

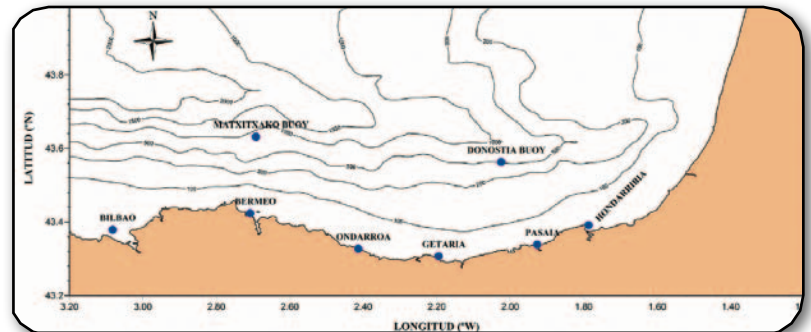
# THE BASQUE COUNTRY COASTAL HF RADAR SYSTEM

Monitoring waves and surface currents in the Bay of Biscay



The Operational Oceanography system in the Basque Country consists of two main elements: an intensive ocean-observing network, together with meteorological and oceanographic modeling tools. These elements are able to provide, on a routine basis, the most precise description of the present Sea State as well as the forecasting of the ocean conditions. The Ocean Observing System includes six coastal meteorological platforms (operational since 2004) and two ocean-meteorological buoys, operating since 2007.

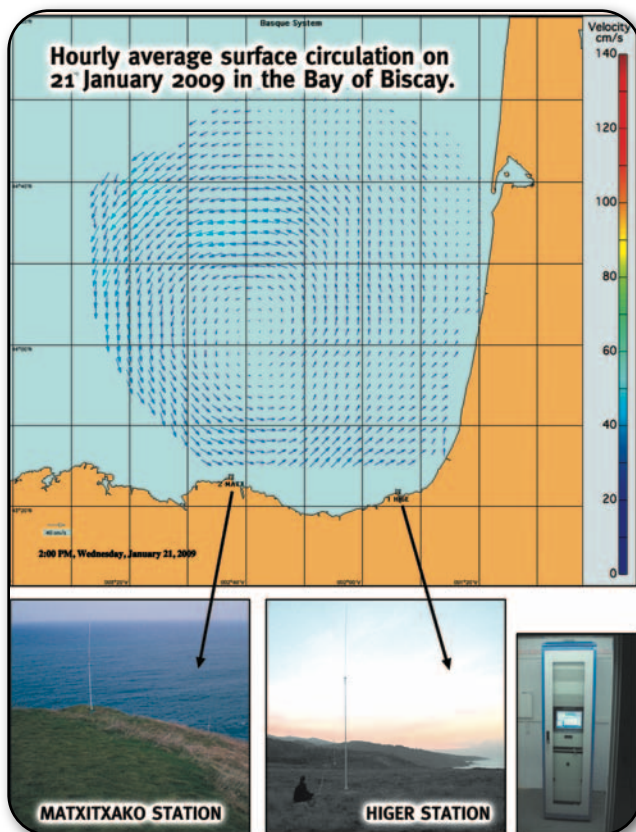
In the general framework of a Coastal Oceanography System in the Basque Country (Northeastern Spain), the Directorate of Meteorology and Climate of the Basque Country Government contracted to Qualitas Instruments S.A. in 2008 the turnkey installations of a Long-Range SeaSonde network. The main purpose is to improve the real-time monitoring of the surface currents and waves in the Bay of Biscay Area. The coastal Long-Range SeaSonde radar stations were installed during year 2008 and have become operational at the beginning of 2009. The final aim of the coastal radar system is the integration of the radar data into the Operational Oceanography network in this important marine region.



Distribution of the coastal and marine observing platforms of the Basque Meteorological Office (Euskalmet).

The utility of the coastal HF radars for the real time monitoring of the oceanographic conditions will be of fundamental importance in the framework of the Interregional European Project LOREA (Littoral, Ocean and Rivers in Euskadi-

Aquitaine), which envisions a very ambitious real-time observing system adapted for the study of the Marine Dynamics in the coastal zone and its interactions with the littoral and the rivers. During year 2009 studies of Quality Assurance and Quality Control (QA/QC) of the HF radar data will be performed in order to incorporate these data into operational tools developed in LOREA as local applications of water quality, beach dynamics, and mitigation of marine pollution (oil spill forecasting, etc.).



## Basque SeaSonde Configuration

The HF radar system in the Basque country consists of two Long-Range SeaSonde Remote Units and a Central Management / Data Combining Station. One radar unit is located in Cape Matxitxako, and the second in Cape Higer, separated a distance of 80 Km. The combine site computer is located in the town of Vitoria in the headquarters of the Meteorological Basque service (Euskalmet). Both radar stations work in a frequency centered at 4.86 MHz and a bandwidth of 40 kHz, resulting in a radial resolution of 4 km and a maximum range of ~200 Km.

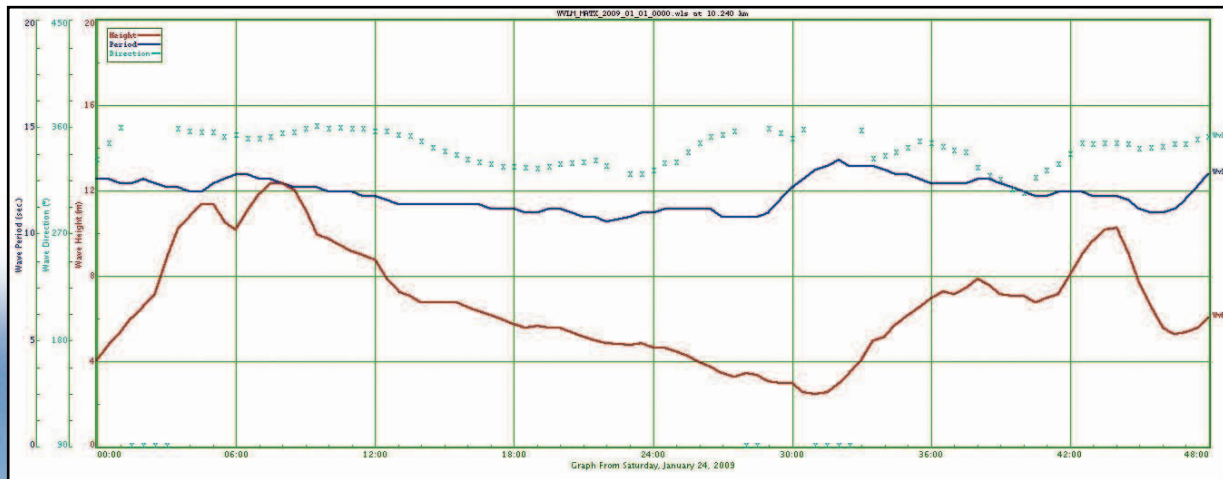
## Data Outputs

Each remote site communicates on line with the Central Management Station via Broadband Wireless Access (WIMAX), maintained and operated by the Basque Met office. The resulting total surface vectors images are distributed in real time basis for the general public in the Meteorological Web: [http://www.euskalmet.euskadi.net/s07-5853x/es/meteorologia/selsensorB.ap?e=5&COD\\_ESTACION=R097](http://www.euskalmet.euskadi.net/s07-5853x/es/meteorologia/selsensorB.ap?e=5&COD_ESTACION=R097).

Shown on preceding page is an example of the range and the spatial coverage of radar measurements, as well as the kind of oceanographic structures captured by the radar. Note the general cyclonic structure of the surface circulation measured by the radar system.

### First Results: High waves in the big storm of 20-24 January 2009

During the days from 23<sup>rd</sup> to 25<sup>th</sup> of January 2009, a few days after launch of the formal operation of the radar by the Basque authorities, an anomalous deep atmospheric cyclone affected severely the northern Iberian Peninsula. An abrupt surface air pressure fall of more than 35 hPa was measured at a latitude corresponding to northern Spain, causing winds speed of more than 190 km/h measured at Matxitxako Cape. This resulted in a severe-storm sea state with significant wave heights more than 12 m. At this point, the radar HF station in Matxitxako measured this significant wave height of 12 m, as can be seen in above below. Note that the buoy at Matxitxaco Cape also observed this maximum at around 06:00 of January 24<sup>th</sup> (not shown). Even though the radar wave measurement is slightly below the ocean buoy record, this is thus far the maximum record for significant wave heights in the history of CODAR SeaSondes.



CODAR wave measurements averaged over a ring at 10 Km radius centered at the Matxitxaco radar station. Note the red curve showing a 12m significant height at 06:00 AM.

