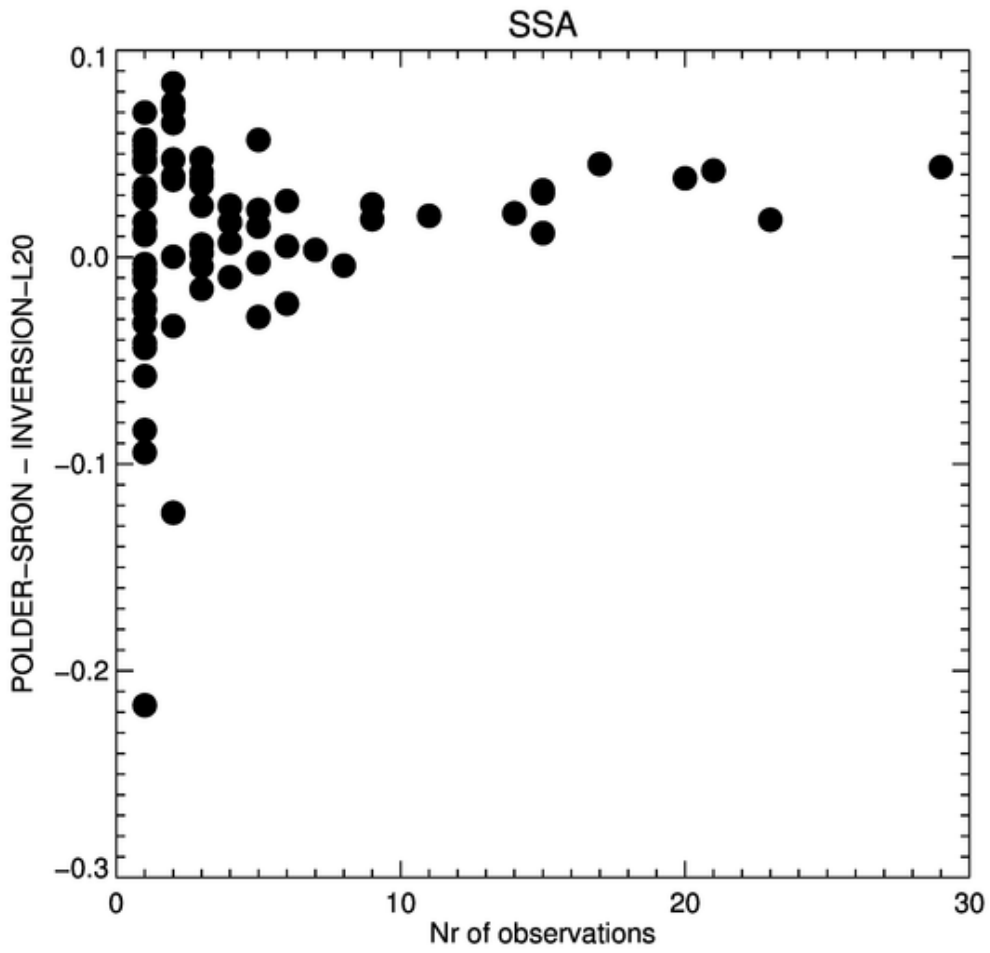


SSA error as function of AOT

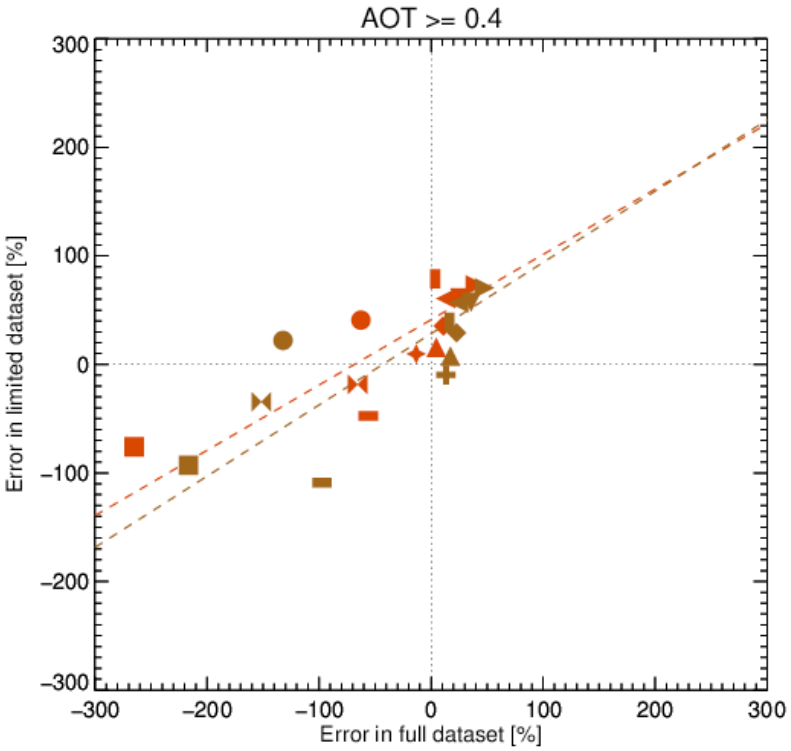


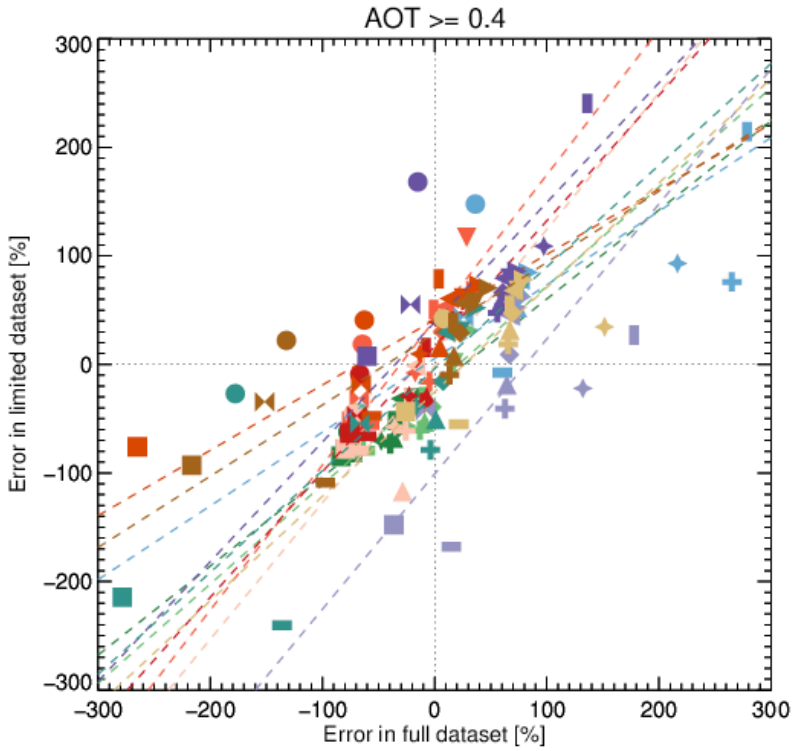


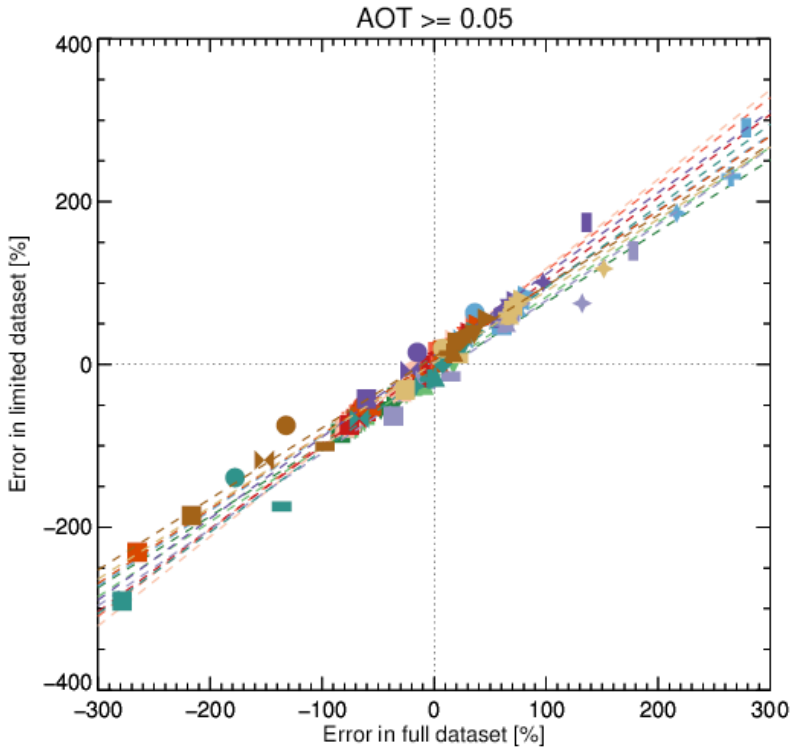
SSA error as function of nr of obs



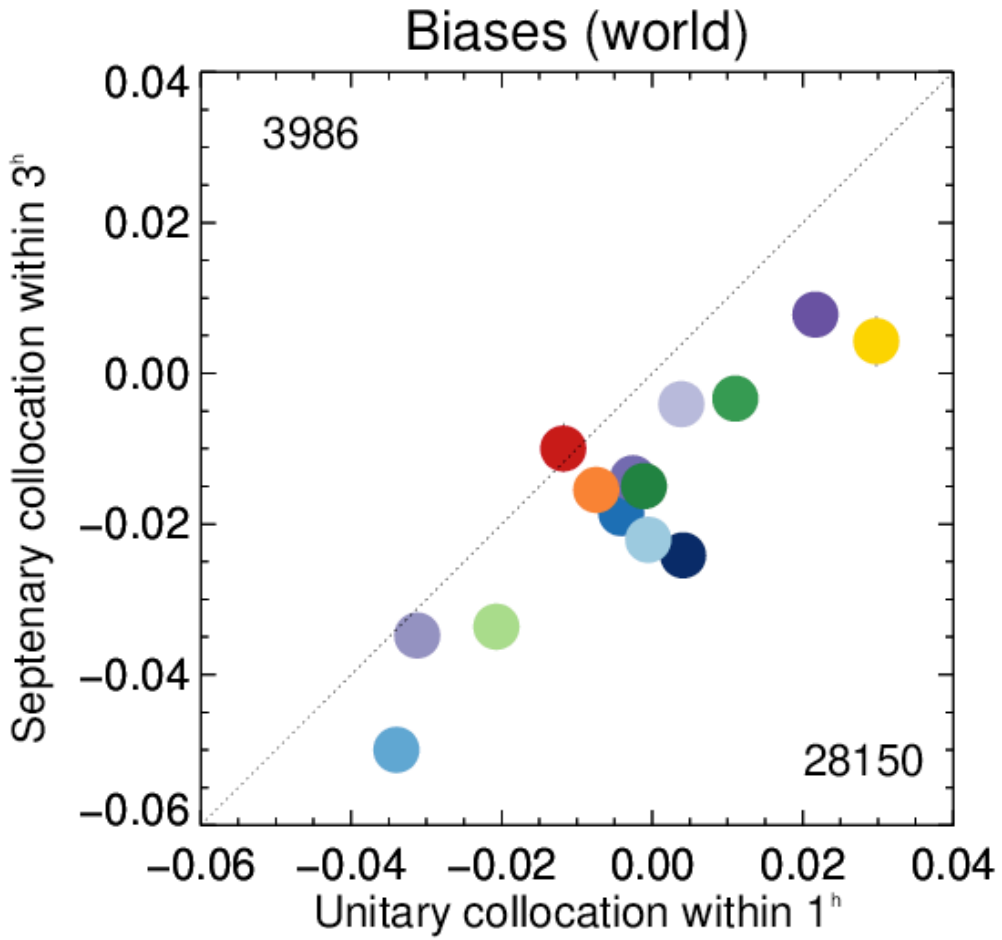
Inferring global AAOT

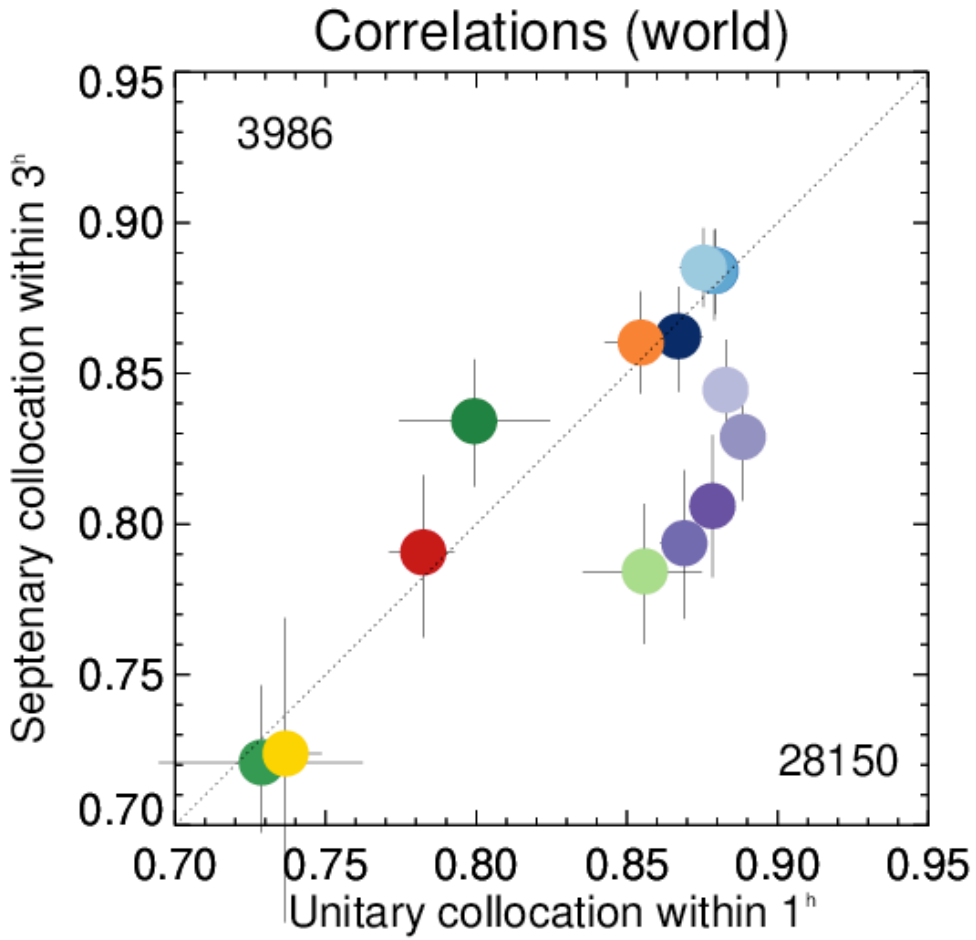




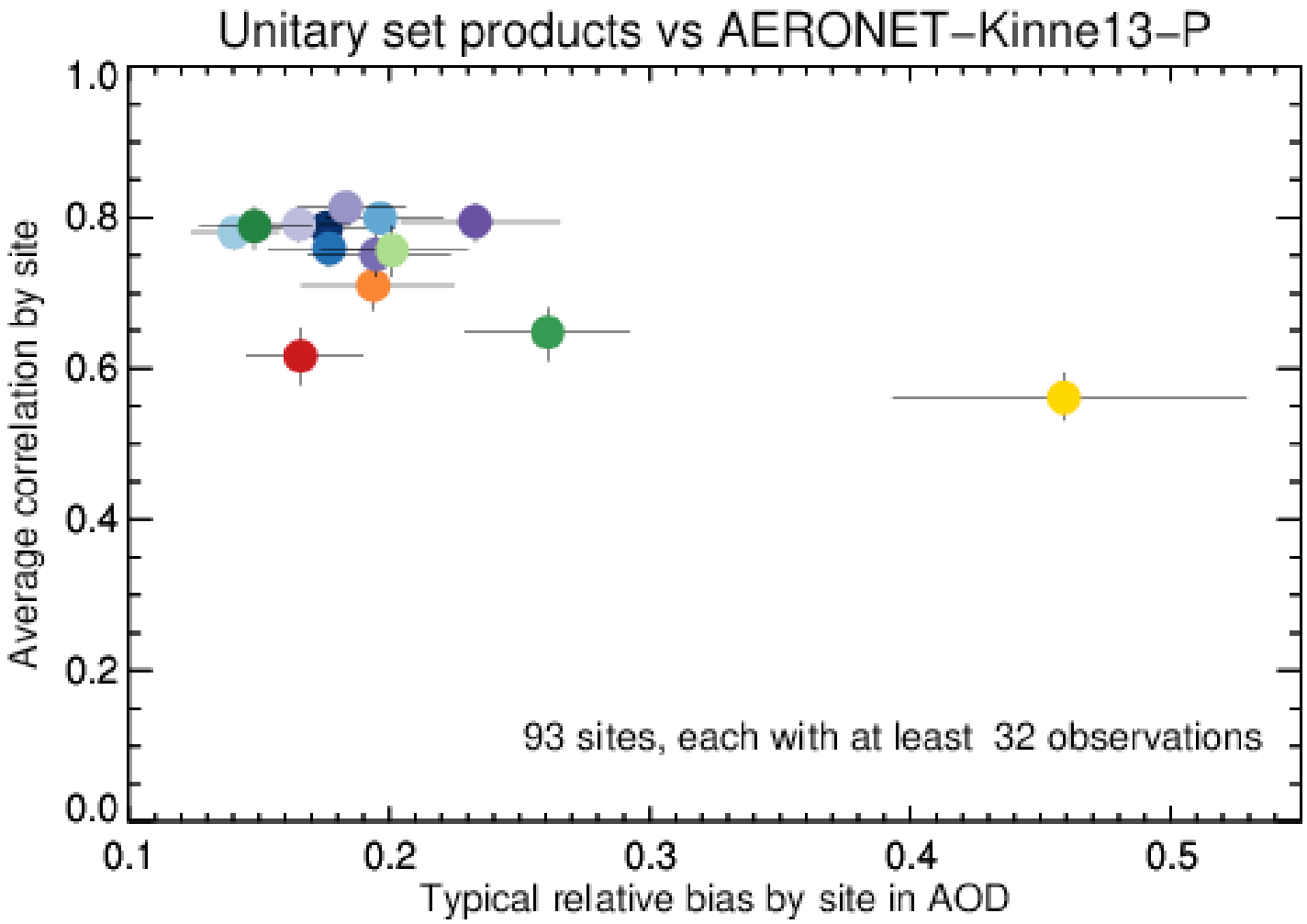


Different intercomparisons …





Statistics, averaged over all sites



Diversity ≅ uncertainty