

Pavel Groisman/UCAR Project Scientist at NCDC

In situ Precipitation Dataset in High Latitudes of the Northern Hemisphere for calibration of GPM Mission Products

Background. At high latitudes, frozen precipitation and precipitation of low intensity represent the lion's share of precipitation events and a substantial contribution to annual totals. The existing rain gauge records should be bias-corrected and in high latitudes these corrections might be as high as 100% of measured totals and, what is more discouraging, measured precipitation might be overestimated too due to blowing snow events and misinterpretation of numerous low amounts of rainfall/snowfall that are below the sensitivity and/or precision thresholds of existing rain gauges. Currently, the reliability of remote sensing precipitation measurements over land is backed by the in situ rain gauge network. When going northward, this support becomes "less adequate" due to increasing uncertainties of this backup network reports. Therefore, future products of the GPM Mission may be compromised across all cold regions (for example, delivering unfeasible input for hydrological studies), if they do not use for calibration the best possible in situ updatable data set over the northern extratropics with daily or better time resolution together with a comprehensive assessment of precipitation measurements accuracy, bias-treatment, and representativeness. To deliver such data set for the NASA Precipitation Science Research Team is a major OBJECTIVE of this proposal.

Approach:

We shall pull available synoptic and precipitation data sets for the northern extratropics and re-process them to secure bias-correction and proper treatment of low intensity precipitation measurements (cf., <http://www1.ncdc.noaa.gov/pub/data/documentlibrary/tddoc/td9813.pdf>). This is a laborious step because correction of each precipitation record requires a lot of supplementary synoptic information and site metadata. Thereafter, we shall: (1) Organize an orderly update of existing synoptic and precipitation datasets for the period sufficient for the GPM calibration effort to be completed; first of all, this will be done for the United States, Canada, Russia, and Belarus where the Research team members have a direct access to national archives, data collection streams, and quality control efforts. (2) Conduct the random error level assessment of point precipitation measurements for different weather conditions, gauge design, and observational practices after application of all bias-corrections. This will be done with a particular focus on long-term field sites data and vicinity of modern high precision sites such as the U.S. Climate Reference Network and its expansion to Russia and Canada. (3) Finally, we shall conduct the representativeness studies for point precipitation measurements for different types of terrain and precipitation events at high latitudes. At this step, we shall focus on grid cell (pixel) level of future GPM products to further quantify the ability of the in situ gauge network to be used for surface-based precipitation comparison products in the high latitudes, at high elevations, and in the cold season in mid-latitudes.

Each of the members of the research team has twenty to forty years of experience in analyses of in situ precipitation data, and/or conducting methodological studies of precipitation measurements in the field. The proposers are aware of but do not pretend to participate in satellite precipitation retrieval algorithms development within the proposal framework. Everyone has to do his own job first. However, if funded, we shall be open to collaboration from the first days of the project because we have ready for use (but not updated) data sets developed in our previous course of studies for the United States, Canada, Russia, and northern Europe.