Radiative transfer code OSOAA
Ordres Successifs Océan-Atmosphère - Avancé

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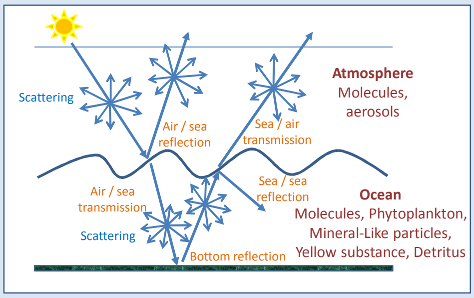
OSOAA is a radiative transfer code which simulates the **propagation of the polarized solar light in the coupled system « ocean / atmosphere »**.



Based on the **successive orders of scattering** method [Deuze et al, 1989] [Lenoble et al., 2007], the initial OSOA code was previously developed to simulate the light propagation into the atmosphere and sea water accounting for a flat surface [Chami et al., 2001].

The new OSOA-Advanced code introduces the capability to simulate a more realistic air / sea interface by taking into account the **roughness of the sea surface** as modeled by Cox & Munk [1954].

An other main improvement of OSOAA is to offer an **user friendly interface** (GUI) and a complete **user manual**.

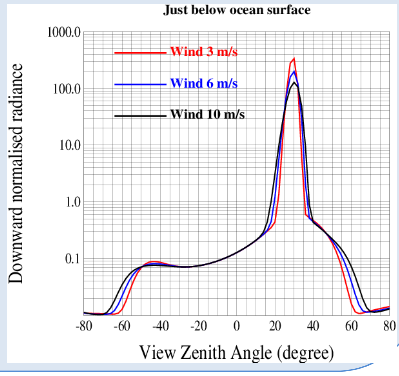


Illustration of the downward radiance just below the surface, at 531 nm, in the solar principal plan, θ_S=40°, for three wind speeds. Maritime aerosols and phytoplankton are introduced.

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Specifications for a roughness surface and software developments performed by CS SI.

Using OSOAA

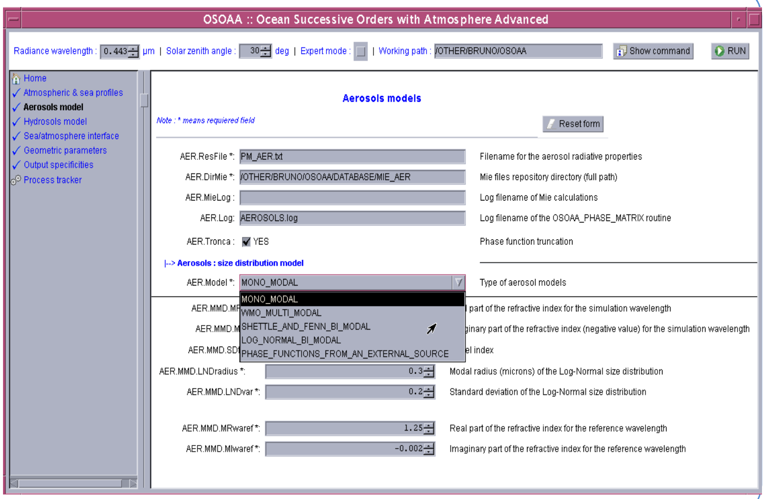
Two ways to operate OSOAA

- Use of a command files
- Use of a Graphical User Interface

The **OSOAA command file** is based on couples of "Keyword value"

The **OSOAA GUI** allows an easy definition of :

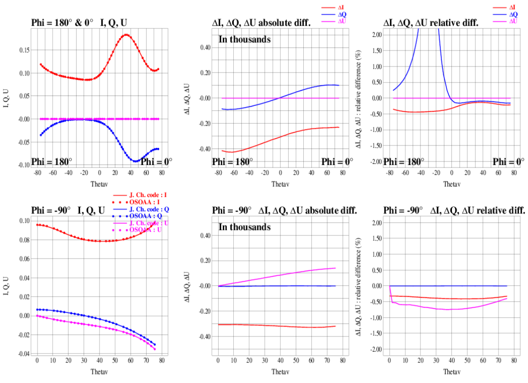
- Atmospheric and sea profiles
- Aerosol model (taking benefit of the SOS capabilities)
- Hydrosol model (phytoplankton, Mineral-Like Particles, Yellow substance and detritus)
- Sea surface interface (air/sea refractive index, sea roughness defined by the wind speed and the correlated waves)
- Geometric discretisation of the radiance field
- Specificities of required outputs



OSOAA validation

A validation exercise has been realized by comparison of OSOAA simulations to Jacek Chowdhary's code simulations [Chowdhary et al., 2006].

Simulation case : 3 SZA : 30 Wavelength : 412 SRF W07



Upward radiance at sea surface
Wind speed : 7 m/s
View in the solar principal plan and at $\Delta\phi$ = 90°

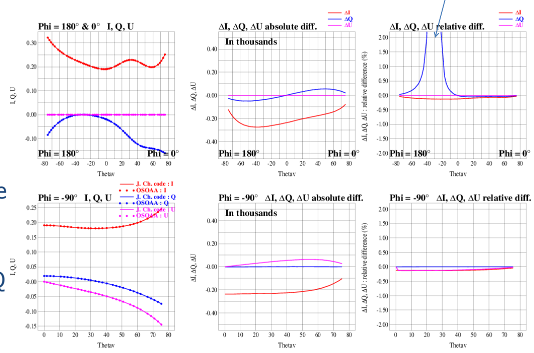
A quite good agreement has been reached, for strictly similar conditions of simulations.

At 412 nm, for highly scattering atmosphere and marine environments :

- The gap between simulations is lower than 0.4×10^{-3} of normalized radiance for the intensity Stokes parameter I
  → differences lower than 0.5% at sea surface and lower than 0.2% at TOA.
- The gap is lower than 0.1×10^{-3} of normalized radiance for polarization Stokes parameters Q and U
  → differences lower than 0.8% for the polarization (besides directions for which Q or U reaches zero)

Angular domain where Q tends to 0

Simulation case : 3 SZA : 30 Wavelength : 412 TOA W07



Upward radiance at TOA
Wind speed : 7 m/s
View in the solar principal plan and at $\Delta\phi$ = 90°

References:

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