ASSESSMENT OF THE POTENTIAL FUTURE HIGH AND MEDIUM RESOLUTION SENSORS ON GEOSYNCHRONOUS ORBIT FOR COASTAL ZONE MONITORING

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Over the past 20 years, the remote sensing data acquired on sun-synchronous orbits (altitude between 600 – 1000 km) by satellites like SEAWIFS, MODIS, MERIS, NOAA and TOPEX/POSEIDON, are widely used to retrieve the oceanic physical and biological properties such as sea surface height, wave height, sea surface wind speed, sea surface temperature, primary production, concentration of chlorophyll, concentration of suspension particles, sea ice state, etc. At the beginning, with low resolution, data were processed for open water (case 1) but with the resolution improvement, remote sensing can now be used for coastal zone survey (case 2). The coastal zone is a land-ocean interactive geographical area, the most active and with the most abundant phenomena and the most complex processes of the earth's surface. Since marine areas (case 1 and 2) have a high temporal variability, the remote sensing data are requested to be provided in real-time and continuously. However, the satellites on sun-synchronous orbit used for ocean remote sensing are in moving state relative to Earth's surface, so these satellites cannot provide a real-time monitoring.

The geosynchronous orbit satellites revolve around Earth with an orbital period matching the Earth's rotation period. They are then stationary relatively to Earth. A geosynchronous satellite can then acquire frequently images of any area of interest. Up to now, there is no geosynchronous sensor dedicated to ocean color. Our purpose is to build a model to simulate the multispectral data acquired on seawater by a geosynchronous optical sensor with any condition (time and location).

The simulation will be used to evaluate the error of estimation of chlorophyll and suspended matter concentrations during the day because the variation of the sunlight conditions will induce a variation of the S/N ratio and then a variation of the water constituents' estimation error.

Our foremost task is to use or develop a seawater surface bidirectional reflectance distribution function (BRDF)) $f(\theta_i, \theta_r, \varphi, a, b)$ on the basis of the existing three-component seawater surface irradiance reflectance model[1], where θ_i is the solar zenith angle, θ_r is the satellite zenith angle, φ is the azimuth angle between sun and satellite, *a* and *b* are absorption coefficient and scattering coefficient of water body according to the chlorophyll *a* concentration, suspension matter concentration and colored dissolved organic matter (CDOM) concentrations. This function deduces the seawater surface reflectance toward the satellite with the specific water body's inherent optical properties (IOPs)[2] and the solar angle calculated from date and time[3]. Then the water leaving downward irradiance will be calculated through an atmosphere radiative transfer model and then combined with the reflectance to get the radiance at the bottom of atmosphere; then again, we could use an upward atmosphere radiative transfer model to compute the radiance on top of atmosphere and finally a remote sensor optical transfer function allow us to simulate the remote sensing data.

In this conference, we will present the simulation chain composed by different modules from the water body to the remote sensor. The major modules are: seawater body's IOPs module, water surface BRDF module, atmosphere-ocean radiative transfer module, and sensor's optical transfer function module. To assure the accuracy of each module, we will compare the simulated values with available measurements. Once we get the simulated remote sensing spectral data, we will retrieve the seawater's composition using existing retrieval method [4] to compare with the initial input parameters.

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