Techniques For Objective Precipitation Analyses and Their Potential Applications in the Yellow Revier Project

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Precipitation analyses of fine temporal and spatial resolution are very important for many research and development works associated with the Yellow River project. Such products, however, are not readily available due to the combined effects of insufficient observations and lack of apporpriate techniques to create the analyses from such input data. Most existing techniques are designed and developed to produce analyses of precipitation with a resolution of daily / 1°lat/lon or lower. The construction of an analysis with higher resolution requires the use of satellite estimates and gauge observations from high density networks.

Work is underway in NOAA/CPC to develop a new technique to create analyses of daily precipitation on a 0.25°lat/lon grid over the globe by merging gauge observations and estimates derived from satellite observations of IR, TOVS, SSM/I, and AMSU-B. In this technique, a 3-step approach is applied to reduce the bias and random error inherent in the individual input data sources. First, bias correction is conducted for each satellite estimates by comparing them with 'reference' fields over an accumulated period. The 'reference' field is the GPCP pentad merged analysis over oceanic areas, while over land areas it is the gauge observations. The second step of the algorithm combines the bias-corrected satellite estimates to reduce the random error through the Maximum Likelihood Estimation method, in which the weighting coefficients are inversely proportional to the error variances. The combined satellite estimates are finally merged with gauge observations to improve the accuracy over regions where dense gauge networks exist. Fig.1 shows an example of a test version of the daily analysis for August 1, 2001.

Construction of such a high-resolution analysis, however, is only possible for the period after 2000 when satellite estimates in high resolution became available. In considering the potential requirements for the daily precipitation analyses and the availability of the observation data, the author proposes to create a suite of products of daily precipitation for the Yellow River Project:

1) A standard analysis of daily precipitation on a reasonably good resolution (0.5/1.0°lat/lon) over an extended domain for an extended period based on gauge observations;

2) A regional analysis of daily precipitation with high resolution (0.1°lat/lon) and high quality over the target domain for an extended period based on gauge observations from GTS and special collections;

3) A merged analysis of daily precipitation on high resolution (0.25°lat/lon) over the extended domain but for a recent period when high resolution satellite estimates are available; and

4) A derived analysis of daily precipitation on 0.1° lat/lon resolution derived from the standard analysis but with no quality guarantee;

The success of the products relies heavily on the availability of gauge observations over China. Especially, gauge reports from additional stations over the target domain around the Yellow River basin are indispensable to the improved quality and therefore the usefulness of the precipitation analyses.

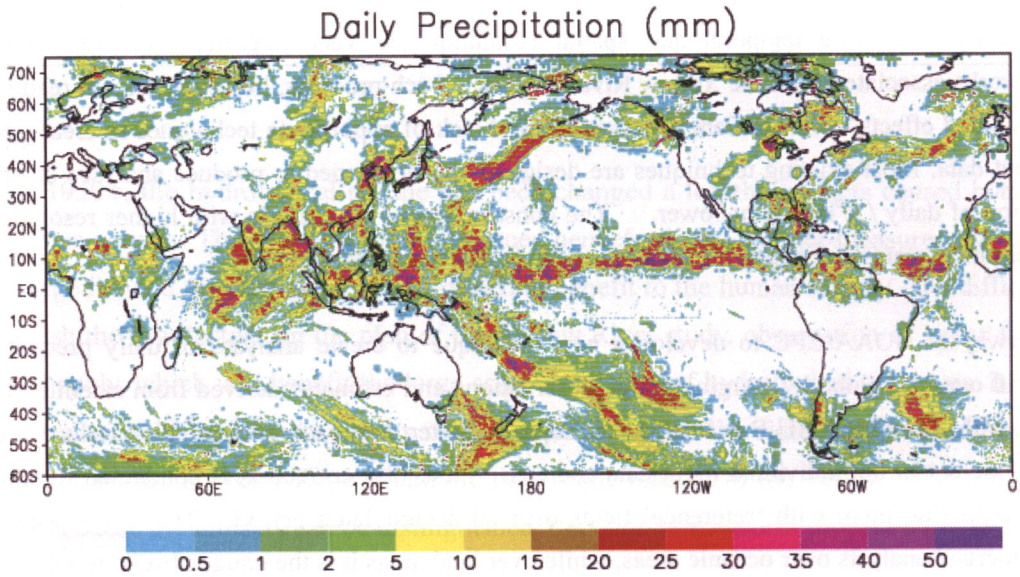

Fig.1 Analysis of daily precipitation (mm) for August 1, 2001, produced by a test veresion of the OI-based merging algorithm.