High-Frequency Coastal Radars in Northern Adriatic

2002-2004

Major Sponsors:

- Italian Ministry of Education, University and Research
- United States Office of Naval Research
The Project
As part of the DOLCEVITA program high frequency (HF) coastal radars were installed in the Northern Adriatic Sea starting in September 2002 to monitor areas of the Northern Adriatic for more than a year. The project was funded by the United States Office of Naval Research and the Italian Ministry of Defence Research.

The Radars
Three radar sites were installed along the Italian coast south of the Po River delta. The northernmost site located on the delta (Faro di Goro, Goro) includes a linear array of 16 antennas (beam-forming), whereas the intermediate (Punta Marina, Ravenna) and the southernmost (Monte San Bartolo, Pesaro) sites consist of 4 antennas installed in a square pattern (direction-finding). The HF radars used are WERA systems manufactured by Helzel Messtechnik in Kaltenkirchen, Germany in collaboration with the University of Hamburg. They are operated near 16 MHz in both beam-forming and direction-finding modes.

The Real-time Graphics
Several graphics including Doppler spectra and maps of radial currents and of surface currents are produced at hourly intervals and are posted in near-real time on a dedicated web site:

http://doga.ogs.trieste.it/doga/sire/d
coastal radars were installed in the coastal region to monitor the surface circulation in most of the area. The radar project was sponsored by the Ministry of Education, University and Research.

The Results
For each radar, radial currents are obtained from the Doppler shift of Bragg-lines in the spectrum data. Maps of radial currents are produced at intervals ranging between 20 minutes and one hour. These radial maps are combined to produce maps of the surface currents on a uniform grid with 2-3 km spacing. Radar-inferred surface currents can be overlaid on maps of sea surface temperature and chlorophyll to describe the near-surface dynamics. The radar data include information about surface currents at a variety of scales, from tides to the seasonal signal. Surface wave parameters (peak direction and significant wave height) can also be extracted from the data of some of the radars.

The Applications
The potential of the HF coastal radar technology for non-scientific applications is significant, especially for operational marine activities. Graphical representations (current maps, etc.) and summaries of the radar data can be made available in real time through a dedicated web page to many end-users including the coast guards and other agencies to assist search and rescue operations, aid oil spill trajectory predictions, and contribute to pollution discharge studies. These instruments, being over-the-horizon radars, also have potentials for tracking ships and low-flying aircrafts up to a distance of 100 km, beyond that of existing microwave radars.
DOLCEVITA (Dynamics of Localized Currents and Eddy Variability in the Adriatic) is an international project focusing on the Adriatic Sea sponsored by the Office of Naval Research (ONR). The project spanned between October 2001 and September 2004, but its experimental phase was mostly concentrated in the September 2002 – June 2003 time period. DOLCEVITA involves several oceanographers, both experimentalists and modelers, of the United States and Europe. The main scientific objective of the DOLCEVITA project is to quantify the kinematic and dynamic properties of the mesoscale circulation in the Northern Adriatic and study the effects of forcing by winds and river run-offs. The monitoring of surface currents by means of HF coastal radars is an important experimental component of the project.

Acknowledgments
We would like to thank the following individuals for helping with the installation logistics and with the data processing: Jérome Aucan, Ricardo Barbanti, Alessandro Bubbi, Roberto Cecco, Cédric Chavanne, Davide Deponte, Michele Deponte, Bénédicte Doussot, Io Flament, Mael Flament, Klaus-Werner Gurgel, Thomas Helzel, Oliver Koshe, Paolo Mansutti, Elena Mauri, Philip Moravick and Giulio Notarstefano. We would like to thank the following individuals and institutions for providing us with permits to install the WERA stations and for helping with the local logistics:

Faro di Goro, Goro: Consorzio per la Gestione del Parco Regionale del Delta del Po, Comune di Goro, Provincia di Ferrara, Corpo Forestale dello Stato, Fabrizio Farinelli e Valentino Gianella.
Punta Marina, Ravenna: Capitaneria di Porto di Ravenna, Agenzia delle Dogane, AGP Petròli, ARPA Ravenna.