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Wave field monitoring at Taipei Harbour, Taiwan

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ABSTRACT

To monitoring the near field wave climates, wave-monitoring stations were set up around Taiwan. Our Department is responsible for the evaluation of the measurements, as well as maintenance of the wave measuring station of the Taipei Harbour. In this paper, we briefly report some of our activities and results of our recent research works. It is shown that wave heights estimated from radar images seem to have a slight tendency of overestimation. In the meantime, wave directions deviate from ground truth for the cases of light winds. Possible reasons for the mismatches are discussed.

KEY WORDS: Radar images; wave climate; significant wave heights.

INTRODUCTION

The catastrophic events occurred in recent years around the globe seem to demonstrate that climate change is inevitable. It is generally accepted that global warming will lead to sea level rise. As a result, coastal areas will probably be flooded. If these predictions were correct, Taiwan, being an island surrounded by oceans, will need a long-time coastal protection policy that can guarantee the life and wealth of the habitants in the near future.

To monitoring wave climates of the coastal areas around Taiwan, the Central Weather Bureau (CWB) of the Government has set up six observation stations around the Island. Figure 1 shows the locations of these stations schematically. To cover the sea surface as large as possible on one hand, and to keep the maintenance costs as low as possible, all these measuring stations use marine radars as measuring instrument.

Using X-band marine radar as an acquisition tool of wave climate is not a new idea. The German research institute, GKSS, has started the research in the late 80's. Researchers from all over the world have studied the possibility of extracting information from radar image sequences. There are vast amounts of literature published in various languages (See, for example, Ziemer, 1987; Nickerson & Clarke, 1988; Senet, 1996; Seemann, 1997; Gommenginger, 1997; Holland et al., 1997; Takase & Hirayama. 2000a, b; Robinson et al., 2000; Gommenginger et al., 2000; Nomiyama & Hirayama, 2003; Dankert, 2003; Dankert & Rosenthal, 2004; Wu et al., 2005; Yim et al., 2005, 2006; Lentine; 2006; Li et al., 2006, just to name a few.)

The Taipei Harbour, as can be seen from Fig. 1, is located in the northern Taiwan. It is a new harbour which is still under continuous construction. The Port Authority of Keelung Harbor (PAKH), which is responsible for all the planning and constructing works of Taipei Harbour, has launched a long-term program to monitor the coastal environments of the Harbour. With this monitoring program, it is hoped that, all possible information of the coastal processes around the Harbour area can be acquired. This information will then be used for the assessments of possible environmental impacts, as well as for possible further future planning, of the Harbour. The Institute of Harbour and Marine Technology (IHMT) is responsible for the monitoring program. It has decided to use marine radar for this purpose. The analyses and interpretations of the marine radar images are to be carried out by our Department.

Figure 1 Wave observation stations around Taiwan

During the construction of the Harbour, it was found that the original site of the radar became partially sheltered by the breakwaters, and the quality of the images was downgraded. It was then decided to move the radar atop of the new building of the Harbour authority, where a relatively clear view of the Harbour can be guaranteed.