Geophysical Research Abstracts
Vol. 19, EGU2017-1307, 2017
EGU General Assembly 2017

Usage of satellite data SMOS in order to characterize Sea Surface Salinity in the western Mediterranean

Anna Brook (1), Lotem Robins (1), and Estrella Olmedo Casal (2)

(1) University of Haifa, Geography and Environmental Studies, Haifa, Israel, (2) Institute of Marine Science, Department Marine Geosciences, Barcelona, Spain

Measuring the level of Sea Surface Salinity (SSS) is a principle component in order to understand climate processes that occur today and for better understanding of climate change in the future; Different processes create different salt concentration in different places in the oceans. This different salinity level had a role in determining the vertical and horizontal water fluxes. As the first three meters of the ocean surface contain more heat than that in the whole atmosphere, the influence of the salinity level on the layering of the different water levels and the different fluxes, thus, it is an important factor determining air sea interaction.
An existing problem in predicting the oceans is the lack of salinity samples in the oceans. While Sea surface Temperature (SST) could be evaluated easier from remote sensed devices, analyzing data at the Near Infra-Red and Visual wavelength. Measuring and locating salinity spectral signature was an obstacle. This lack of data caused problems running different models that describe different parameters of the ocean, both in depth and surface.
One of the main goals of a program called: Soil Moisture and Ocean Salinity (SMOS), is to deliver data on a global scale concerning the sea surface salinity (SSS).
The main idea of the SMOS technology is based on the differences between the electro-magnetic properties (spectral signatures) of distilled water and salted water. High concentration of salt revealed by analyzing the energy emitted from the ocean's surface, using detectors that are sensitive for the wavelength at the range of 21 cm (L-band: 1.4 GHz). One of the main problems, measuring this wavelength, is that it requires very large antennas.
In order to solve this problem, a Y shaped satellite was built, on each of its arms, 69 antennas were attached, with equal distances between each antenna. Each antenna is 165 mm on the diameter and their height is 19 mm. This antenna transmits all the information they receive to a central device. By using interferometry and a matching algorithm between the signals of each possible couple of antennas, synthesis of all the antennas is preformed, which makes it possible to overcome the problem of using large antennas.
The SMOS satellite delivers data at accuracy of 0.1psu, with spatial resolution of 200 km. The data is available in different forms, starting from unprocessed data to final products of brightness temperature that are temporally and spatially synchronized (L2 level). By downscaling those products, models of spatial resolution of 25 km and temporal daily resolution are calculated.
The meaning of this long process is that the data is going through long process before arriving to scientific analysis. The process from raw data until L2 level involves radiometric and physical corrections, detection and exclusion of atmospheric disturbance, geographical anchor etc.
In order to check the possible usage of the processed data of SMOS in the Mediterranean, a simple comparison was held between SMOS and MEDRYS1V2 – reanalysis of the Mediterranean sea during the years 1992-2013, which is based on the oceanic model of NEMO12, and forced by the atmospheric model of ALDERA. While doing this comparison, it is important to remember that the goal of the SMOS program is to deliver data in a global scale, while MEDRYS1V2 was created especially for the Mediterranean.
From the comparison of the two data sets, it is possible to detect to main issues:
The first issue is that it seems that the SMOS satellite uses more linear interpolation, to describe the space, while the reanalysis is based on the primitive physical equations and data assimilation.
The second issue is a large anomaly that occurs probably due to the river spill, which is getting a different signature, as the low resolution of SMOS might be a problem detecting correctly the spill, without another local data source.
To conclude, the SMOS program which one of its main goals is to create a reliable data source of SSS, on a global scale, has an important role for understanding oceanic process and climate change patterns.
While the global goal is contributing for research and development, on a more local scale it is possible to observe that analyzation of the Mediterranean, that mainly being held in high spatial resolution is not represented well

using SMOS products.
The main reason is the low spatial resolution, of the satellite, but owing to its unique technology, different methods could be applied, to better represent smaller scaled research.