Consistent retrieval of clouds, aerosol and surface

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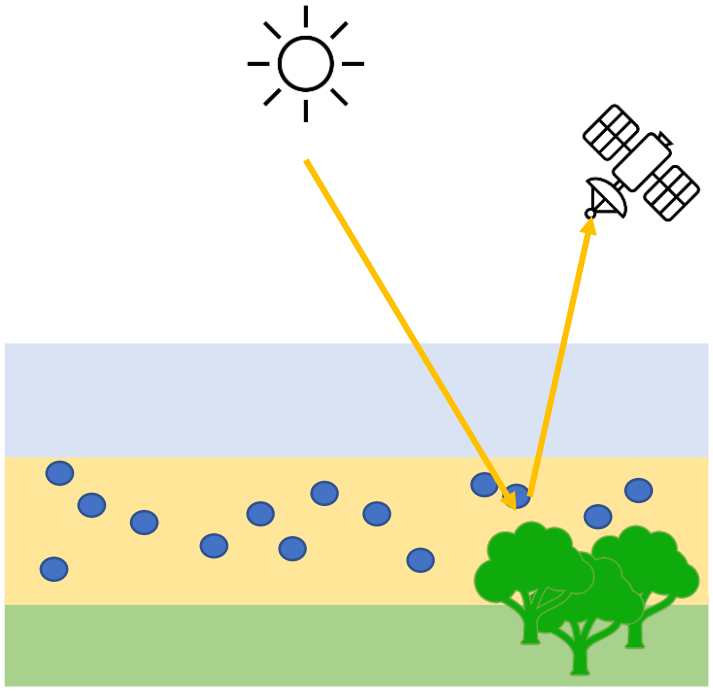
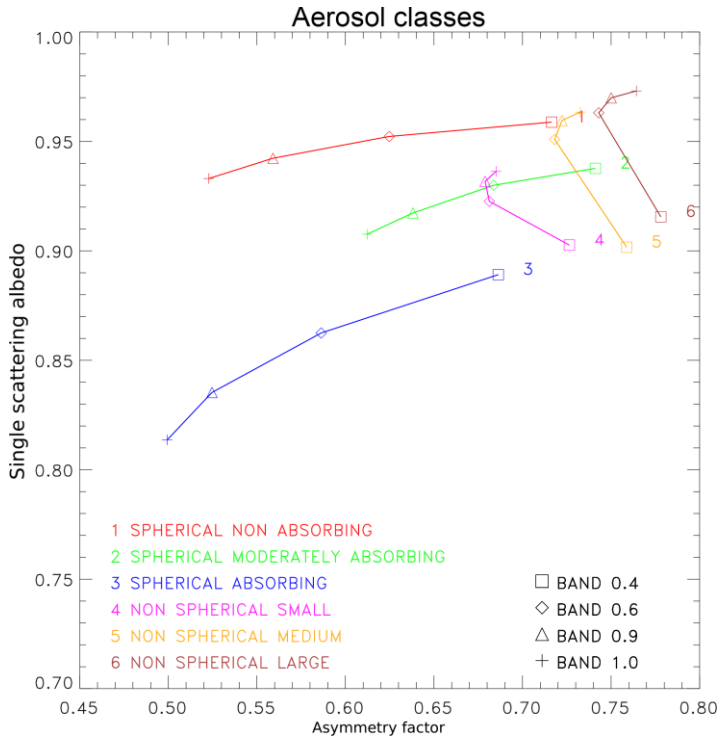
The CISAR algorithm

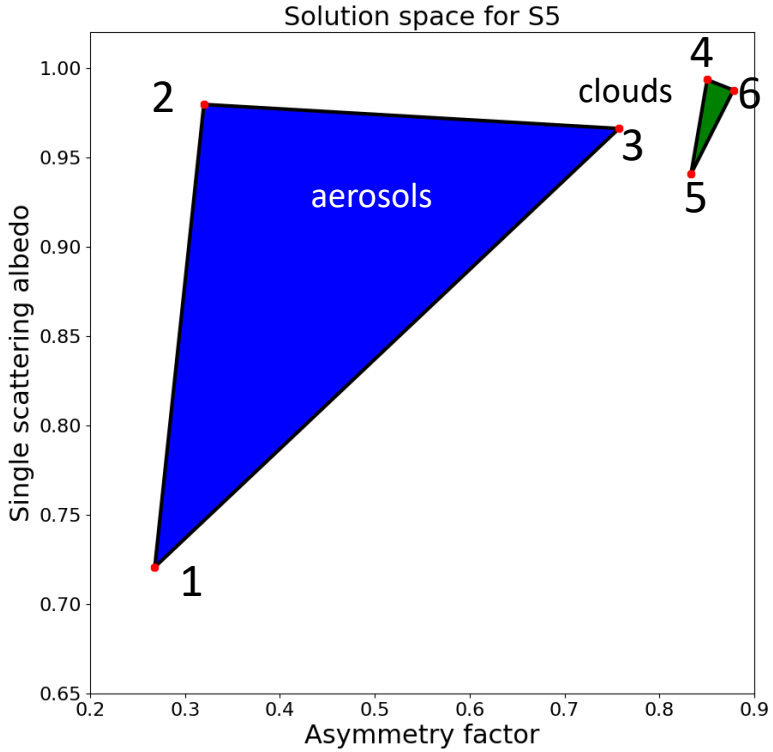
- CISAR is an inverse algorithm for the join retrieval of surface reflectance, aerosol and cloud single scattering properties.
- It is based on the online inversion of a 1D Radiative Transfer Model with continuous variation of the state variable in the solution space.
- The inversion is performed in an Optimal Estimation (OE) framework, delivering pixel-level retrieval uncertainties.



CISAR - atmospheric solution space



- The 2D space defined byt the single scattering albedo and asymmetry factor is sampled by selecting aerosol classes.
- The position of each vertex of each class varies according to the wavelength.
- The retrieved solution is a linear combination of these vertices.

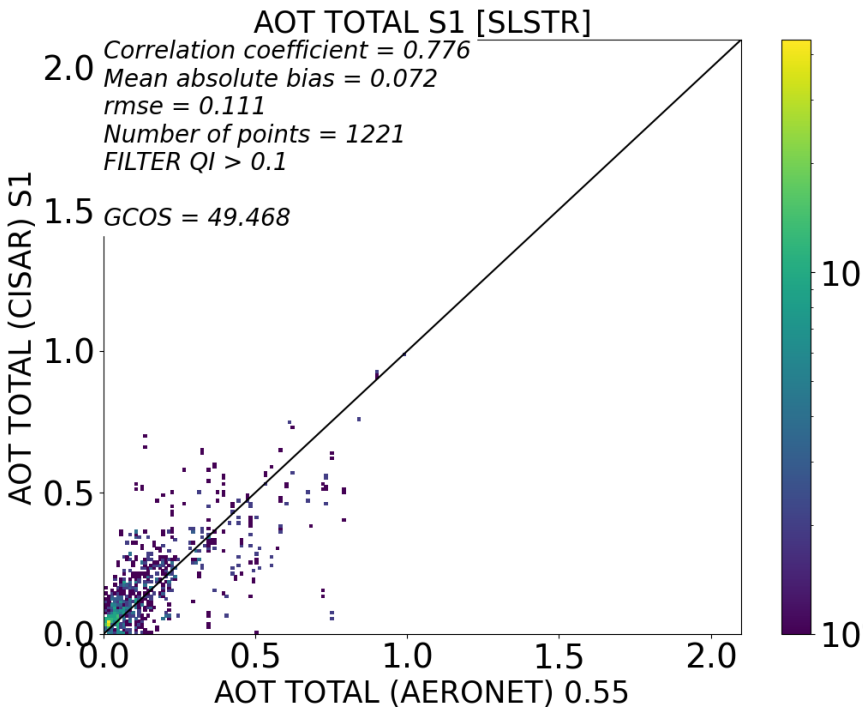


1. Fine absorbing
2. Fine non absorbing
3. Coarse
4. Water small
5. Water large
6. Ice

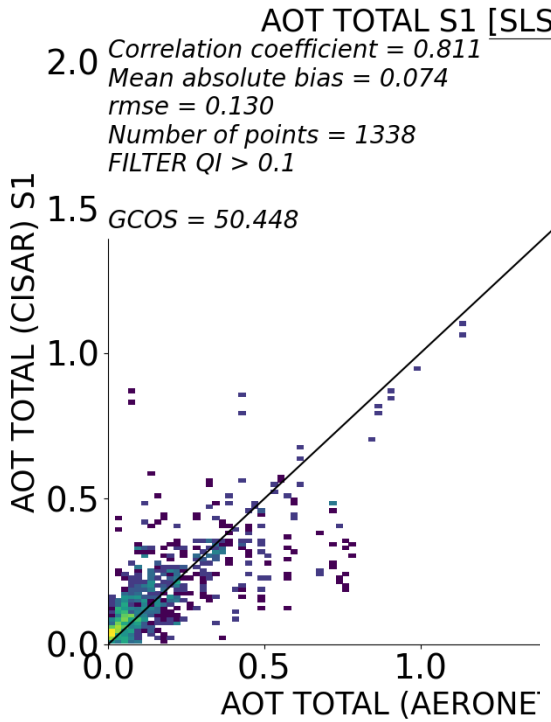
- Six classes are selected, 3 for aerosols and 3 for clouds.
- CISAR retrieves the AOT in the blue triangle and the COT in the green triangle, **without relying on any cloud mask**.

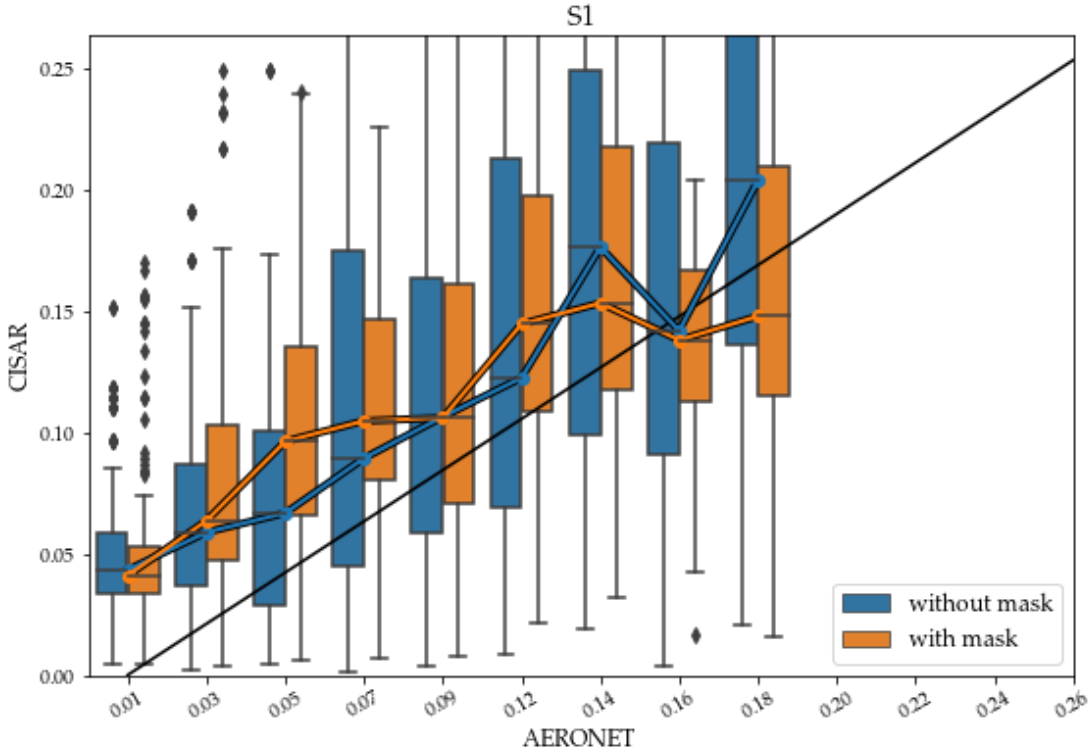
CISAR – application to SLSTR

With mask

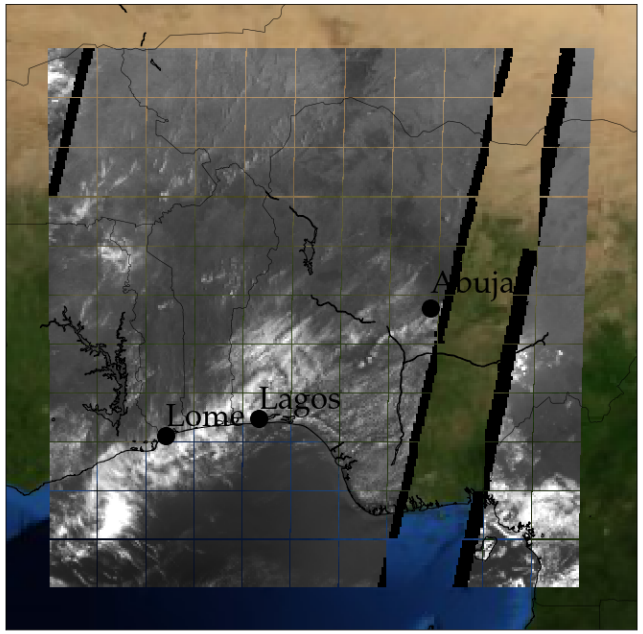


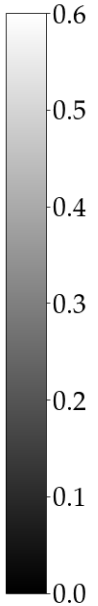
Without mask



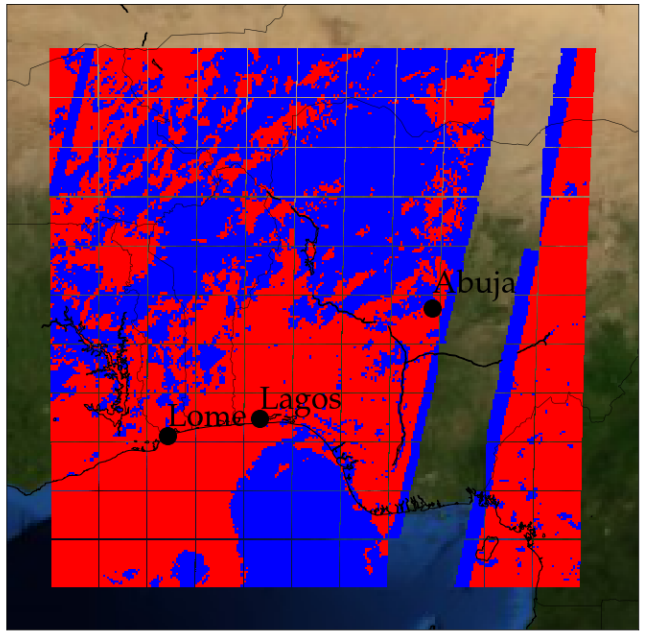


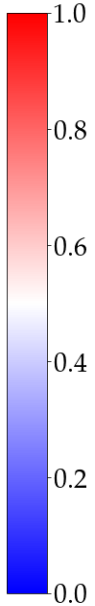
TOA BRF





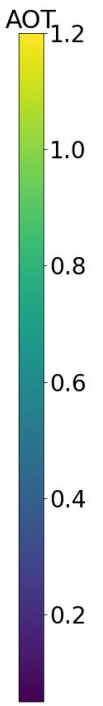
CLOUD MASK

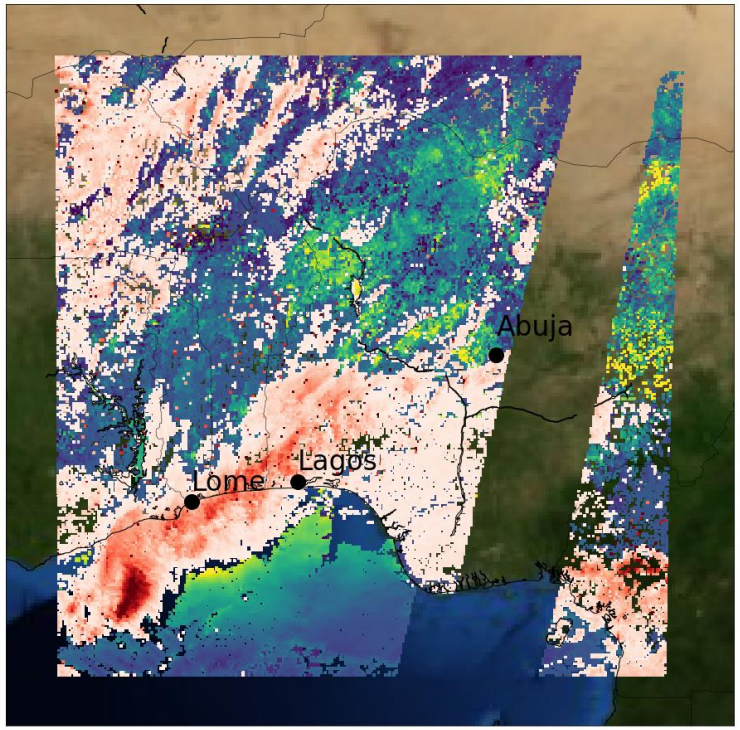




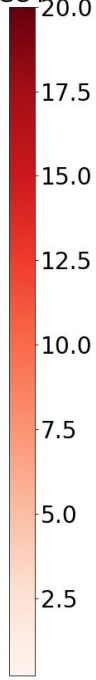
21st April 2019

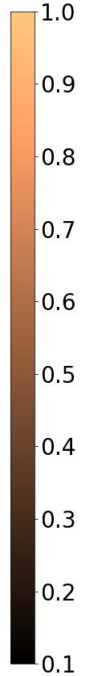
AOT



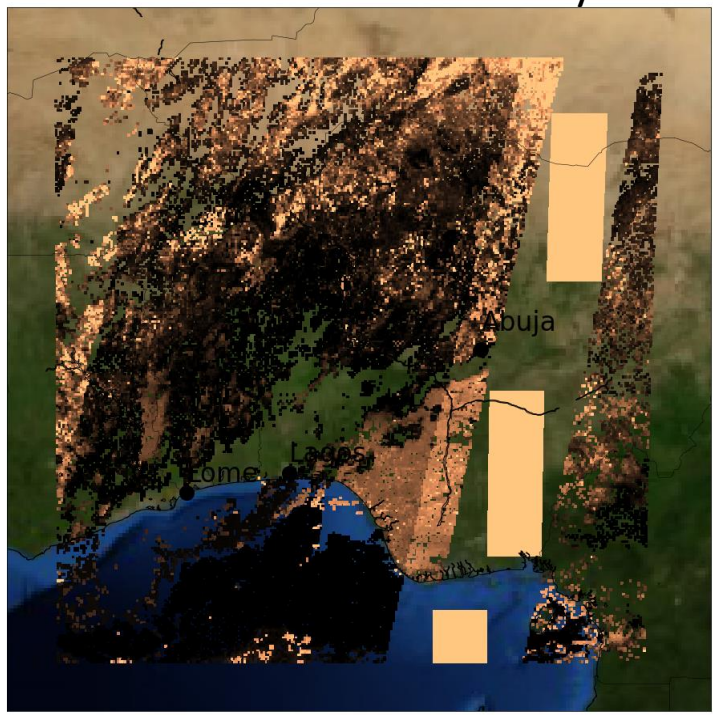


COT





AOT relative uncertainty



Conclusions

- The CISAR algorithm has been improved and adapted for the simulataneous retrieval of AOT and COT within the same pixels.
- The spatial coverage is improved, as the AOT is retrieved in presence of thin clouds (COT < 5.).
- The AOT retrieval uncertainty is increased when aerosol and clouds are retrieved within the same pixels.
- The evaluation against AERONET shows a correlation of 0.8 and a reduced overestimation at low AOTs.