



The crucial role of Arctic atmospheric rivers and surface longwave flux anomalies on episodes of reduced Arctic sea ice growth in fall and winter

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Arctic sea ice growth in fall and winter is facilitated by surface cooling through turbulent and radiative fluxes from the surface to the atmosphere. Climatologically, these seasons are characterized by distinct episodes of increased and reduced surface cooling and sea ice extent and volume growth. Periods of reduced surface cooling and sea ice growth are associated with the presence of clouds and increased atmospheric water vapor content transported from lower latitudes, termed moisture intrusions or Arctic atmospheric rivers. In the research presented, we quantify the cumulative effects of Arctic atmospheric rivers on downwelling longwave surface fluxes and seasonal Arctic sea ice growth, utilizing PIOMAS sea ice thickness and CERES surface radiative flux data. We show that fall and winter seasons with more frequent and more intense Arctic atmospheric river events exhibit anomalously low cool-season sea ice volume growth. We also show that the effects of the events on clear sky downwelling longwave fluxes contribute more to the total increase in associated downwelling longwave fluxes than changes in surface cloud radiative effects, especially in fall. The variability in the intensity and frequency of the Arctic atmospheric river events may in part explain the interannual variability and recent trends in total sea ice volume growth after the September minimum extent.