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Influence of hurricane wind field in the structure of directional wave spectra.

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Three numerical experiments using the spectral wave prediction model SWAN were carried out to gain insight into the mechanism that controls the directional and frequency distributions of hurricane wave energy. One particular objective is to evaluate the effect of the translation speed of the hurricane and the presence of concentric eye walls, on both the wave growth process and the shape of the directional wave spectrum. The HRD wind field of Hurricane Dean on August 20 at 7:30 was propagated at two different velocities (5 and 10 m/s). An idealized concentric eye wall (a Gaussian function that evolve in time along a path in the form of an Archimedean spiral) was imposed to the wind field. The white-capping formulation of Westhuysen et al. (2007) was selected. The wave model represents fairly well the directionality of the energy and the shape of the directional spectra in the hurricane domain. The model results indicate that the forward movement of the storm influences the development of the waves, consistent with field observations. Additionally the same experiments were carried out using the Wave Watch III model with the source terms formulation proposed by Ardhuin et al., 2010, with the aim of making comparisons between the physical processes that represent each formulation, and the latest results will be addressed.

References

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