

MARINEMET PROYECT.
CONSULTANT TYPE III
(Annual Report 2011)

Under the framework of the Maritime Meteorology Northwest Africa Project- MARINEMET, the Type III consultant was hired the 1st November 2009 with the following responsibilities:

1. Compilation of bathymetric information available at the north-western African coast needed for the coastal wave applications.
2. Specific implementation of the coastal wave forecast system (SAPO) for three ports on the north-west African coast (Mauritania, Senegal and Cape Verde).
3. Support to the oceanic models developments and parameterizations.
4. Models validation tasks.
5. Coordination with the participant NMHs for the implementation of new developments.
6. Elaboration of annual reports in Spanish and English and an annual abstract in French.
7. Possibility to participate in the training activities.

The consultant, Cristina Toledano, is working at Puertos del Estado (OPPE)-Madrid with an annual contract (2011) involved to the project through the World Meteorological Organization.

Work carried out and results obtained during this year:

1. Implementation of the bathymetries and interpolation in a regular grid using the nautical charts digitalized given by the company PROES.
2. Preparation of the model to received automatically the wind and boundary conditions.
3. Run automatically the 3 SAPOs in a twice day cycle.
4. Preparation SAPOs outputs: html tables, maps and series and automatically sent to the web.
5. Validation SAPOs outputs with the boundary conditions and preparation of tools to do the validation with the satellite data.

1. Implementation of the bathymetries and interpolation in a regular grid using the nautical charts digitalized by the company PROES.

With the interpolation of vectorized charts given by the company PROES, GEBCO bathymetries and NOAA coastal lines, the bathymetries for the 3 SAPOs with a resolution of 250m x 250m and the grids with a resolution of 500m x 500 m have been created.

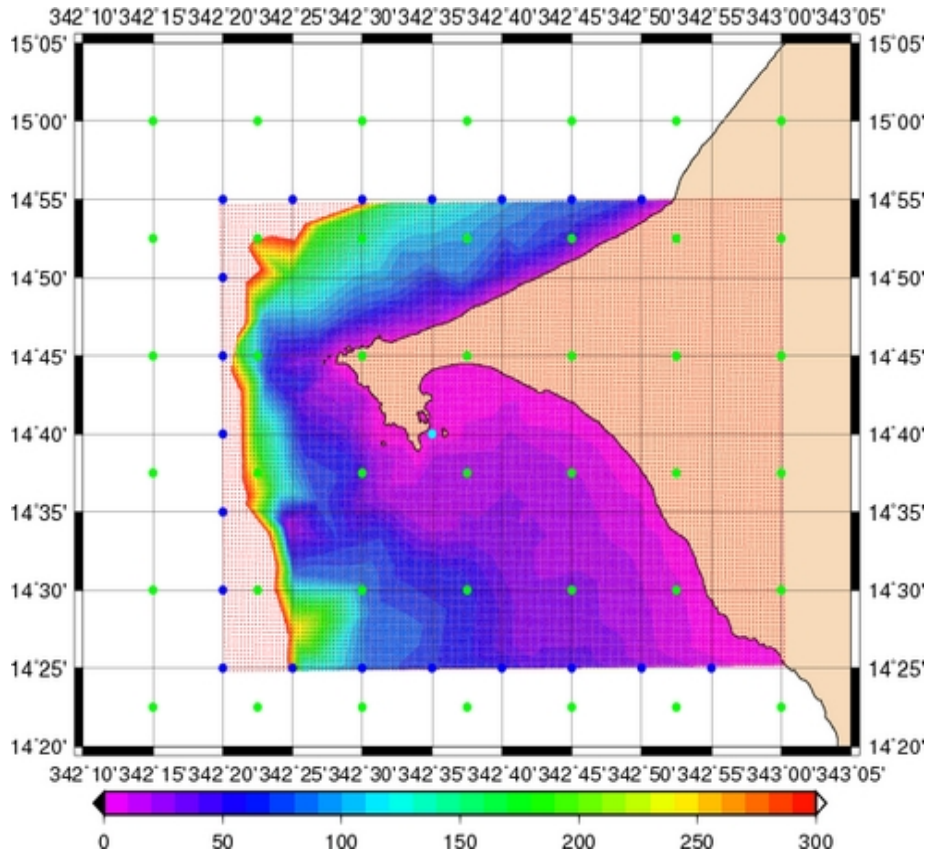


Figure 1: Bathymetry and computational grid of SAPO Dakar.

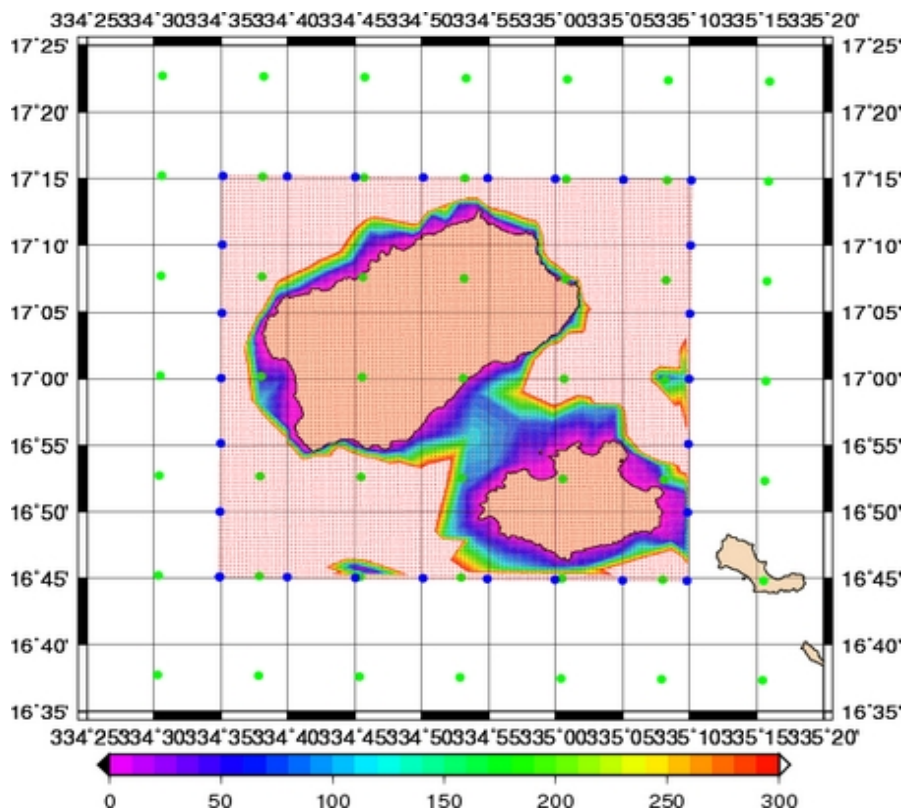


Figure 2 : Bathymetry and computational grid of SAPO Mindelo.

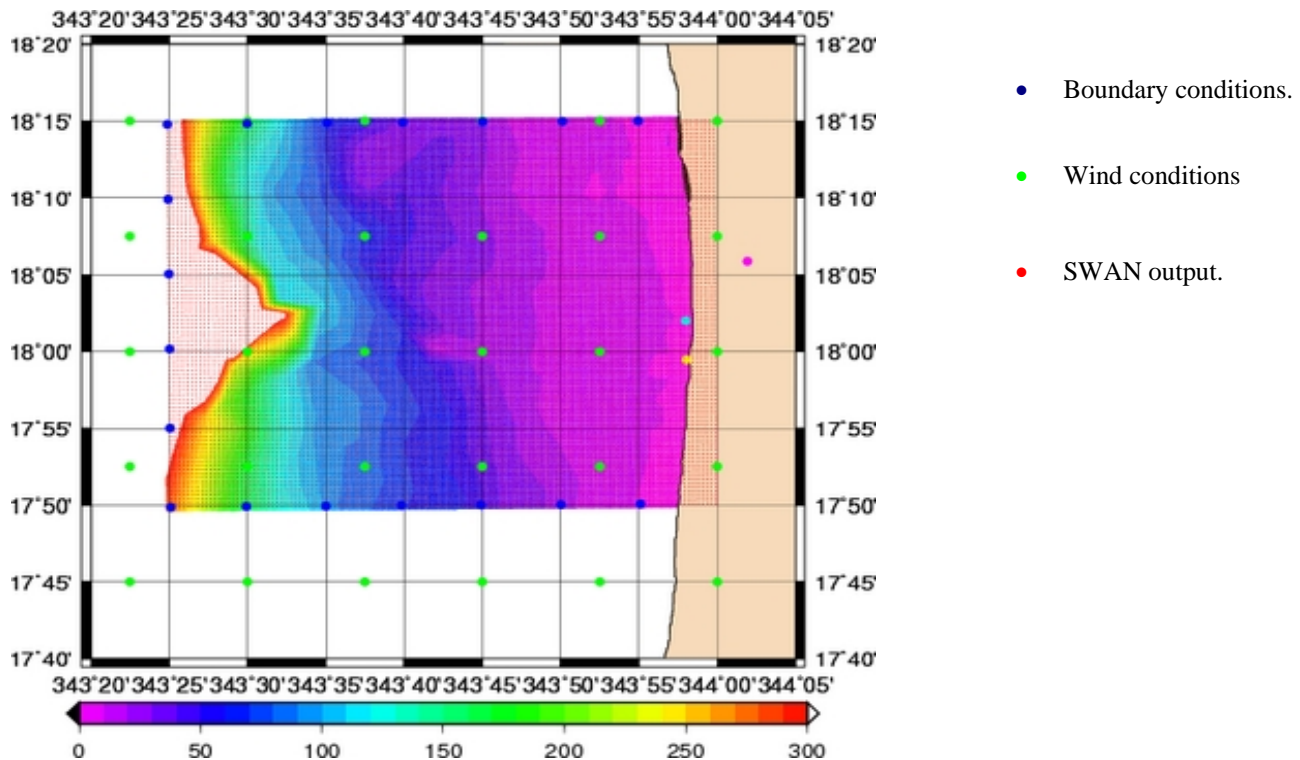


Figure 3: Bathymetry and computational grid of SAPO Nouakchott

2. Preparation of the model to received automatically the wind and boundary conditions.

In the middle of June it starts the automatically reception of boundary and wind conditions from AEMET. This reception is necessary to start to run SAPOs.

The reception of those conditions is twice a day, the first cycle between 9.30/ 10.00 UTC and the second one between 21.30/22.00 UTC, in three mails with the subjects: 'sapo0', 'sapo1', and 'sapo2'.

Each mail only has a zip archive with the boundary conditions generated by WAM África and the ECWF wind conditions for each SAPO.

On the computer where SWAN model (SAPOs) runs, it has been installed the fetchmail program, which is used to download mail from a remote server. When the initial conditions arrive, fetchmail download them in the correct folder: sapo0 in Dakar, sapo1 in Nouakchott and sapo2 in Mindelo.

This is not the final computer where SAPOs will be running. It will be installed a computer in each harbour, and each SAPO will run there.

SAPOs are prepared to run in the moment they received the initial conditions.

3. Run automatically the 3 SAPOs in a twice day cycle.

In 2010 SWAN model of the three SAPOs (Dakar, Mindelo, Nouakchott) run for test cases, so at the moment the model was prepared to automatically run , in addition to the implementation of the new bathymetries, the only that has been necessary to change is the specification about the wave spectra resolution received from WAM Africa. That resolution has changed of 36 frequencies and 36 directions in the past, to 25 frequencies [0.0345, 0.34] and 24 directions [7.5°, 352.5°].

The wave spectra resolution of SWAN output will be 25 frequencies and 36 directions.

Run SWAN model takes about 25', so SAPOs finish at 10:15 the first cycle and 22:15 the second.

4. Preparation SAPOs outputs: html tables, maps and series and automatically sent to the web.

The wave modelling outputs are series (.gif format), wave maps, (72 wave maps, one for each time horizon prediction, in gif format, figures 4, 5, 6) and an html table with the data of a specific point.

When those outputs are generated, they are sent by the ftp to Marinemet web server. Since October 2011 that process has been running operationally.

The language used is English.

The harbours could choose the grid point (or points) for html tables that they are interested in.

Each SAPO give 6 series, those have the information of wave parameters: significant wave height, mean period, peak period, mean direction, wind speed and wind direction. That information is in a specific grid point .

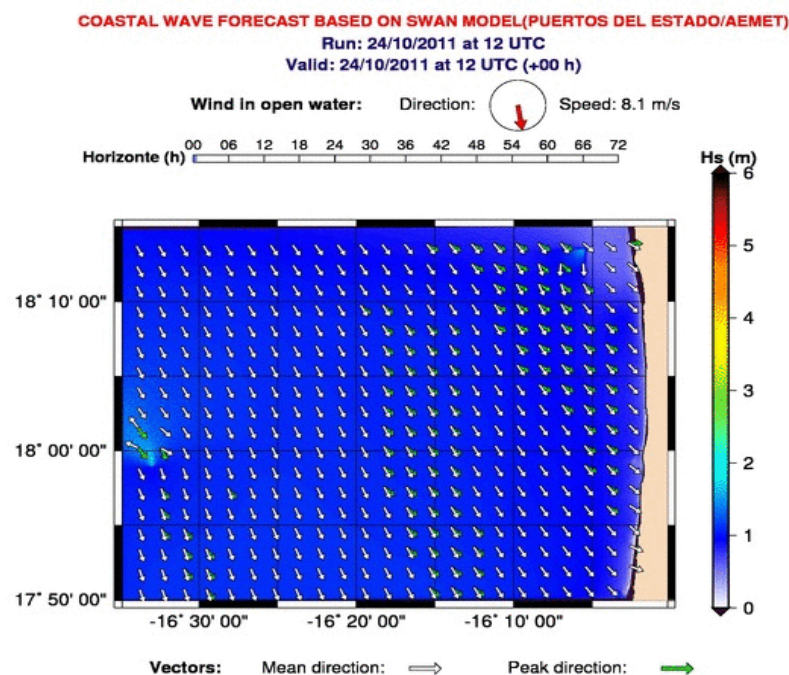


Figure 4: Map of SAPO Nouakchott. Colour isolines show significant wave height. When mean and peak directions differ more than 15°, both are showed.

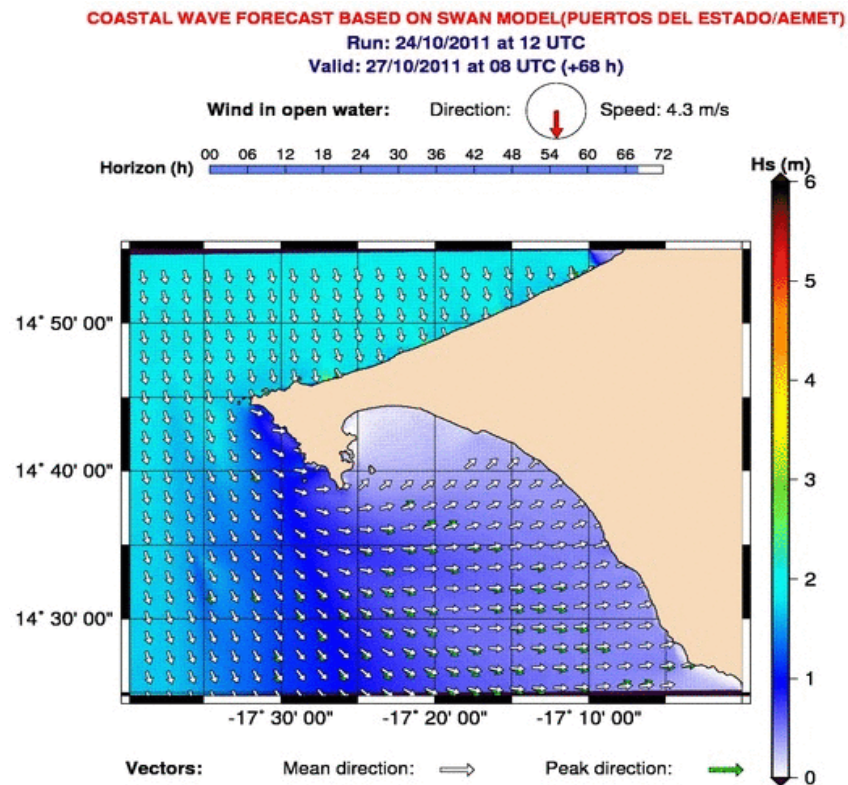


Figure 5: Map of SAPO Dakar. Colour isolines show significant wave height. When mean and peak directions differ more than 15°, both are showed.

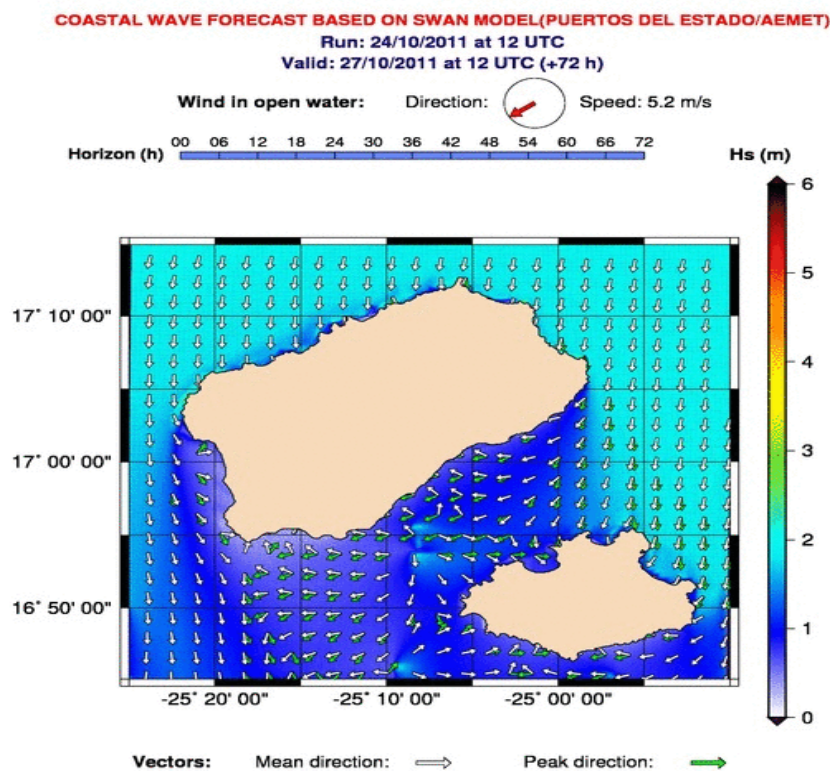


Figure 6: Map of SAPO Mindelo. Colour isolines show significant wave height. When mean and peak directions differ more than 15°, both are showed.

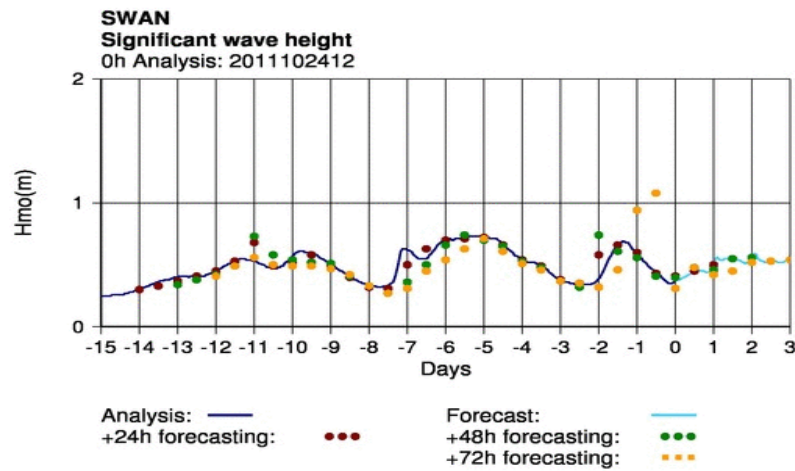


Figure 7: Significant wave height serie.
Dark blue line is the analysis SWAN output.
Brown points show the forecasting with +24h horizon of each cycle.
Green points show +48h and yellow points +72h.

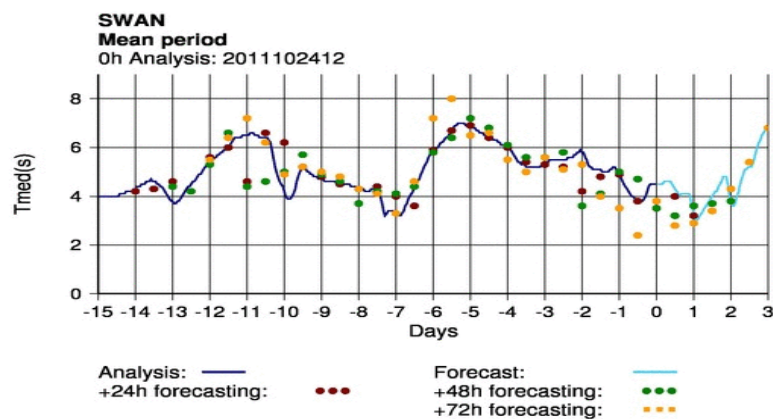


Figure 8: Mean period serie .
Dark blue line is the analysis SWAN output.
Brown points show the forecasting with +24h horizon of each cycle.
Green points show +48h and yellow points +72h.

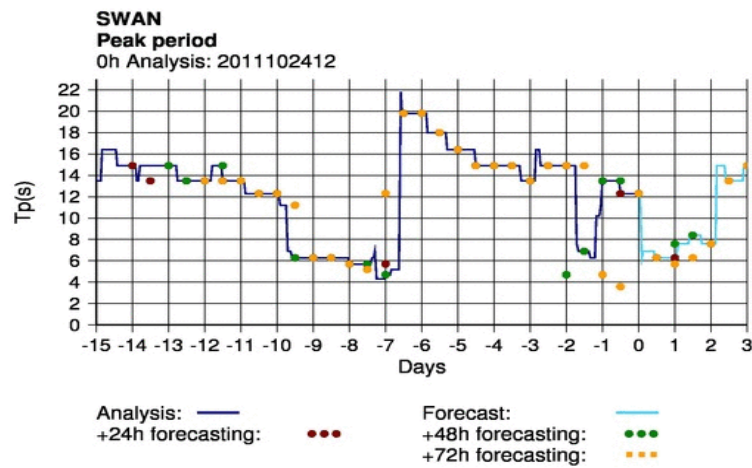


Figure 9: Peak period serie.

Dark blue line is the analysis SWAN output.

Brown points show the forecasting with +24h horizon of each cycle.

Green points show +48h and yellow points +72h.

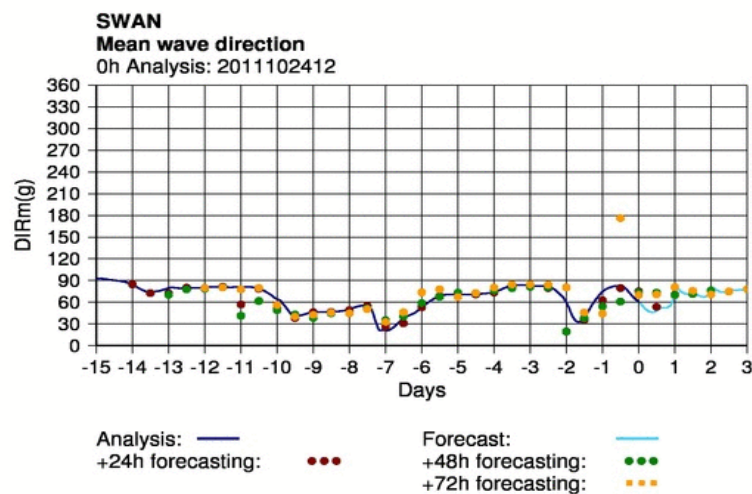


Figure 10: Mean wave direction serie.

Dark blue line is the analysis SWAN output.

Brown points show the forecasting with +24h horizon of each cycle.

Green points show +48h and yellow points +72h.

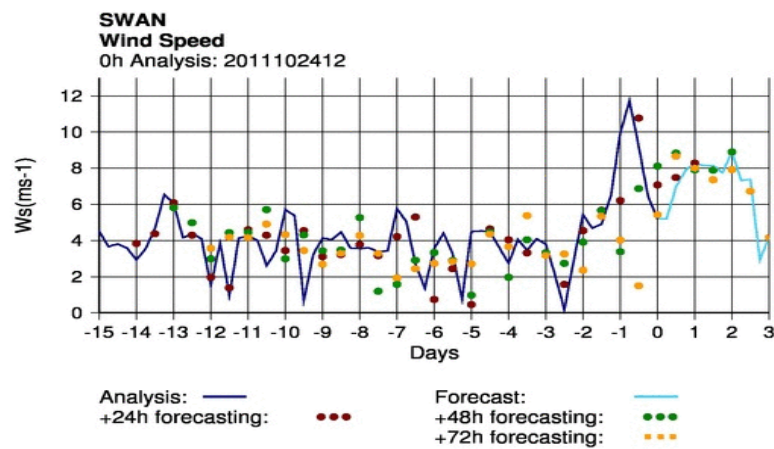


Figure 11: Wind speed serie.

Dark blue line is the analysis SWAN output.

Brown points show the forecasting with +24h horizon of each cycle.

Green points show +48h and yellow points +72h.

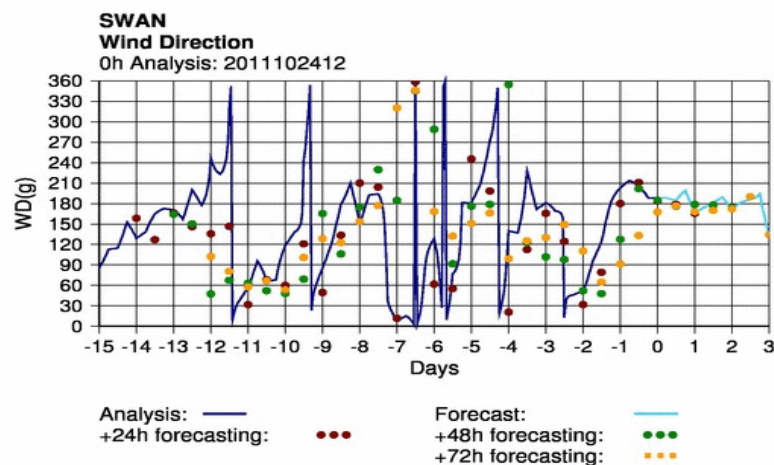


Figure 12: Wind direction serie.

Dark blue line is the analysis SWAN output.

Brown points show the forecasting with +24h horizon of each cycle.

Green points show +48h and yellow points +72h.

5. Validation SAPOs outputs with the boundary conditions and preparation of tools to do validation against satellite data.

As there are not buoys in SAPOs area, the validation of SWAN application is going to be done with the satellite observations. Satellite data is not good at near coastal observations, so the validation will be done against WAM Africa outputs, where SWAN model is nested.

The SWAN outputs have been validated comparing with the boundary conditions done by the WAM Africa, so if the validation of WAM Africa is done, SWAN validation will be done too.

AEMET has sent the necessary files to do the validation: the Jason2 data and WAM Africa outputs. In that moment, tools for the validation are being developed.

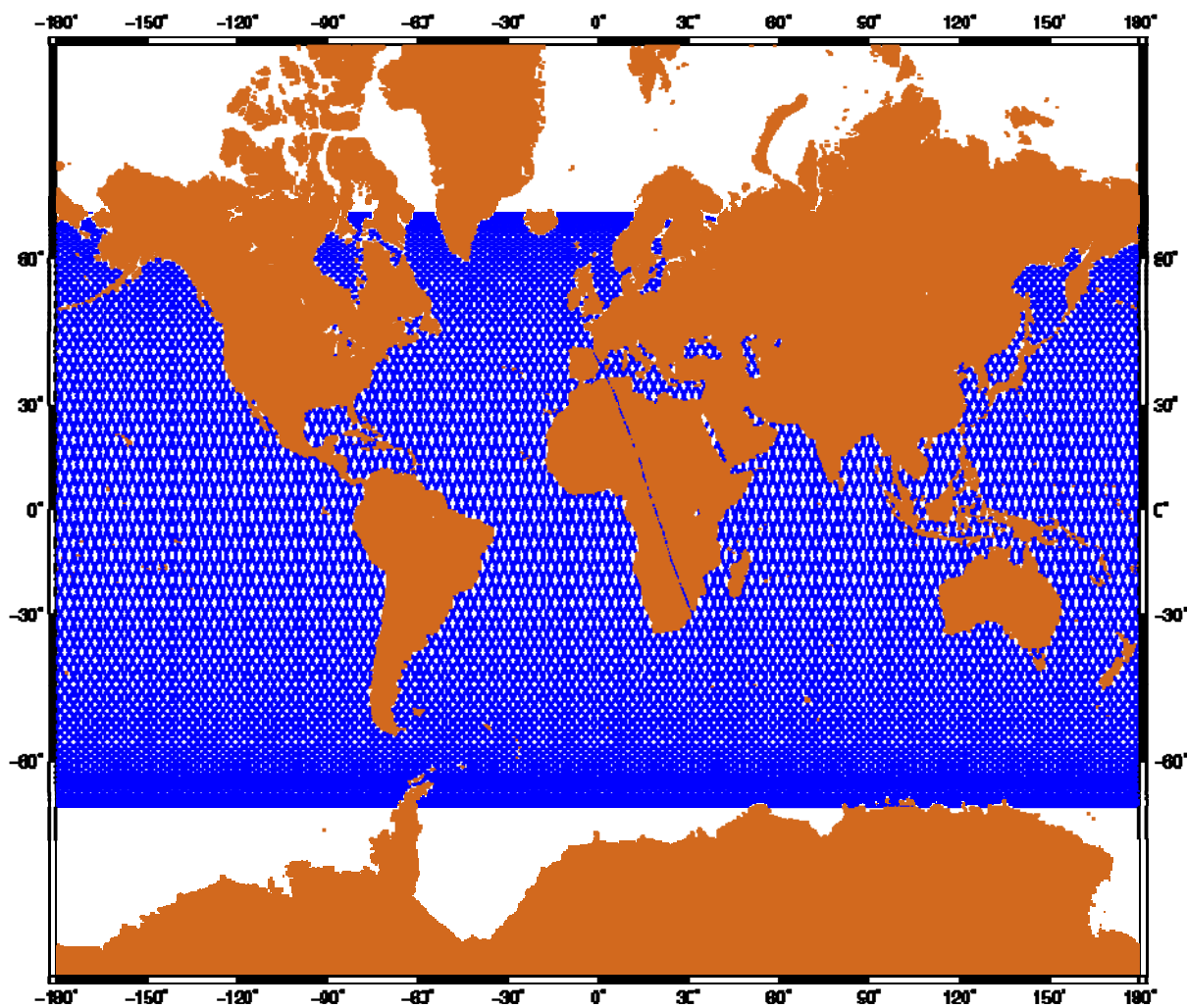


Figure 13: Positions of Jason2 satellite.