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Atmospheric moisture transports to the Arctic from different reanalyses: comparative assessment and analysis of source terms

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Accurate knowledge of the Arctic heat and moisture balances is critically important for understanding mechanisms of polar climate change and the observed amplification of the Arctic warming. Basic characteristics of the atmosphere in the Arctic region have quite a large spread in the modern era and first generation reanalyses, thus preventing effective use of reanalyses for the assessment of atmospheric moisture and heat transports and analysis of variability in the source terms. We used Eulerian approach to derive and intercompare to each other estimates of the moisture transports in the atmosphere from 5 reanalyses (ERA-Interim, MERRA, NCEP-CFSR, JRA-25, NCEP-1). Computational procedure involved decomposition of the velocity and moisture fields into mean conditions and variations around the mean. This concept allowed for the further association of the mean and eddy transports with large scale circulation modes (mean component) and synoptic transients (eddy component). The latter was associated with the characteristics of cyclone activity derived from the same reanalyses using state of the art numerical algorithm for cyclone identification and tracking. Atmospheric moisture transport is most intense over the GIN Sea and the North European basin, however over this area of the most intense transports, the contributions from the eddy and mean transport components are not correlated hinting on different pattern of variability in moisture fluxes due to cyclone activity and mean circulation. Decadal scale variability in the atmospheric moisture transports has been further associated with the Arctic-scale and regional differences between local precipitation and evaporation as well as with the magnitude of the storage terms. Potential mechanisms of variability in these terms are discussed.