

Seasonal variability in warm-water inflow towards Kangerlugssuaq Fjord

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Seasonal variability in pathways of water masses toward the Kangerlugssuaq Fjord-Glacier system (KF/KG), southeast Greenland, is investigated by backtracking Lagrangian particles seeded at the fjord mouth in a high-resolution regional ocean model simulation in the ice-free months (JASON, summer) and the months when sea ice is present (JFMAM, winter). The waters at KF are a mixture of Atlantic-origin water advected from the Irminger Basin (measured at the Faxaflói (FF) hydrographic section) and waters originating from the Arctic and Nordic Seas (measured at the Kögur (KO) hydrographic section). In summer about 90% of the particles comes from the KO section, in winter decreasing to 80%. The FF particles take similar routes in summer and winter, but KO particle trajectories cross the shelf in summer while they follow the long route along the shelf break and into Kangerlugssuaq Trough in winter, resulting in longer transit times and a smaller volume contribution to the KF mixture. While the majority of the volume flux is from the KO section, the vast majority of heat comes from the FF section. Notably, while the FF water in the Irminger Basin is colder in winter than it is in summer, the reverse is true at KF because the mixture there contains twice as much of the warm FF water in winter than in summer. The T/S properties at the fjord mouth can thus not simply be inferred from the source waters, but depend crucially on the pathways and along-path transformation of the individual source waters, which are different in summer and winter.