Merging Gauge Observations and Satellite Estimates of Daily Precipitation over China

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OBJECTIVE

To develop a prototype algorithm to define high-resolution analysis of daily precipitation over land by combining gauge observations and satellite estimates

DOMAIN

0.25°lat/lon over China

PERIOD

May – September, 2007

INPUT DATA

- Gauge Data

Gridded analysis of daily precipitation defined by interpolating gauge observations from over 2,400 stations over China

- Satellite Data

High-resolution precipitation estimates generated by the CPC MORPHing technique (CMORPH, Joyce et al. 2004) Precipitation estimates of 8km/30-min resolution regridded into 0.25°lat/lon / daily

BASIC STRATEGY

- First Step --- Removing Satellite Bias
  - Assuming gauge data is unbiased
  - Removing bias in the satellite estimates through comparison against the gauge data
- Second Step --- Combining Gauge Data and Bias-Corrected Satellite Estimates
  - Combination through OI
  - Bias-corrected satellite estimates as first guess
  - Gauge data used to improve the first guess over regions with gauge coverage

BIAS CORRECTION THROUGH PDF MATCHING

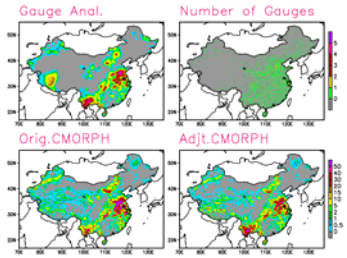
- Principal

Matching the PDF of the CMORPH against that of the gauge to define and remove the bias, assuming PDF of the gauge analysis represents that of the truth

- Implementation

Collecting co-located pairs of gauge and CMORPH over grid boxes within a spatial window centering at the target grid box and for a time period ending at the target dates. Define PDF for the gauge and CMORPH, respectively.

SAMPLE RESULTS OF BIAS CORRECTION for August 2, 2007



➔ Under- / over-estimates in the original CMORPH over southern / northern China is corrected in the adjusted CMORPH

CROSS-VALIDATION RESULTS

- Combined Time / Space Domain

CMORPH	Bias (%)	Correlation
Original	-9.7%	0.706
Adjusted	-0.0%	0.785

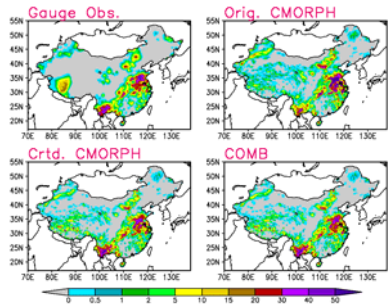
- Time Series

➔ Bias in the CMORPH is removed successfully and the PDF of the bias-corrected CMORPH close to that of the gauge data

COMBING GAGUE DATA WITH THE BIAS-CORRECTED CMORPH THOUGH THE OI

First Guess : Bias-Corrected CMORPH
Observations: Gauge Data
Final analysis is the same as the bias-corrected CMORPH over gauge sparse areas
Final analysis is the combination of the bias-corrected CMORPH and the gauge data over areas with gauge

SAMPLE OI MERGED ANALYSIS For August 2, 2007



➔ Precipitation distribution pattern looks better than the individual inputs.

SUMMARY

- A prototype algorithm is developed to define daily precipitation analysis on a 0.25°lat/lon grid over land by merging gauge observations and CMORPH satellite estimates
- Merged analysis presents improved quality of precipitation fields compared to the inputs
- More work is underway to implement the algorithm for global applications