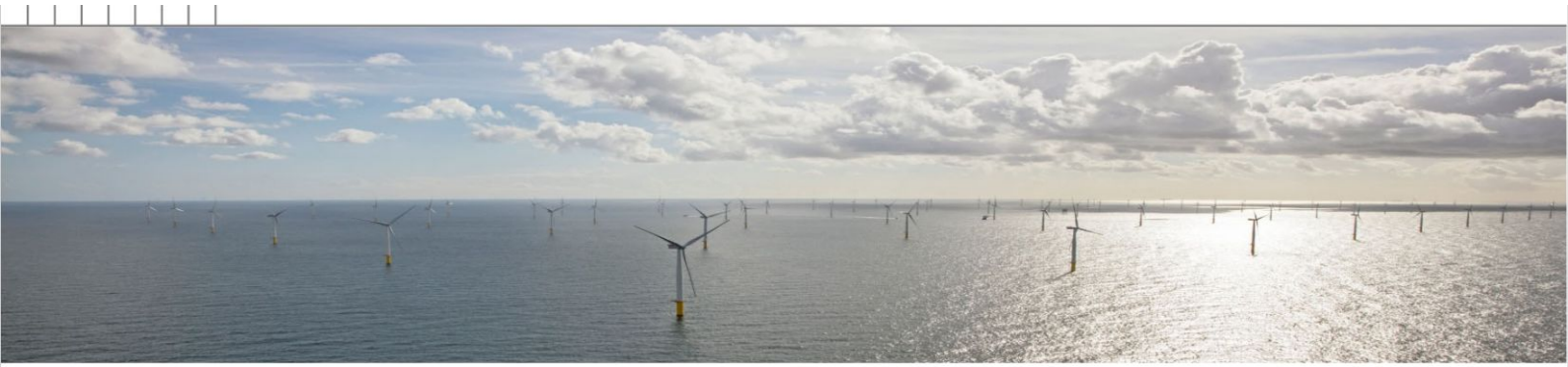
RADAC
level, tide and wave monitoring



Ocean Wave Measurement with Phased Array Radar

Date: October 30, 2020

Supervisor: Rolf van der Vlugt, Msc

Introduction

As the need for renewable energy grows, offshore wind energy is becoming an increasingly important source. The main challenge for offshore wind is to reduce the cost of installation, operation and maintenance in the rough offshore environment. A key aspect in this challenge is knowing how rough and challenging the conditions really are, all all times. Radac is at the forefront of developing new and better ways to measure the sea state and joined a consortium to develop an Offshore Operational Advisory System, which aims to reduce the cost of operation. Within the project, Radac will develop it's unique scanning radar technique into a highly accurate wave sensor. This master thesis is focused on developing the algorithms to estimate the directional distribution of wave energy.

Master Thesis Assignment

Radac's newly developed phased array FMCW radar delivers 6000 measurements per second, spread over a 90 degrees section of water and up to a distance of 760m. Doppler based reflection gives a high spacial resolution of 75cm at which the water surface velocity is captured. These surface velocities contain all the necessary information of motion and thus for estimating the height and direction of the waves. Advanced statistical and deterministic methods will be used to reconstruct the water surface and make a detailed estimation of the sea state. The final goal is to estimate the full 2D spectral wave information. The student may be involved in gathering experimental data and doing measurements at the Pier of Scheveningen or the Acta Auriga support vessel.

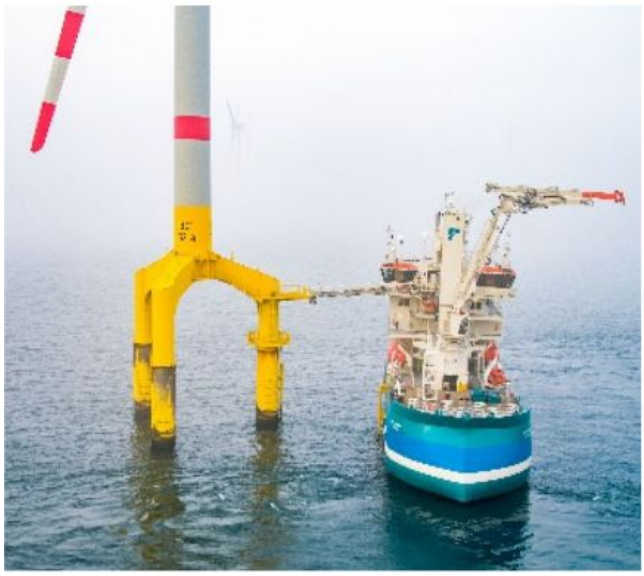


Figure 1: Critical gangway operation in wind farm.

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Key aspects of the work:

- Generation of synthetic data
- Inverse modeling techniques
- Development of algorithms for processing and parameter estimation
- Processing of data from real measurement

Programming language: Python

Reference to previous master thesis work: Predicting the sea surface from high resolution multi-beam FMCW radar data

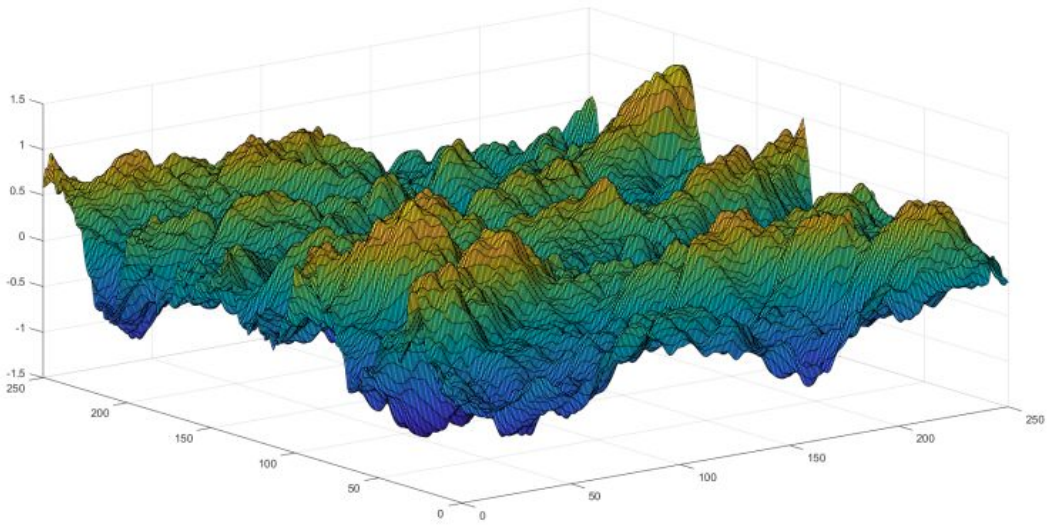

Figure 2: Reconstruction of sea surface.

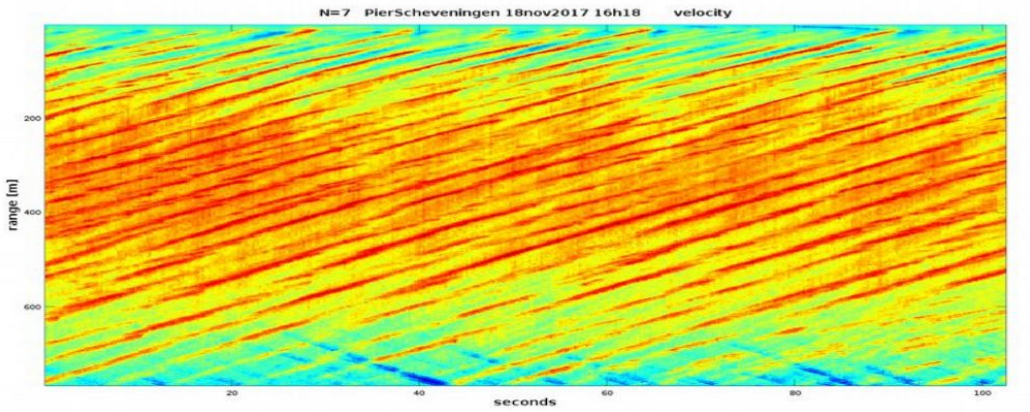

Figure 3: Radar data of incoming waves over range and time.

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