

## Sensitivity Experiments with the Louvain-la-Neuve (LIM3) Sea-Ice Model

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The Louvain-la-Neuve (LIM3) sea-ice model is a dynamic-thermodynamic model which represents the ice pack as a series of ice categories to simulate heterogeneous ice cover more accurately. In the Arctic there are numerous factors which impact the state of sea, modelling these features is often difficult. In order to gain insight towards the relative impact of different components on the simulated ice pack, sensitivity experiments are run to analyze changes in key model output variables, as well as to gain insight into the improvements and shortcomings of the LIM3 model compared to the previous LIM2 model. Analysis is focused on two regions, pan-Arctic and then a closer look at the Pikialasorsuaq (North Water Polynya region). Key variables, sea-ice thickness and concentration are looked at more closely and compared to observations; CryoSat thickness and AMSR2 concentration as well as changes to ice volume, extent, salinity, and thickness distribution. Further, the relative sensitivity to changes in sea-ice physics to ocean properties are analyzed, including sea-ice transport through the Canadian Arctic Archipelago. On a pan-Arctic scale, LIM3 has a thinner ice pack than LIM2 and better matches CryoSat observed thicknesses. As well, LIM3 has a greater seasonality in ice concentration with slightly greater winter values and lower summer concentrations than LIM2 and better matches AMSR2 ice concentration observations. Including tides is found to further decrease mean ice thickness and increase the seasonality of thickness. Lowering the ice salinity acts to thin ice slightly. Increasing the ice shear strength increases ice thickness, while changing the ice density produces minimal changes. On a pan-Arctic scale sensitivity experiments only produce small discrepancies in ice concentration compared to the change from LIM2 to LIM3.