Mass Transport Evaluation using consolidated VHF Radar and Acoustic Doppler Current Profiler Data

Thesis submitted by

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STATEMENT ON THE CONTRIBUTION OF OTHERS

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Abstract

In this study, a PortMap Ocean Surface Current Radar operating in the VHF band was used in conjunction with a seabed mounted Acoustic Doppler Current Profiler to obtain measurements of current velocity through the Lido channel to the Venice Lagoon. Current flow data were obtained over a six week period from both instruments. These data, together with additional data obtained from tide gauges and wind speed data from weather stations have been used to develop techniques for producing the measurements required to obtain the mass transport of water through the inlet.

The combination of data from these two different instruments was used to overcome the limitations of each technology in obtaining a complete estimation of mass transport through the inlet. Seabed mounted ADCPs only provide current measurements for a single geographical point, and are unable to measure the surface current due to side-lobe ringing within a few metres of the surface. It is for this reason that a second technology, the surface current radar was used to measure the current across the surface of the channel. For the PortMap Ocean Surface Current Radar operating in the VHF Band (152.2 MHz) this represents a depth weighted average measurement in the upper 15.7 cm of the water column.

The PortMap radar systems used in Venice produced data that were generally of a very poor signal-to-noise ratio. This was determined to be caused by a hardware fault present in the PortMap radar affecting the range resolution. Although this resulted in insufficient radar coverage of the channel required to produce an evaluation of mass transport, techniques were developed to produce the secondary data required for this purpose. The analysis software was modified to reflect the change in range resolution, enabling high resolution, short-range current vector maps to be produced for the regions surrounding each radar station.

During the deployment, a turbid water plume was observed entering on the Sabbioni side of the inlet while the tide continued to ebb on the Lido side of the inlet. The high resolution vector current maps produced were sufficient to

observe this interesting current dynamic. These measurements show that during an outgoing tide with a strong ebb tidal stream on the Lido side of the channel, water begins to flow into the channel on the Sabbioni side of the channel. This current dynamic has obvious implications for the transport of sediment from the neighbouring Cavallino beach into the inlet, and into the Venice Lagoon.

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