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Wave parameters comparisons between High Frequency (HF) radar system and an in situ buoy: a case study

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The coastal zone is an important area for the development of maritime countries, either in terms of recreation, energy exploitation, weather forecasting or national security. Field measurements are in the basis of understanding how coastal and oceanic processes occur. Most processes occur over long timescales and over large spatial ranges, like the variation of mean sea level. These processes also involve a variety of factors such as waves, winds, tides, storm surges, currents, etc., that cause huge interference on such phenomena. Measurement of waves have been carried out using different techniques. The instruments used to measure wave parameters can be very different, i.e. buoys, ship base equipment like sonar and satellites. Each equipment has its own advantage and disadvantage depending on the study subject. The purpose of this study is to evaluate the behaviour of a different technology available and presently adopted in wave measurement.

In the past few years the measurement of waves using High Frequency (HF) Radars has had several developments. Such a method is already established as a powerful tool for measuring the pattern of surface current, but its use in wave measurements, especially in the dual arrangement is recent. Measurement of the backscatter of HF radar wave provides the raw dataset which is analyzed to give directional data of surface elevation at each range cell.
Buoys and radars have advantages, disadvantages and its accuracy is discussed in this presentation. A major advantage with HF radar systems is that they are unaffected by weather, clouds or changing ocean conditions. The HF radar system is a very useful tool for the measurement of waves over a wide area with real-time observation, but it still lacks a method to check its accuracy.

The primary goal of this study was to show how the HF radar system responds to high energetic variations when compared to wave buoy data. The bulk wave parameters used (significant wave height, period and direction) were obtained during 2013 and 2014 from one 13.5 MHz CODAR SeaSonde radar station from Hydrographic Institute, located in Espichel Cape (Portugal). These data were compared with those obtained from one wave buoy Datawell Directional Waverider, also from Hydrographic Institute, moored inbound Sines (Portugal) at 100 m depth. For this first approach, was assumed that all the waves are in a deep water situation.

Results showed that during high energetic periods, the HF radar system revealed a good correlation with wave buoy data following the bulk wave parameters gradient variations.