SWAN model (Simulating Waves Nearshore) has been developed by Delft University or Technology.

SWAN is third generation wave model, although first and second generation modes are also possible. This model is based on wave action balance equation spectra propagation. SWAN is specifically designed for coastal applications, taking into account generation by wind, whitecapping, depth-induced wave breaking and non linear interactions (quadruplets and, more important for coastal applications, triads). Propagation processes like propagation through geographic space, refraction and shoaling due to spatial variations, blocking and refraction by opposing currents are represented in SWAN.

$$\frac{\partial}{\partial t}N + \frac{\partial}{\partial x}c_x N + \frac{\partial}{\partial y}c_y N + \frac{\partial}{\partial \sigma}c_\sigma N + \frac{\partial}{\partial \theta}c_\theta N = \frac{S}{\sigma}$$

Second and third term represents propagation of action in geographic space, the fourth term represents shifting of the relative frequency due to variations in depth and currents, and fifth term represents depth and current induced refraction. Source/sink (S) terms are wind input, dissipation by whitecapping, bottom friction and depth-induced wave breaking and non linear wave-wave interaction.

SWAN can be used on any scale, although is specifically designed for coastal applications. In that sense, SWAN can be easily coupled to other third generation models such as WAVEWATCH III or WAM. In that case, special care must be taken to ensure that shallow water effects at boundary conditions are not too strong, avoiding large discontinuities between models.

Spectral data from 2.5’ Wavewatch model and ARPS 6km 10m wind are reprojected to a UTM grid to obtain a 500 m high resolution wave prediction. Wave prediction goes into Rias Baixas which is a difficult coastal structure for wave modelling.

A rotated grid of 104x170 grid points is used in order to represent the natural orientation of Rias Baixas. With this particular orientation we achieve the maximum sea/land point ratio.

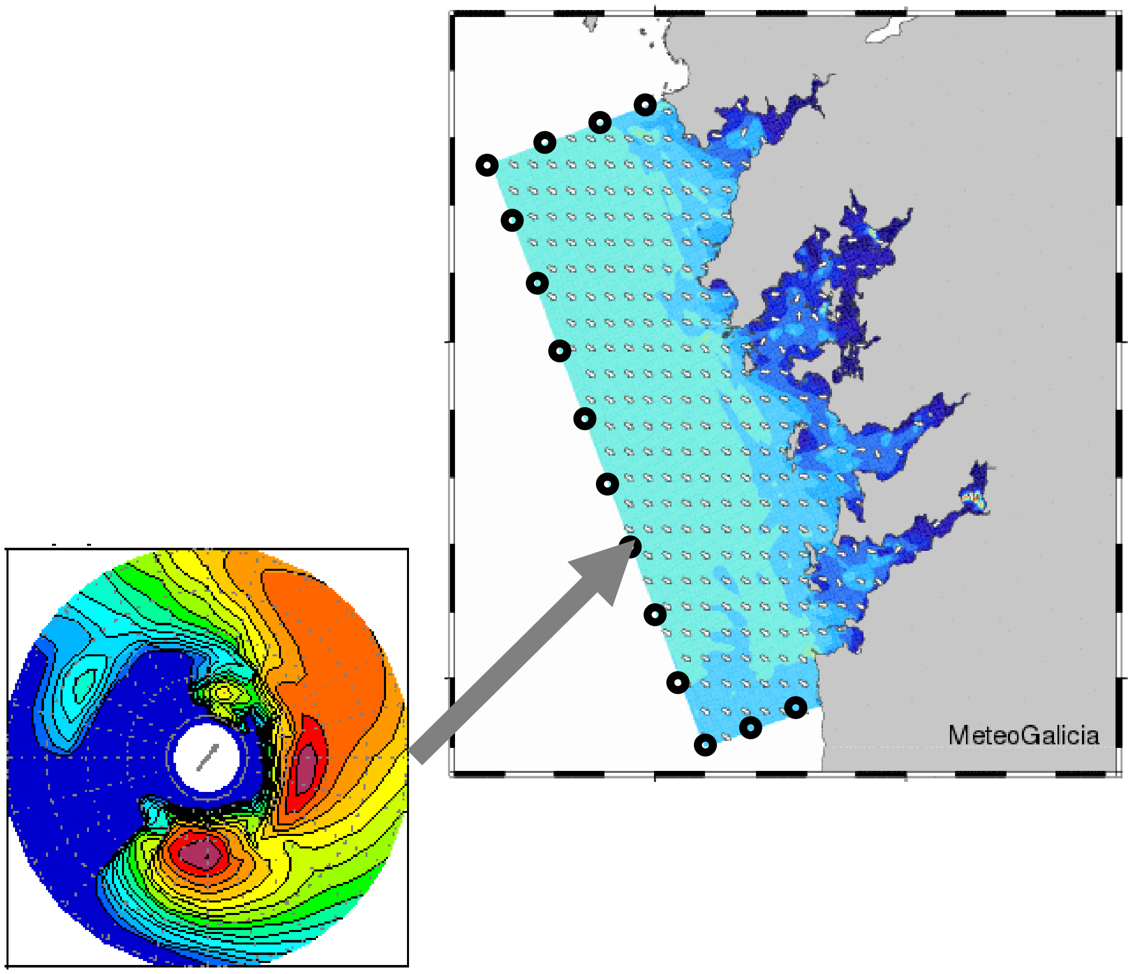

Fig.1. - Directional variance density spectra used as boundary condition for SWAN model grid, showing two well defined swell peaks. Discrete spectra representation includes 25 frequencies and 24 directions both in SWAN and WW3 models. On the right side, a plot of significant wave height (backgroud color) and mean wave direction (arrows) for Rias Baixas model grid. Black spots represent reprojected boundary spectra input coming from WaveWatch III 2.5’ model grid.

SWAN model has also another configuration in MeteoGalicia. A 250m resolution grid is coupled with WaveWatch III 2.5’ and forcing by ARPS 6km 10m wind, running for Arco Ártabro.

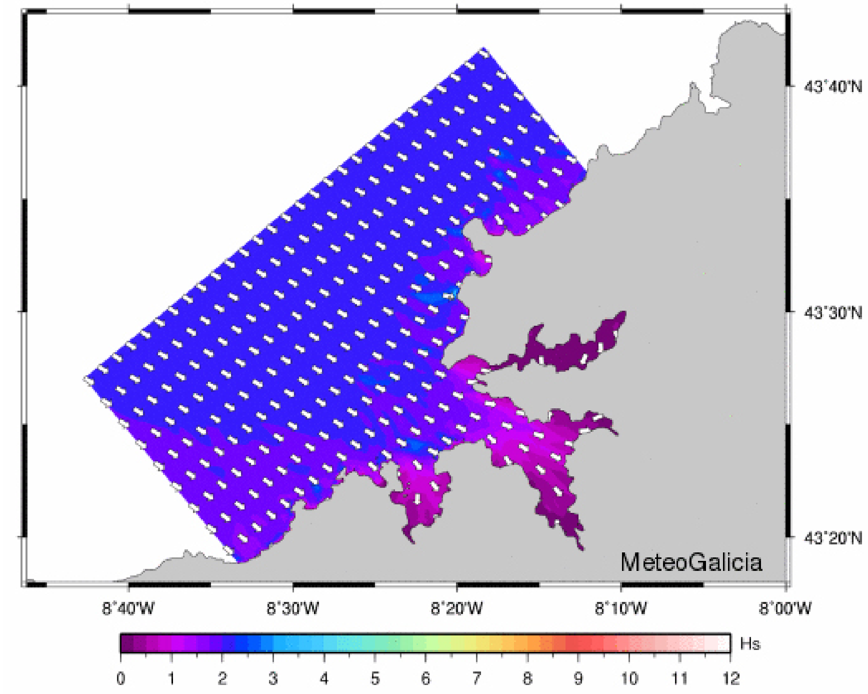

Fig.2. - Plot of significant wave height (backgroud color) and mean wave direction (arrows) for Arco Artabro model grid.

SWAN provides, once a day in both domains, coastal wave forecasts, hourly significant height, peak and medium period and peak and medium direction, for the next 72-hours, and they are daily available for the weather forecasters and general public on the MeteoGalicia Web site (http://www.meteogalicia.es).