Implementation of the wave boundary layer model in the OpenIFS model

Nefeli Makrygianni (makrygiannin@Cardiff.ac.uk) (1), Jean R. Bidlot (2), Michaela Bray (1), Shunqi Pan (1)
(1) Cardiff University, Department of Engineering, Hydro- Environmental Research Centre, Cardiff, UK
(2) European Centre of Medium-Range Weather Forecast, Reading, UK

Background

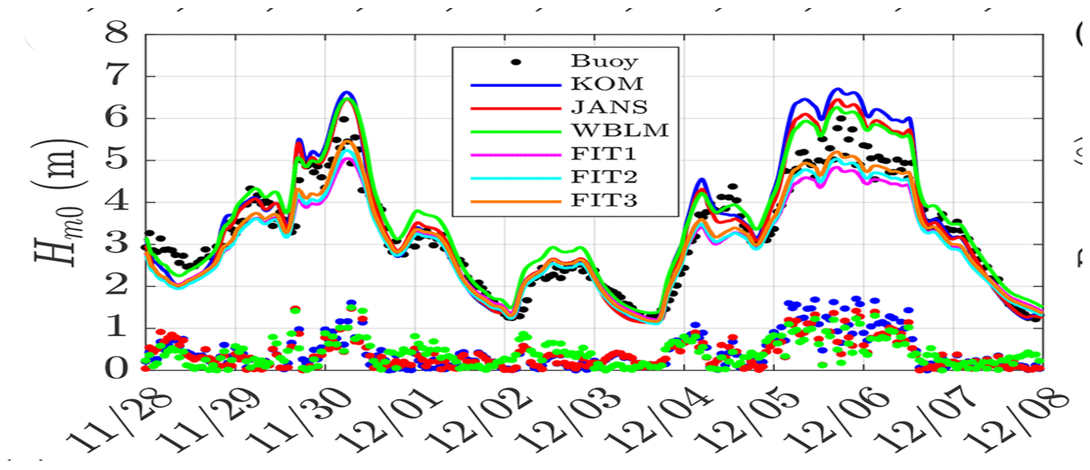
- Predictions of winds and waves under coupled atmosphere are challenging.
- Momentum fluxes (wind stresses) in the Wave Boundary Layer (WBL) are one of the most important issues in the wind and wave forecast.
- WBL model has been used to calculate stress (C_d, z_0) (e.g. Janssen 1991; Komen et al. 1994).
- Recently used to calculate source functions (Du et al., 2016).

Methodology

- Use of OpenIFS coupled with WAM wave model.
- Resolution of 28 km with spectrum discretized with 36 directions and 36 frequencies.
  - Implementation of WBLM of Du et al. (2017, 2019) in forecasting model.
    - Novelty includes modification of WBLM Input, WBLM Dissipation, WBLM Stress.
  - Sensitivity tests.

Results

- Better performance of the enhanced model on the estimation of the roughness length and drag coefficient.
- Improved predictions of the wind speeds and significant wave height, especially under extreme conditions.



Significant wave height (solid lines) in comparison to buoy error measurements (black dots); coloured dots: absolute error (Du et al. 2019, O.S.)

Further Work

- Comparison with published results.
- Potentially downscaling, for small scale features.
- Applications of the model.

References

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