

COMPARISON OF DIRECTIONAL SPECTRA OF SEA WAVES ESTIMATED BY AN ARRAY OF RADAR SENSORS AND A DIRECTIONAL WAVERIDER BUOY

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Paper topic: Laboratory and field observations and techniques

1. Introduction

For some years now, there has been an increasing interest in the description of directional spectra of sea waves, due to its manifold usage in various disciplines. Barstow et al. (2005) underline the fundamental importance for wave modeling and engineering applications. Forces on piles, breakwaters and offshore structures as well as their response to waves, for instance, depend on direction. Furthermore, the knowledge of directional spectra of sea waves is essential for scientific purposes, such as diffraction and refraction studies (Panicker, 1975). Nevertheless, directional records are still rarely available. This might be due to the fact that the most common measuring systems are expensive and require extensive maintenance.

Therefore, the German Federal Institute of Hydrology – *BfG* is developing a low-cost, non-contact directional wave monitoring system based on liquid-level radar sensors. In this study, a short description of the measuring principle and the analysis of wave parameters are given. The main focus is on the comparison of the results estimated by the radar based system and the Datawell Directional Waverider buoy MK III.

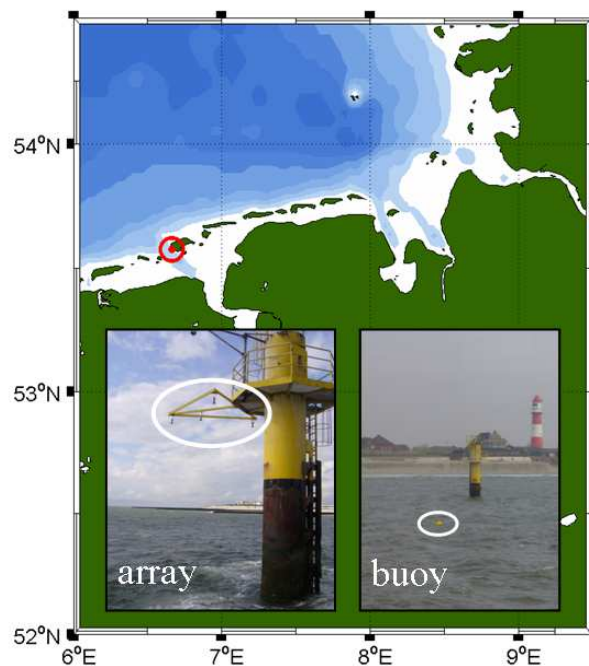


Figure 1. The first test construction at the gauging station “Borkum Südstrand”. The red dot marks the observation site. The photograph on the left illustrates the monitoring system, based on a triangular arrangement of radar sensors, whereas the location of the Datawell Waverider buoy is depicted on the right.

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2. Data and Methods

The German Federal Institute of Hydrology – BfG (in cooperation with the German Federal Waterways Administration - WSV), has developed a single point wave gauging system to record one dimensional wave parameters, based on radar technique (Barjenbruch, 2008). Since 2002, such a system has been in operation at different gauging stations in the German North Sea (Mai, 2010). To enlarge the capability towards monitoring of wave direction, the BfG developed a measurement setup based on an array of four radar sensors. In this way, the phase relationships can be used to estimate the directional spectrum.

A first test construction is mounted at the gauging station “Borkum Südstrand” (Figure 1), since July, 2012. Furthermore, a Datawell Directional Waverider buoy MK III was deployed (in cooperation with the Hamburg University of Technology) at a distance of approximately 75m.

3. First Results

The first results show a good agreement of both measuring methods (Figure 2). The effects of the different measuring principles will be examined in more detail.

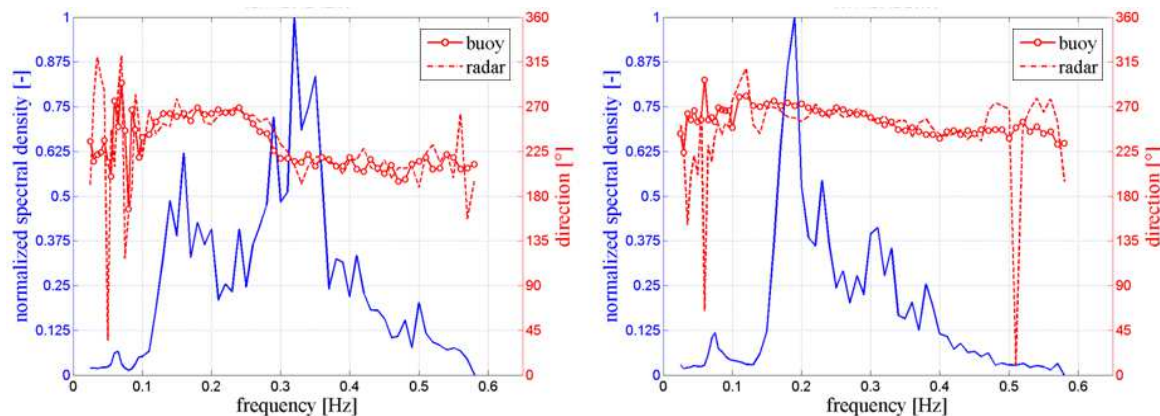


Figure 2. A comparison of the spectral directional information estimated by the two methods. For two 30 minute time spans, the sea state conditions (left panel 02.11.2012 12:00-12:30; right panel 03.12.2012 23:30-24:00) are shown exemplarily.

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