Wave - Sea Ice Interactions in E3SMv3

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Statement of Importance

Ocean waves are generally missing from earth system models.

WAVEWATCH III (WW3) is now part of E3SMv3.

The variable-resolution, unstructured meshes used in E3SM gives the DOE a unique capability to explore the role of waves in the coupled earth system, polar regions, and the Marginal Ice Zone.

Critical E3SM Developments for Wave–Sea Ice Interactions

1. Full Coupling between MPAS-SI and WW3
2. New Wave Attenuation Scheme
3. Sea Ice Floe Size Distribution (FSD) + Ice Breaking
4. E3SMv3 30km Icosahedral Mesh for WW3

Looking Forward

Wave – Sea Ice coupling is just beginning. The DOE, LANL and E3SM are at the forefront of research simulating wave-sea ice interactions in fully coupled climate systems.

- Role of waves and wave-sea ice interactions in fully coupled climate system
- Improvements to the ice breaking mechanism and wave attenuation schemes

Key Result:

Ice breaking is sensitive to Wave attenuation

improved wave attenuation leads to more realistic ice floe sizes