An Analysis of Daily Precipitation over East Asia:Algorithm and Validation

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A new gauge-based data set of daily precipitation has been created on a 0.5olat/lon grid over the East Asia (the Base Product; 65E-155E; 5N-60N) and a 0.1lat/lon grid over the Yellow River basin (the Derived Product) for a 20-year period from 1978 to 1997. The creation of the daily precipitation analysis is conducted in three steps. 1) A gridded analysis of daily precipitation climatology is created for each of the 365 calendar days. Analyzed fields of daily precipitation climatology are defined by adjusting it against the PRISM (Daily et al. 1994) monthly climatology over China and Mongolia and against the PREC/L (Chen et al. 2002) in order to better represent the orographic effects. 2) An analyzed field of ratio of daily precipitation to daily climatology is defined. Then interpolation is done to the ratio of daily precipitation using the Optimal Interpolation (OI) algorithm. 3) The analysis of total daily precipitation is calculated by multiplying the analyzed daily climatology with the ratio. Details of the whole algorithm are described in Xie et al. (2004).

Station observations of daily precipitation from three individual data sets are used. These are the Global Telecommunication System (GTS) daily summary files archived by the NOAA Climate Prediction Center; a personal collection of Chinese daily observations (CHN); and the daily gauge data at over ~1000 hydrological stations from the Chinese Yellow River Commission (YRC). Only daily observations from CHN and YRC data sets are used inside China, while the GTS gauge data for all stations with 90% or higher reporting rates are used over the regions outside China.

Generally, the Base product estimates more precipitation over whole China compare to the other grid precipitation data set because we adjusted precipitation climatology against the PRISM. For example, the Base product has 20-50 mm/month more precipitation in July over most part of China comparing to the test product that was made by simply averaging GTS gauge precipitation (~200 stations in China). The Yellow River basin (over 95-120E/32-42N) consists of three parts; the upper reach, in the Tibetan Plateau; the middle reach in Loess Plateau; the lower reach. Over the basin, the Base product has 20-30 mm more precipitation in July in comparison with that of the test product (GTS gauge average), and it has 5-10 mm more precipitation in comparison with that of PREC (Chen et al., 2002). Among the three sub-domain, the largest difference is seen over the Tibetan part, which shows about 30 mm more precipitation in July average. The July precipitation averaged over the Tibetan part of the river shows clear decreasing trend from 1979 to 1997. It should be one of the important points that contribute to the recent decreasing trend of the run off of the Yellow River. Further quantitative hydrological and meteorological analysis should be expected using this Base/Derived product to assess the recent variability ofof the hydrological budget over the Yellow River.