



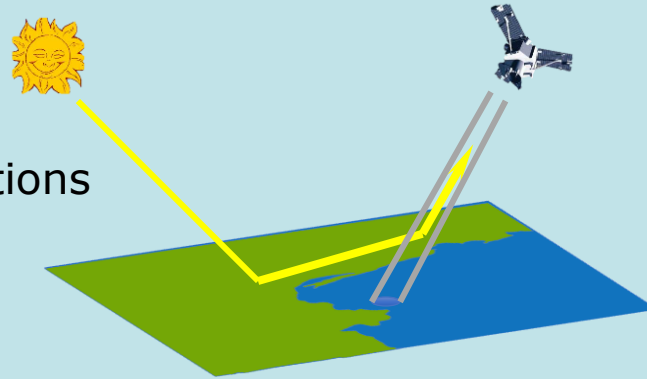
Simulation of Adjacency Effects in Coastal Waters

Barbara Bulgarelli

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Accurate, Extensive and Realistic AE Simulations

- Typical observation conditions
- Off-nadir observations
- Seasonality
- Coastal morphology
- Sea surface roughness
- Multiple scattering

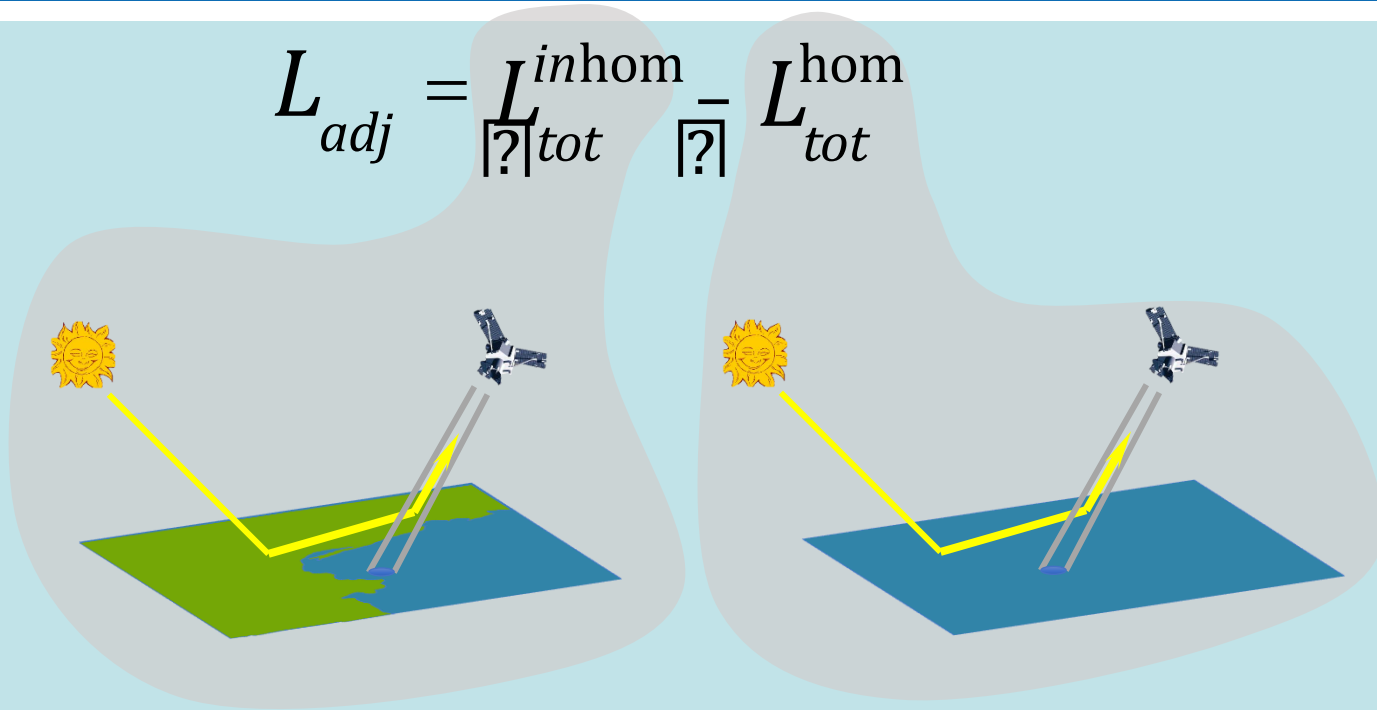


$$L_{\text{tot}} = L_{\text{atm}} + tL_w + L_{\text{adj}}$$

SeaWiFS
MODIS Aqua (HR and LR)
MERIS (FR and RR)
OLCI (FR and RR)
MSI
OLI

Definition of Adjacency Effects

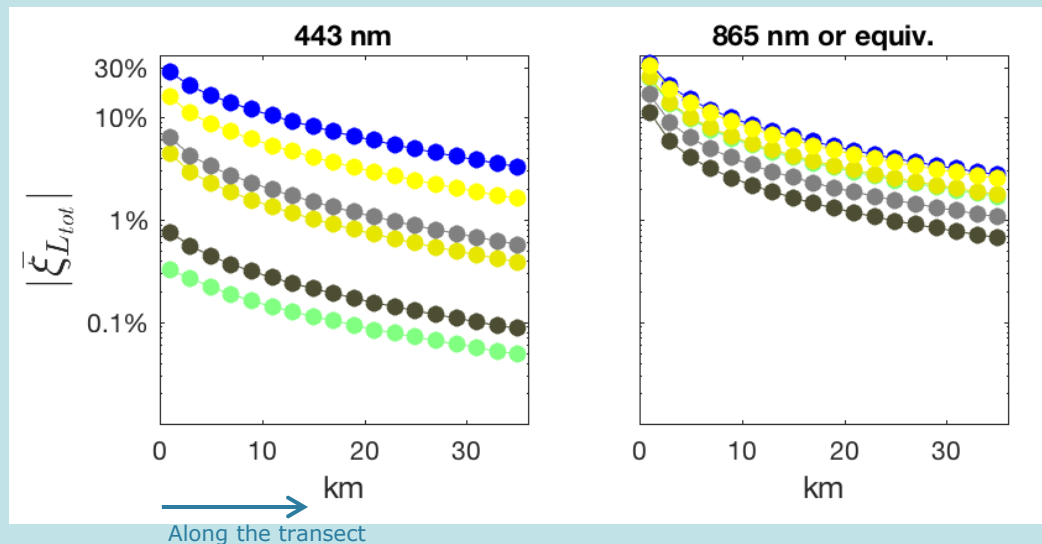
$$L_{adj} = \frac{L_{tot}^{inhom}}{L_{tot}^{hom}}$$



$$X_{L_{tot}} = L_{adj} / L_{tot}$$

AE spatial extension

Values of $\left| \overline{X}_{L_{tot}} \right|$



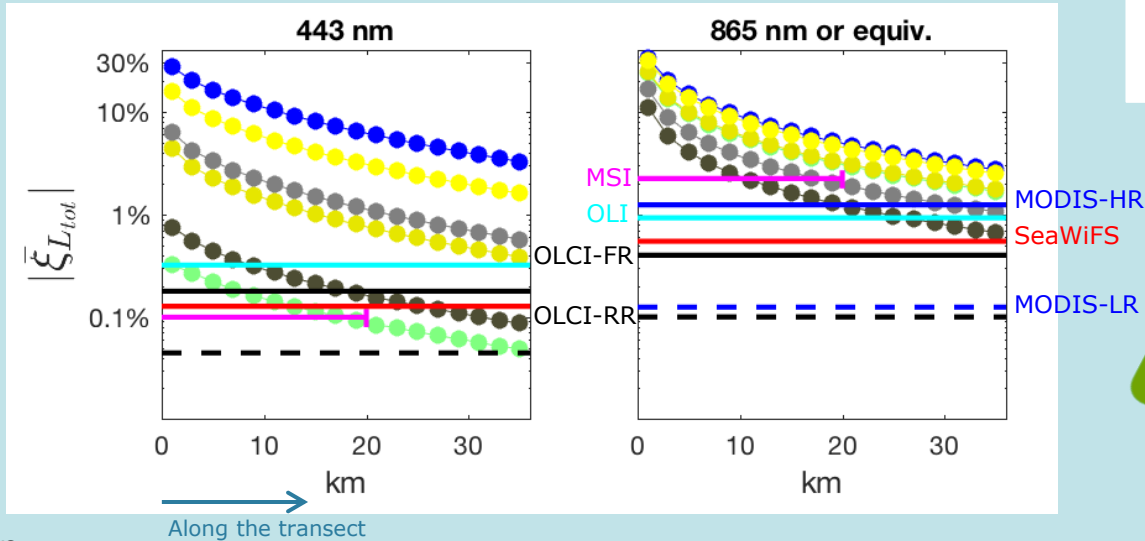
error bars = uncertainties
northern Adriatic Sea waters

- Snow
- White sand
- Concrete
- Dry grass
- Bare soil (brown loam)
- Green veg. (dec. trees)

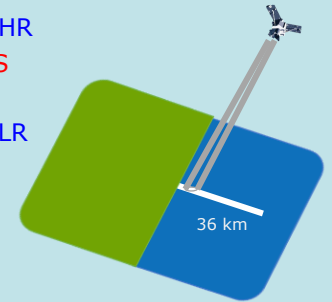


AE spatial extension

Detectability: $\xi_{L_{tot}} > NL$ ($NL=1/SNR$)



- Snow
- White sand
- Concrete
- Dry grass
- Bare soil (brown loam)
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error bars = uncertainties
northern Adriatic Sea waters

→ AE are NOT confined to the first km offshore.

Particularly for highly reflecting land covers, in the NIR and for highly sensitive sensors

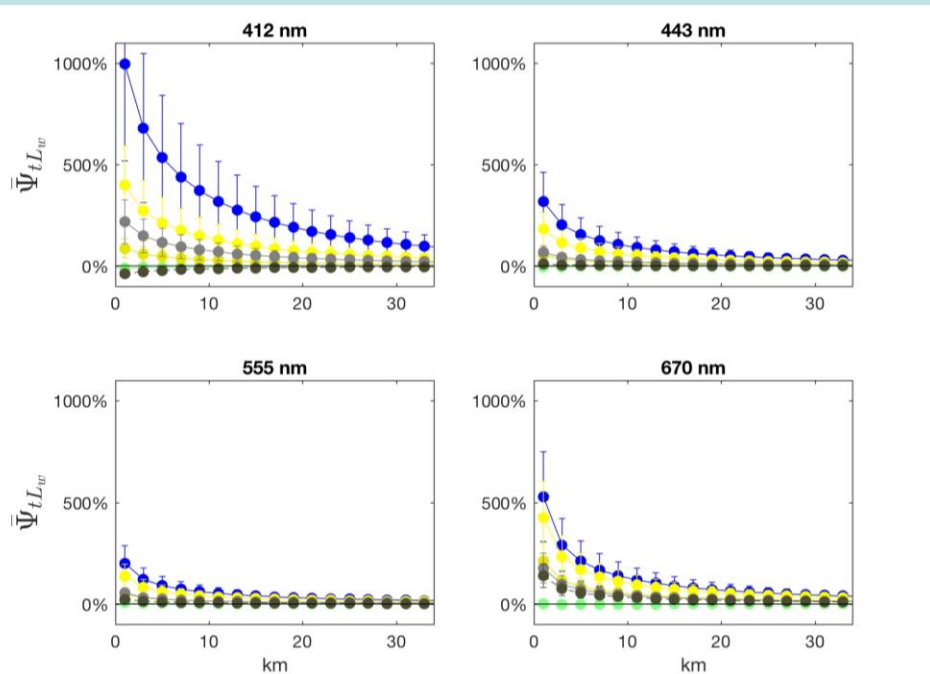
→ In inland waters AE are expected to be higher!

Biases induced by AE on OC products strictly depend on the AC procedure

Atmospheric correction scheme **not** deriving the atmospheric properties from the satellite data

$$y \mu r_i$$

biases are all positive
And monotonically decrease with distance



Snow
White sand
Concrete
Dry grass
Bare soil (brown loam)
Green veg. (dec. trees)



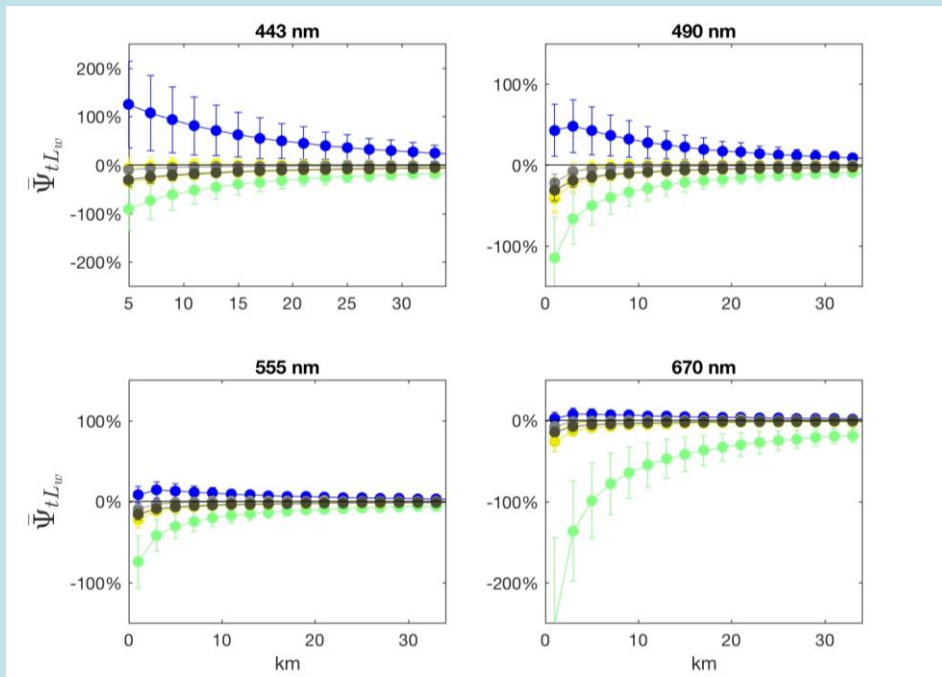
error bars = $\pm 1 \sigma$ (N=24 cases)
northern Adriatic Sea waters

Biases induced by AE on OC products strictly depend on the AC procedure

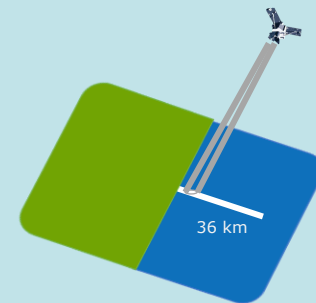
Atmospheric correction scheme determining the atmospheric properties from two NIR bands (e.g., I2gen) power-law spectral extrapolation

$$y \neq r_1$$

Apart from snow, biases are mainly negative



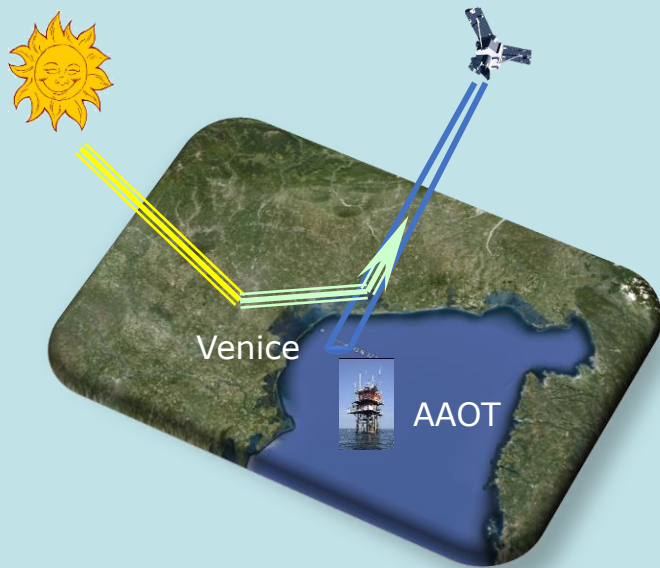
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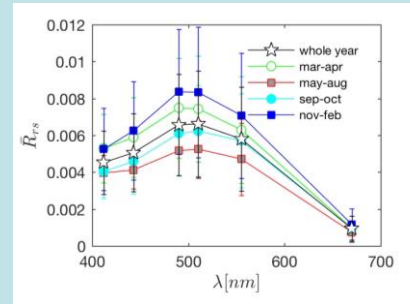
error bars = $\pm 1 \sigma$ (N=24 cases)
northern Adriatic Sea waters

→ **COMPENSATIONS** between AE at VIS and NIR!

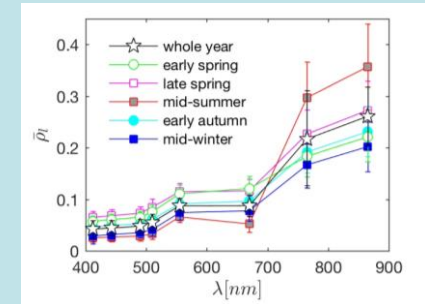
Impact of AE on matchups at the AAOT



Aqua Alta Oceanographic Tower (45.31N, 12.51E)
of the AERONET-OC network
comprehensive bio-optical in situ measurements since 1995



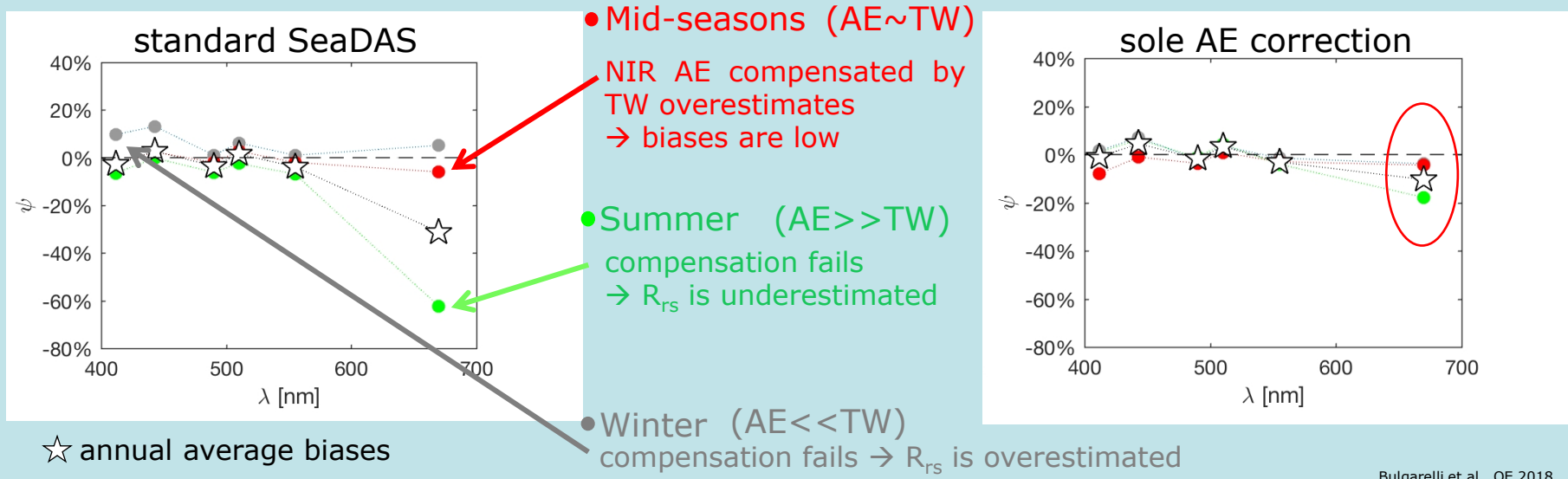
Case-1 to Case-2
moderately turbid waters



Cropland ecosystem

Impact of AE on matchups at the AAOT

Intra-annual average biases on R_{rs} 82 cloud-free SeaWiFS images of the AAOT

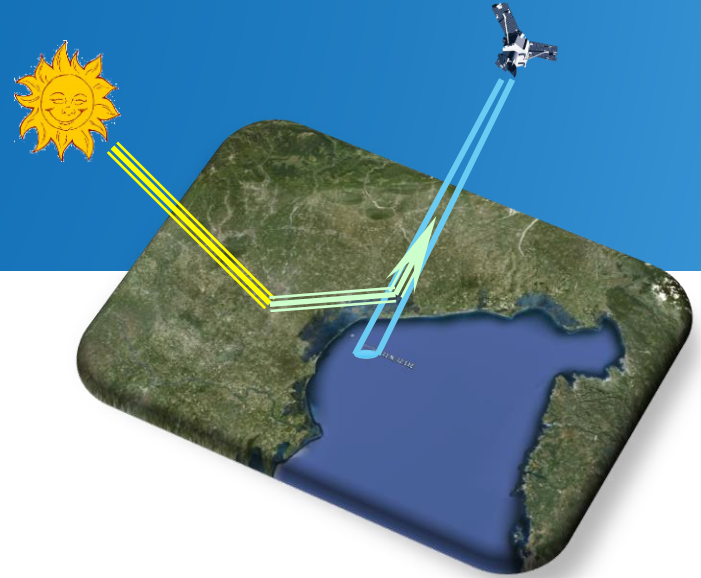


- **correction for AE reduces biases**
- **but attention to possible compensations**
- **validation is crucial**

Recommendations

- Need for a **clear definition** of the parameters used to quantify AE
- AE are **not** confined to the first few km offshore, particularly for highly reflecting land covers, in the NIR, for highly sensitive sensors (e.g., MERIS-RR, OLCI-RR, MODIS-LR). **Effects are expected to increase in inland waters**
- **Need to correct for AE:** AE correction reduces biases.
- How AE affect OC products strictly depends on the atmospheric correction (AC) scheme applied
- **Compensations** might occur within AC procedure (e.g., in l2gen compensations between TW and AE contributions)
- Need to **validate** AE correction algorithms
- Until accurate AE corrections are not available: **flagging to indicate risk of AE contamination**

Thank you



barbara.bulgarelli@ec.europa.eu