A systematic assessment of water vapor products in the Arctic: from instantaneous measurements to monthly means

(only 750 characters allowed)
Water vapor is an important component in the water and energy cycle of the Arctic. With respect to Arctic amplification, changes of water vapor are of high interest but are difficult to observe due to the sparsity of data in that region. The ACLOUD/PASCAL campaign performed in May/June 2017 in the Arctic North Atlantic sector offers the opportunity to investigate the quality of various satellite and reanalysis products: reference IWV measurements at R/V Polarstern and at Ny-Ålesund are used to investigate the quality of instantaneous satellite measurements from AIRS, AMSR2, GOME, IASI and MIRS. In future, we will also exploit the comprehensive measurements of MOSAiC providing a full year of IWV reference measurements in the central Arctic.

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Water vapor is an important component in the water and energy cycle of the Arctic. Especially in the light of Arctic amplification, changes of water vapor are of high interest but are difficult to observe due to the sparsity of data in that region. The ACLOUD/PASCAL campaign performed in May/June 2017 in the Arctic North Atlantic sector offers the opportunity to investigate the quality of various satellite and reanalysis products. For this purpose, reference integrated water vapor (IWV) measurements at R/V Polarstern frozen into the ice (around 82° N, 10° E) and at Ny-Ålesund are used to investigate the quality of instantaneous satellite measurements from AIRS, AMSR2, GOME, IASI and MIRS. These products use different parts of the electromagnetic spectrum and have different uncertainty characteristics related to the presence of clouds and/or surface characteristics. Therefore, the analysis is expanded to all radiosonde stations within the region. Due to the strong spatio-temporal variability of IWV - in particular during atmospheric river measurements - sampling issues are important that arise due to the different satellite orbits as well the synoptic radiosonde launch times. Following up on this analysis, the question arises whether the satellite data are suitable for a long-term monitoring and trend assessment of water vapor in the Arctic. For this purpose, we will also present an analysis of monthly mean values for May and June - two months with strongly changing surface characteristics in the Arctic - and investigate their performance relative to various reanalyses. In future, we will also exploit the comprehensive measurements of the MOSAiC campaign providing a full year of IWV reference measurements from radiosondes, microwave radiometers (MWR) and GNSS in the central Arctic. In particular, continuous and temporally highly resolved IWV information is provided from several MWRs onboard R/V Polarstern. Exploiting higher MW frequencies (around 183 GHz) will even enhance the accuracy of the MWR reference measurements for low IWV amounts which frequently occur in the Arctic.