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Intercomparison of satellite-derived Arctic cloud climatologies

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Clouds in the Arctic, particularly in wintertime, have a strong warming effect. Relatively small changes in cloud cover or cloud properties can lead to an anomalous climate forcing. Despite of significant effects of clouds their adequate detection in the Arctic is still very difficult problem due to little visible and thermal contrast with underlying surface. We present intercomparison of up-to-date satellite-derived total cloud climatologies (APP-x, CERES, ISCCP, MODIS, Patmos-X). Ground-based observations (EECRA) and reanalyses data (ERA-40, ERA-Interim, JRA-25, MERRA, NCEP/NCAR, NCEP/DOE, NCEP-CFSR, 20CR) were used as well. The annual-mean total cloud fraction (TCF) varies between 0.67±0.01 from CERES Aqua data and 0.73±0.03 from APP-x data. All observations show larger annual-mean TCF over ocean (between 0.70±0.02 from CERES Terra data and 0.78±0.03 from Patmos-X data) than over land (between 0.64±0.01 from CERES Aqua data and 0.70±0.03 from APP-x data). According to reanalyses data TCF varies in much wider range from 0.48±0.01 by NCEP/NCAR reanalysis data to 0.88±0.01 by 20CR data. The best fit to observations display MERRA reanalysis data. The disagreement between different observational data is larger in winter than in summer. Winter TCF varies between 0.55±0.02 from CERES Aqua data and 0,71±0.07 from APP-x data. According to all observations (except ISCCP) TCF is larger in summer than in winter, while TCF from reanalyses is larger in winter than in summer mostly because of the summer cloudiness underestimation. The largest discrepancies among different observational data are revealed over Greenland and over central and Canadian part of Arctic Ocean. In general, an agreement of different data is much better in summer than in winter, especially over Canadian part of Arctic Ocean and northern Eurasia. It can be related with frequent low tropospheric temperature inversions in winter.