Uncertainties in Arctic sea ice thickness associated with different atmospheric reanalysis datasets using the CICE5 model

Su-Bong Lee\textsuperscript{1,2}, Baek-Min Kim\textsuperscript{3}, Jinro Ukita\textsuperscript{4}, Joong-Bae Ahn\textsuperscript{2}

\begin{itemize}
  \item \textsuperscript{1}Korea Polar Research Institute,
  \item \textsuperscript{2}Division of Earth Environmental System, Pusan National University,
  \item \textsuperscript{3}Division of Earth Environmental Atmospheric Science, Pukyong National University,
  \item \textsuperscript{4}Faculty of Science, Niigata University
\end{itemize}

Reanalysis data are known to have relatively large uncertainties in the polar region than at lower latitudes. In this study, we used a single sea-ice model (Los Alamos‘ CICE5) and three sets of reanalysis data to quantify the sensitivities of simulated Arctic sea ice area and volume to perturbed atmospheric forcings. The simulated sea ice area and thickness thus volume were clearly sensitive to the selection of atmospheric reanalysis data. Among the forcing variables, changes in radiative and sensible/latent heat fluxes caused significant amounts of sensitivities. Differences in sea-ice concentration and thickness were primarily caused by differences in downward shortwave and longwave radiations. 2-m air temperature also has a significant influence on year-to-year variability of the sea ice volume. Differences in precipitation acted the sea ice volume by causing changes in the insulation effect of snow-cover on sea ice. The diversity of sea ice extent and thickness responses due to uncertainties in atmospheric variables highlights the need to carefully evaluate reanalysis data over the Arctic region.

\textbf{Key words:} sea ice model, reanalysis, uncertainty, Arctic

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