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Biogeosciences Discussions

Interactive comment on "Regional variability of acidification in the Arctic: a sea of contrasts" *by* E. E. Popova et al.

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We very much appreciate the viewpoint that model projections are only of value if sensitivity to the main physical process is presented. Especially so since our manuscript's main conclusion concerns the importance of the physical processes for future change.

To address the Referee's concerns on this point we propose to run a number of sensitivity experiments to further investigate the main physical processes controlling sea-ice extent, formation and stratification. However, taking into account that such experiments should be of at least 100 years duration, these runs will stretch our available computational recourses. As such, we would like to use the opportunity provided by the EGU Open Discussion process to post our plans for these additional experiments in order that Referee 2 may be able to comment on these before we embark on a major com-

putational and analytical task.

Our computational resources would potentially allow us up to 6 100-year duration runs and possibly a number of shorter ($\sim$10 years) tests for optimising the choice of parameter variations. Taking into account these constraints we would like to focus on the following processes:

1. Sensitivity to the rate of the ice decline: To achieve a more generally applicable conclusion – and to avoid dependence on the particular ice model employed in our study – we will vary ice albedo to produce two runs with slower and faster rates of ice decline relative to the baseline simulation.

2. Sensitivity to brine rejection: Here we will vary sea-ice salinity which will simultaneously affect both sea-ice cover and upper ocean stratification (two runs).

3. Sensitivity to the strength of the modelled upper ocean mixing: We propose to achieve this by varying mixing due to surface and internal waves in the turbulent kinetic energy parameterisation employed in our model. At present, this mixing process is ignored if sea-ice is present in a model cell. To address this, we proposed to run the model such that the mixing due to surface and internal waves remains accounted for in both ice-free and ice-covered model grid cells.

Interactive comment on Biogeosciences Discuss., 10, 2937, 2013.