Action 726

Aerosol Single Scattering Albedo retrieval in UV range at Rome

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Outline

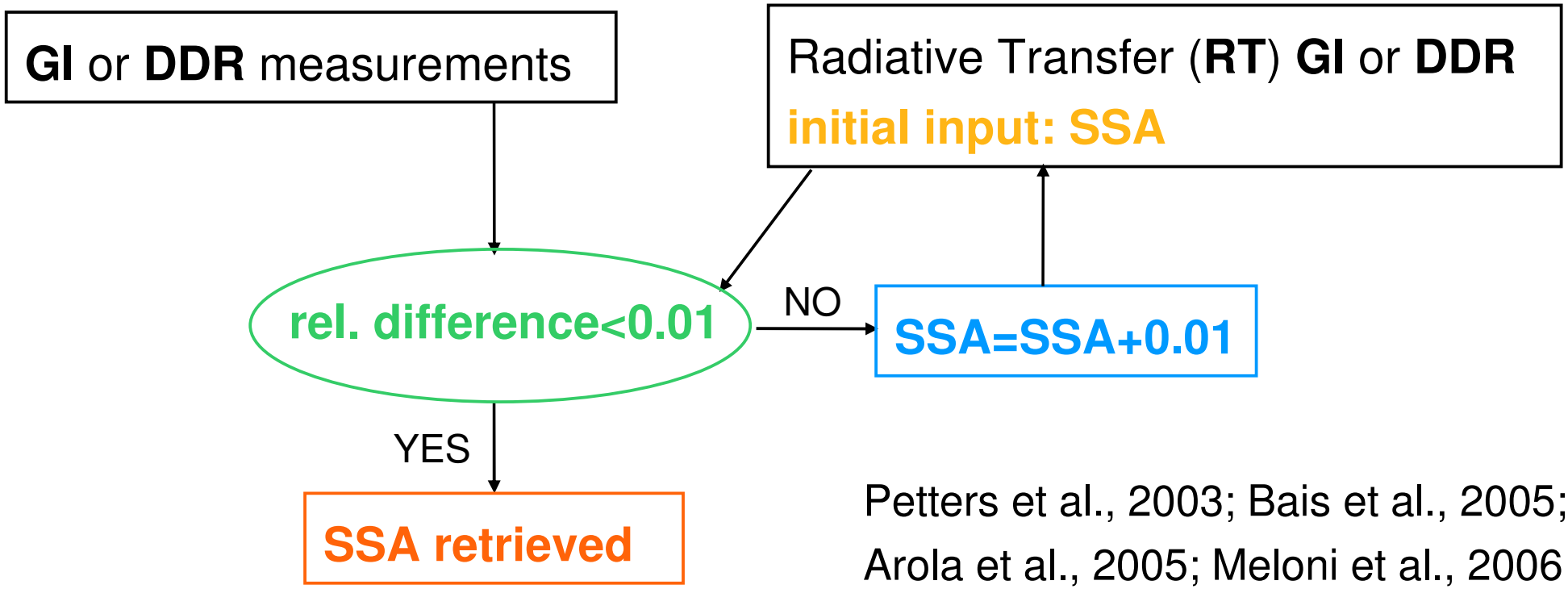
- ✓ Single Scattering Albedo (SSA) retrieval methodology
- ✓ Dataset (Rome station)
- ✓ Radiative Transfer (RT) model (UVSPEC DISORT2)
- ✓ Results (SSA and AAOD)
- ✓ Application to OMI validation at Rome site

Methodology

$SSA = k_s/(k_s+k_a)$ Single Scattering Albedo

$AAOD = (1-SSA)*AOD$ Absorbing Aerosol Optical Depth

GI global irradiance **DDR** direct-to-diffuse irradiance ratio



Petters et al., 2003; Bais et al., 2005;
Arola et al., 2005; Meloni et al., 2006

Rome Brewer dataset

Brewer spectrophotometer 067 (model MKIV)

- ✓ Global UV Irradiance (time sampling 30 min)
  - wavelength range: 290-325 nm (step 0.5 nm)
  - FWHM=0.63 nm
  - cosine and temperature corrected
- ✓ Direct Sun (DS) measurements
  - Direct Irradiance (Kazadzis et al., 2004)
  - Aerosol Optical Depth (AOD) (Sellitto et al., 2006)
  - Total Ozone Column (TOC)

Radiative Transfer model

LibRadtran package version 1.2 (Mayer and Kylling, 2005)

UVSPEC DISORT2 radiative transfer equation solver (Stamnes et al., 2000)

- discrete ordinate
- atmosphere plane-parallel

INPUT settings

atmosphere file: Anderson et al. (1986)

solar file: ATLAS3

slit function: Brewer 067

day of year (Sun-Earth correction,Spencer 1981)

altitude=60 m ASL (Meloni et al., 2000)

surface albedo=0.09 (Meloni et al.,2000)

sza: Brewer data

SSA range: (0.60-0.99, step 0.01)

wavelength: 290-325 nm (step 0.1 nm)

aerosol default: Shettle et al. (1989)

aod profile: Elterman et al. (1968)

INPUT data

TOC and aod at 320.1 nm

OUTPUT

Global and Direct Irradiance (spectral res.: 0.1 nm)

Uncertainties analysis

according to Bais et al., 2005

Brewer 067

GI uncertainty = 5%

DDR uncertainty = 10% (langley plot calibration – Kazadzis et al., 2005)

RT model UVSPEC DISORT

GI uncertainty = 4.6%

DDR uncertainty = 4%

DDR is more sensitive than GI to changes in SSA

The number of SSA values gives information on the accuracy of the SSA retrieval:

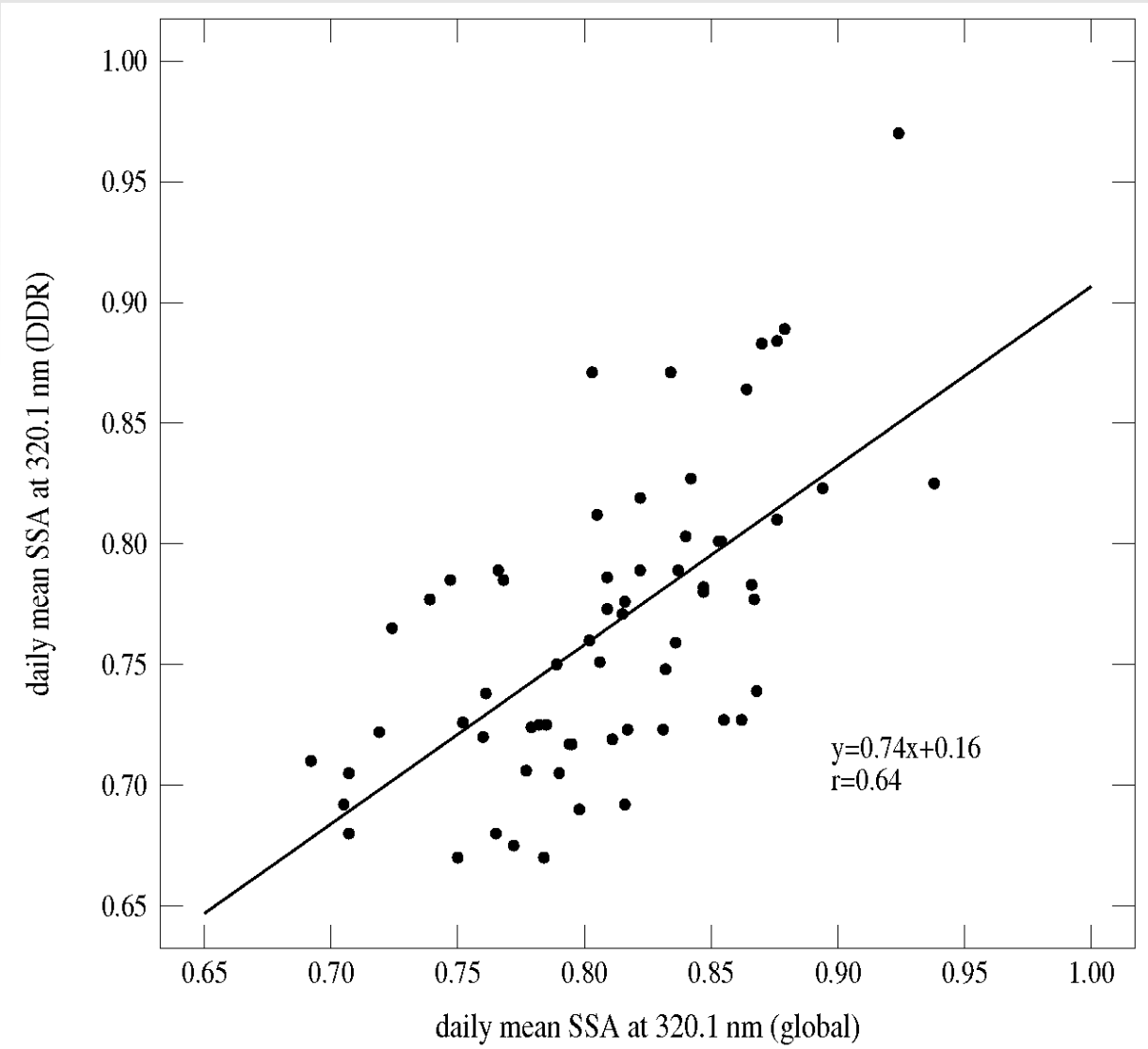
- ✓ uncertainty on SSA from GI: 0.01-0.05
- ✓ uncertainty on SSA from DDR: 0.01-0.03

SSA daily means

SSA from GI:
range=(0.69 - 0.94)
mean=0.81

SSA from DDR:
range=(0.67 - 0.97)
mean=0.77

mean relative difference%=(6±7)%



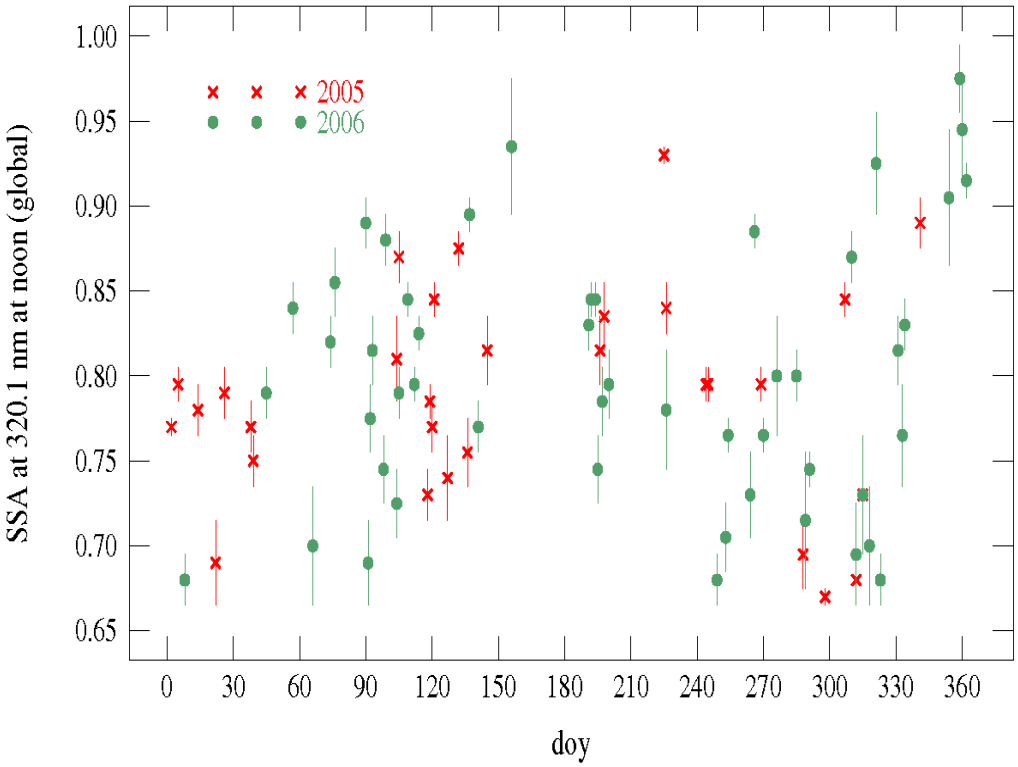
SSA and AAOD at noon

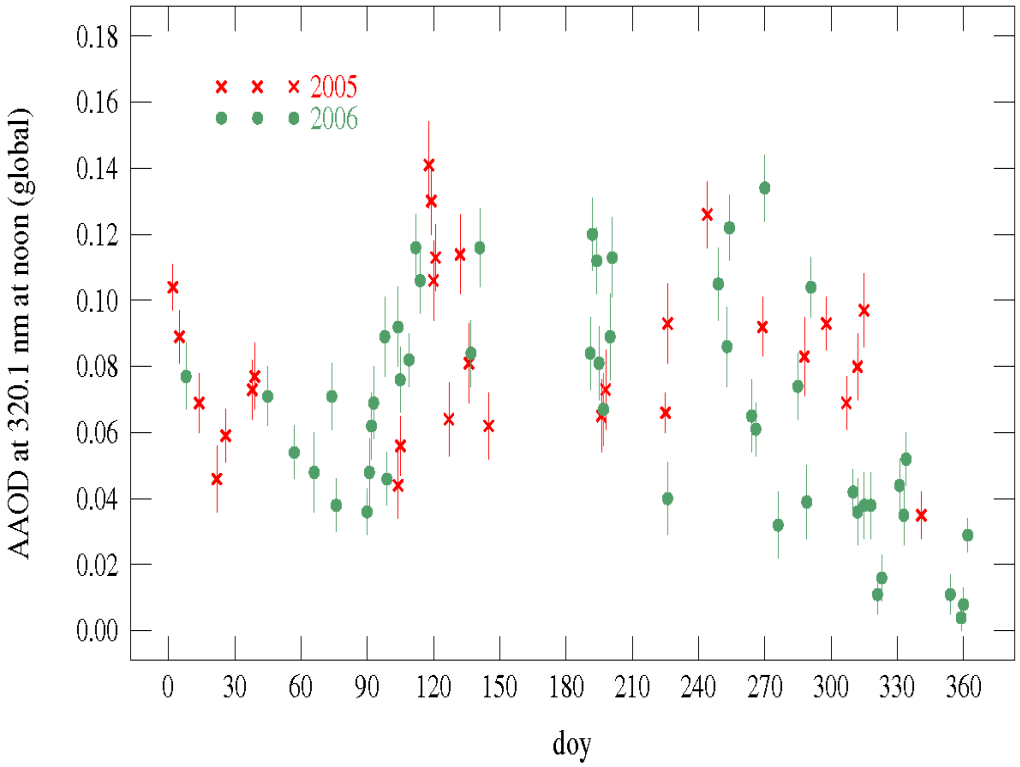
SSA at noon

range: (0.67 - 0.93)

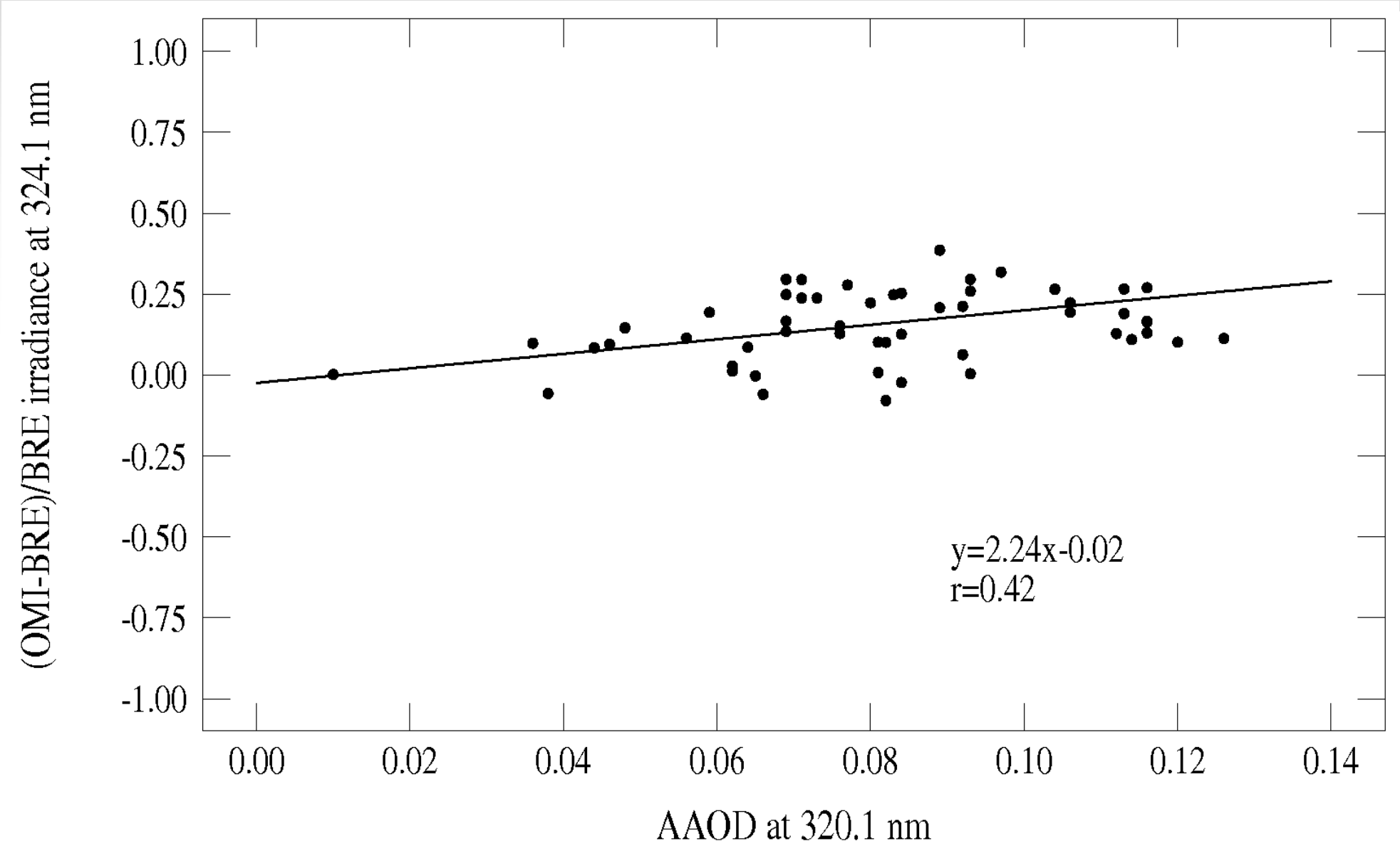
AAOD at noon

range: (0.03 - 0.14)





OMI validation



Summary and conclusions

- Application of a methodology for the aerosol SSA retrieval in UV range at Rome station
- SSA range: 0.67-0.97
- AAOD range: 0.03-0.14
- The increase in AAOD from 0.04 to 0.12 leads to an increase in the relative difference OMI vs Brewer from 0 to 25%

Thank you!

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