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The Latest GPCP products (V3.2) and high latitudes analysis

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The Global Precipitation Climatology Project (GPCP) product is a popular combined satellite-gauge precipitation data set in which the long-term standards of consistency and homogeneity are underlined. Here we discuss various high latitude analyses considered in the recently released GPCP V3.2 monthly and daily products. Satellite data are used over land and ocean and obtained from the Special Sensor Microwave Imager (SSMI), Special Sensor Microwave Imager/Sounder (SSMIS), geostationary imagers and polar-orbiting infrared sounders. GPCP uses the Global Precipitation Climatology Centre (GPCC) over land, as its in situ component, but prior to combination with satellite data GPCC estimates are adjusted for gauge undercatch. Advanced sensors aboard the Tropical Rainfall Measuring Mission (TRMM), CloudSat, and Global Precipitation Measurement (GPM) mission have enabled more accurate estimation of rain and snowfall rates in recent years. Starting with GPCP V3.1 these observations are integrated into GPCP through the development of the Tropical Combined Climatology (TCC) used at lower latitudes and the Merged CloudSat, TRMM, and GPM (MCTG) climatology used over the extratropics and higher latitudes. Improved calibrations of Television-Infrared Operational Satellite (TIROS) Operational Vertical Sounder (TOVS) and Advanced Infrared Sounder (AIRS) precipitation are used outside 60ºN-S, where inside this zone the Goddard Profiling (GPROF) algorithm retrievals from SSMI/SSMIS is used to calibrate geostationary IR based precipitation estimate at monthly scale. The Gravity Recovery and Climate Experiment (GRACE) mass change observations are used to determine snowfall accumulations over frozen land and arctic basins and to assess gauge undercatch corrections. Observations of snow on sea ice from NASA's Operation IceBridge (OIB) flights are utilized as an additional tool for snowfall assessment over sea ice. GPCP V3.2 has a higher spatial resolution (0.5^{o}x0.5^{o}) than earlier versions (e.g., 2.5^{o}x2.5^{o} in V2.3) over both land and ocean, going back to 1983. Version 3 Daily product uses the Integrated Multi-satellitE Retrievals for Global Precipitation Measurement (GPM) mission (IMERG) Final Run V06 estimates as well as rescaled TOVS/AIRS data in high-latitude areas, all calibrated to the GPCP V3.2 Monthly estimate. GPCP V3.2 shows about 5.5% increase in global oceanic precipitation and about 4 % increase over global land and ocean compared to the previous version (V2.3), some major changes occur over the ocean and around 40^{o}S and $60\ ^{o}$S. We will discuss other important changes of GPCP V3.2, compared to the earlier versions, and our future plans. This includes a discussion of some

challenges that the team had to deal with, such as consistencies in inter-annual variations of satellite precipitation products and modification of gauge undercatch correction methods.