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## Feature of Surface Waves Generated by Polar Lows

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A parametric wave model developed by Kudryavtsev et al. (2021) is adapted for Arctic conditions, to help simulate surface waves generated by non-stationary and non-uniform wind fields, to study extreme events in the Norwegian and Barents seas. The ERA-5 reanalysis wind field is used as the input parameter. The model equations are solved using method of characteristics and solutions are then presented as hourly fields of wave parameters (significant wave height, SWH, wavelength, and direction) on the regular grid. The satellite altimeter data are used to validate the model results. Model outputs can then be readily compared with all available satellite observations, including Sentinel-3, Altika and CryoSat-2 measurements.

Observations and analysis of model simulations reveal appearance of abnormal high surface waves, resulting from a resonant fetch-enhancement associated to travelling wind fields. In other words, the generation of waves in the “spiral-shaped” PLs is most likely associated with the generation of waves in the TCs. However, in PLs with a “comma-shape”, the resonance effect occurs when the strong wind zone inside the PL is located in the right sector, where the direction of the wind velocity coincides with the movement of the front. That is, the surface wave group velocity enters in resonance with moving wind field features, leading to abnormal wave development.

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### Reference

Kudryavtsev, V., Yurovskaya M. , Chapron, B., 2021. “2D parametric model for surface wave development in wind field varying in space and time”, *Journal of Geophysical Research: Oceans*, Vol. 126.