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Variability of the Arctic Ocean fresh water balance over the last 50 years

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The Arctic Ocean fresh water balance over the period 1948 - 2001 is examined using results from a hindcast simulation with an ocean-sea ice model of the Atlantic and Arctic oceans. Atmospheric forcing is taken from the NCEP reanalysis and different terrestrial fresh water sources as well as Bering Strait through flow are specified as constant seasonal cycles. The long-term variability of the Arctic Ocean liquid fresh water content is determined by the variability of lateral exchanges with the subpolar seas. Surface fresh water flux variability is dominated by the thermodynamic growth of sea ice. This component of the fresh water balance has larger variability at interannual frequencies. The Arctic Ocean liquid fresh water content was at a maximum in the middle of the 1960s. Extremely low liquid fresh water export through Fram Strait caused this maximum in the fresh water content. The low export rate was related to weak volume transports in the East Greenland Current. Low volume transports were forced by a reduction in sea surface height across Fram Strait, triggered by anomalous melt water from Barents Sea ice export that was carried towards Fram Strait with the West Spitzbergen Current. After the 1960s maximum liquid fresh water content, the Arctic Ocean gradually returned to an equilibrium between export through the passages toward the Atlantic and the fresh water sources.