Radiative closure studies applied to Sentinel-2 data at the Lampedusa Climate Observatory

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1. Study area & Data
Lampedusa is a small island in the central Mediterranean sea, with a surface area of about 28 km², sparse vegetation, limited pollution sources. The highest elevation of the island is 120 m.

2.1 MSI/S2A surface reflectance for radiative simulation
The surface reflectance was provided by applying the iCOR atmospheric correction algorithm, available through the ESA Sentinel Application Platform (SNAP), to the Sentinel-2 image. The processing parameters depend on the surface to be corrected. Over land, the iCOR is able to retrieve the aerosol optical thickness at 0.52 μm (AOD) while over water the AOD is fixed to 0.1. Furthermore, the rural aerosol model is fixed when iCOR is applied to MSI/S2 image. Finally, iCOR is able to apply the adjacency correction to the image.

2.2 Radiative Closure
The radiative closure studies on ground-based diffuse and direct solar irradiances were simulated by using the Second Simulation of a Satellite Signal in the Solar Spectrum, Vector (6SV) atmospheric radiative transfer model with the atmospheric conditions and surface reflectance provided by iCOR atmospheric correction algorithm available through the ESA Sentinel Application Platform (SNAP), and with the detailed characterization of the atmospheric properties provided by Lampedusa Observatory.

2.3 Results
The two MSI/S2A images were acquired quasi-synchronously with AERONET, pyranometer and pyrheliometer available data. The iCOR software was applied to the images for surface reflectance retrieval. The target and the environmental measurement required by 6SV run for radiative simulation, are selected from the atmospherically corrected Sentinel-2 images with spatial resolution of 10 m. In order to perform the solar radiation simulation by 6SV runs, the atmospheric input are the water vapor (v), the ozone (O3) columnar contents and the aerosol properties (AOD, aerosol model).

3. Conclusion
The direct and diffuse components of the downward solar irradiance at a specific MSI/S2 acquisition time, 6SV model run, two times considering two different aerosol conditions, the AERONET products and those used in the iCOR software.

References

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