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SUPPORTING COASTAL MANAGEMENT DECISION-MAKING WITH HIGH-RESOLUTION WAVE MODELLING

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Coastal management is a multifaceted practice that balances environmental, economic, social, and regulatory considerations. Robust evidence is essential for decision-making, necessitating advanced numerical models.

A key area of focus is the Hurst Spit to Lymington frontage in the western Solent, which is characterised by complex morphologies and hydrodynamics. High-energy storm waves frequently damage Hurst Spit, necessitating a better understanding of how the morphology of the Spit and adjacent saltmarshes affects storm wave propagation.

Traditional phase-averaged spectral wave models have limitations in these environments, particularly with wave breaking, diffraction, and infragravity wave processes. To address these issues, the phase-resolving wave model REEF3D was employed across the Strategy frontage at a 5m grid resolution.

The modelling aimed to assess wave overtopping risks along the defence line from storm wave propagation under different representations of the Spit and saltmarsh, defined as system states. The model transformed recorded wave spectra from the 14 February 2014 storm event through the domain. Novel post-processing routines enabled frequency analysis across the entire model domain to determine key wave statistics (e.g. Hm0, Tm-1,0) in different frequency bands.

The land in the lee of Hurst Spit is defended by various structures of differing geometry. To understand the impact of the system state on flood risk, wave overtopping rates were determined using the EurOtop Manual, with modifications for infragravity waves.

This study has been instrumental in building an evidence base for Strategy decisions and represents the first application of such a model at this scale in UK coastal management.