Geophysical Research Abstracts
Vol. 13, EGU2011-8456, 2011
EGU General Assembly 2011

Remote Sensing Ocean Currents in the German Bight: HF Radar Measurements and Quality Control

Klaus-Werner Gurgel (1), Thomas Schlick (1), Jörg Seemann (2), and Friedwart Ziemer (2)

(1) University of Hamburg, Institute of Oceanography, 20146 Hamburg, Germany, (2) Helmholz-Zenrum Geesthacht, Institute for Coastal Research, 21502 Geesthacht, Germany

[10pt,onecolumn,conference,a4paper]IEEEtran

Remote Sensing Ocean Currents in the German Bight: HF Radar Measurements and Quality Control

Klaus-Werner Gurgel
and
Thomas Schlick
Institute of Oceanography
University of Hamburg
D-20146 Hamburg
Germany
Email: gurgel@ifm.uni-hamburg.de

Jörg Seemann
and
Friedwart Ziemer
Institute for Coastal Research
Helmholz-Zentrum Geesthacht
D-21502 Geesthacht
Germany
Email: joerg.seemann@hzg.de

January 10, 2011

In the South-Eastern part of the North Sea, known as the German Bight, the Helmholz-Zentrum Gessthacht (HZG, former GKSS Research Center) is currently installing the experimental observation Network COSYNA (Coastal Observing System for Northern and Arctic Seas). The main components of COSYNA include *in-situ* instruments, a network of High-Frequency over-the-horizon (HF) radars currently consisting of three WERA (WEllen RAdar) systems installed on the islands of Wangerooge and Sylt, and close to the harbour of Büsum, as well as numerical models which are connected to the measurements by data assimilation.

The WERA HF radar system has been developed at the University of Hamburg in 1996. A commercial version is available since 2000. As WERA uses FMCW modulation for range resolution, there is no blind range in front of the system and data are available very close to the coast. Azimuthal and range resolutions are $\pm 3^\circ$ and 1.5 km, respectively with a maximum range of 120 km. Ocean current maps are measured three times an hour. Operation of the HF radar systems started during summer 2010. The three radial components of the current field as measured by the WERA radars are transfered to a central server at HZG, where they are quality checked and combined to give area-covering 2D maps. Radial components and 2D maps are archived in a data base and provided to the numerical model system. COSYNA provides a web-based interface to make the 2D maps, as well as the model now- and forecasts available to the public. This paper describes details of the HF radar network including the procedures to reduce the impact of Radio Frequency Interference (RFI) on the measured ocean current maps and to control the quality of the data. The model and data assimilation system will be the topic of a different paper.

HF radar measurements, especially in the lower frequency range from 8 to 20 MHz, are quite often affected by RFI, which contaminates the backscatter Doppler spectrum and makes it difficult to identify the first- and second-order echoes from the ocean. WERA makes use of a technique to simultaneously measure Doppler spectra including echoes and RFI, as well as Doppler spectra containing RFI only. The RFI only spectra are used to identify the structure of the RFI which is then removed from the echoes. Besides RFI, echoes from targets like ships may be mapped into the Doppler frequency range of the ocean echoes which result in erroreous ocean current or wave measurements. These targets are identified by a special algorithm and removed from the Doppler spectra before processing.

The radar processing described above may not remove all RFI and target echoes in all cases. An additional quality check of the ocean current data is implemented to identify and flag these situations. This procedure checks the temporal variability between measurements, i.e., to the last measurement (20 min ago) and to the last measurement at the same tidal phase (approx. 12 hours ago). This check is done for the radial components and the 2D current vectors. If the variability exceeds a threshold, the data is flagged as "probably bad". The radial components and the 2D current vectors are neither removed nor interpolated to avoid providing "manipulated data" to the model / data assimilation system, which can handle these situations in a better way, as the flagged measurements may be erroreous or indicate an abnormal oceanographic situation.