

Ocean remote sensing with HF radars and application to tsunami detection



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Abstract: Radar remote sensing is a powerful means for characterizing the ocean surface, both at large scale and high resolution. This includes a variety of instruments with different purposes, working under various configurations (e.g., airborne, space-borne, ground based) and electromagnetic frequencies. The so-called « oceanographic radars » are shore-based remote sensing systems working in the « High-Frequency » (HF) frequency regime (3-30 MHz) that are used for monitoring ocean currents, waves, and measure wind direction. They can provide quasi real-time synoptic maps of ocean surface currents over a large fields of view, up to a few hundred miles from shore. Today, they are employed routinely to characterize the coastal oceanic circulation at high spatial (~ 1 km) and temporal (~ 1 hour) resolution.

An emerging application of oceanographic radars is early tsunami detection, which takes advantage of the far-range and wide coverage capabilities of these instruments. The detection is based on measuring the additional surface current induced by the arrival of a tsunami wave train and can advantageously complement classical warning systems, which rely on seismic or bottom pressure sensors.

In this lecture we will recall and highlight in a simple way the main physical mechanisms underlying measurements of ocean currents as well as the state of art in tsunami detection in this context. We will present a novel technique that has been developed at the University of Toulon (France) in collaboration with the University of Rhode Island (USA, RI) to improve the tsunami detection performance of oceanographic radars. Some preliminary results based on measurements at an actual HF radar system will be presented.

Bio: Charles-Antoine Guérin received the B. Eng. degree from the Ecole Nationale Supérieure de l'Aéronautique et de l'Espace, Toulouse, France, in 1994 and the Ph.D. degree in Theoretical Physics from the University of Aix-Marseille, France, in 1998. He is now professor and researcher at the University of Toulon, France, with the Mediterranean Institute of Oceanography (MIO). He is specialist in physical modeling of ocean remote sensing. His current interests include the characterization of the sea surface with microwave radars and tsunami detection with HF radars.

He is currently a distinguished visiting international scholar at URI and a Fulbright scholar for the academic year 2016-2017.

