



Exploiting in-situ ocean wave measurements at Station Mike

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As part of a UK-SOLAS project “HiWASE” (High Wind Air-Sea Exchanges) the National Oceanography Centre Southampton instrumented the Norwegian weather ship Polarfront with a directional wave radar “WAVEX” (<http://www.miros.no/wavex.php>). The Polarfront occupies Station Mike (66 N, 2 E) year-round, with only one 8-hour port call every 4 weeks. The WAVEX wave radar system complements the Polarfront’s existing ship borne wave recorder (SBWR) which was originally installed by the Norwegian Meteorological Institute (DNMI) in 1978 and upgraded in 1996 and 2006. In addition to the WAVEX, NOC also equipped the ship with a) two digital cameras to record whitecap fraction and b) the autonomous air-sea flux system “AutoFlux”, to obtain direct measurements of the air-sea fluxes of momentum, sensible heat, latent heat and CO₂.

All the NOC systems were installed in September 2006 and will operate continuously for the 3 year life of the HiWASE project. Real-time (<24 hour) data from the ship and more information on HiWASE can be found via <http://www.noc.soton.ac.uk/ooc/CRUISES/HiWASE/index.php>. The sea-state dataset currently being obtained on the Polarfront is unparalleled in that the ship now has the WAVEX radar system in addition to the SBWR: it is believed that, until now, the two systems have never been deployed together for more than brief periods. The SBWR provides reliable wave height data but no directional information, whereas the wave radar provides excellent directional wave spectra but does not measure wave heights reliably. Initial results from the two systems show that they are in good agreement for

wave period, but that the wave height estimate from the WAVEX can be poor, particularly in mixed seas where swell dominates the wind sea. In combination the two systems provide the most comprehensive in-situ information on sea state, located in a region of the world's oceans which experience a wide range of sea states including extreme events (e.g. 3-hourly significant wave height of 15.5 m in November 2001). Raw data is saved from the SBWR (30 minutes sample period every 45 minutes) and from the WAVEX (raw data twice per hour, spectra and derived parameters once every 5 minutes). "Sea spikes" in the raw wave radar images will be related to wave breaking. Both wave breaking and estimates of whitecap coverage (from the digital camera images) will be related to wind and sea state conditions. The main research aim of HiWASE is the parameterisation of the air-sea fluxes in terms of wind speed, sea state etc. However, there are a wide range of research areas which fall outside the HiWASE aims. Ideas for collaborative projects from members of the remote sensing and modelling communities are welcome.