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# Wave climate in the Arctic 1992-2014: seasonality, trends, and wave-ice influence

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The diminishing sea ice has direct implications on the wave field which is mainly dependent on the ice-free area and wind. Over the past decade, the Arctic sea ice has diminished which directly impacts the wave field. This study characterizes the wave climate in the Arctic using detailed sea state information from a wave hindcast and merged altimeter dataset spanning 1992-2014. The waves are driven by winds from the Climate Forecast System Reanalysis. Ice concentrations derived from satellites with a grid spacing of 12.5 km are sufficiently able to resolve important features in the marginal ice zone. Before implementation, suitable wind forcing is identified and the validity and consistency of the wave hindcast is verified with altimeters.

The seasonal ice advance and retreat largely dictates the waves and creates distinct features in the wind-waves and swells. The Nordic-Greenland Sea is dominated by swells from the North Atlantic while the coastal regions and semi-enclosed seas of the Kara, Laptev, Chukchi, and Beaufort have a more equal proportion of wind-waves and swells. Trends in the altimeters and model are in agreement and show increasing wave activities in the Baffin Bay, Beaufort, Chukchi, Laptev, and Kara Seas due to the loss of sea ice. In the Nordic-Greenland Sea, there is a decreasing trend related to changes in the wind field by North Atlantic Oscillation. The waves also influence the sea ice. Two distinctly different wave-ice environments are identified and selected events demonstrate the importance of waves in the marginal ice zone. The crux of the research identifies the need for continued study and improvement of wave-ice interaction.