



Inclusion of 3-Hourly Accumulated Precipitation Analysis to the Climatology-Calibrated Precipitation Analysis (CCPA)

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INTRODUCTION

Through a closely collaborative effort with OHD and ESRL, NCEP Environmental Modeling Center has developed Climatology-Calibrated Precipitation Analysis (CCPA), a new precipitation analysis at about 5km resolution with 6 hour accumulation for bias correction and downscaling. CCPA has been running in real-time and updating twice daily since July 14, 2010, and the product is available to users at five basic grids over the continental US from 2002 to present. This product is generated by combining two widely used available datasets to take advantage of the higher reliability of the CPC Unified Global Daily Gauge Analysis and the higher temporal and spatial resolution of the Stage IV dataset based on multi-sensor observations. This product is being used in several important studies. In particular, bias correction and downscaling of the precipitation forecast from GEFS have been made progress and presented in the previous meeting.

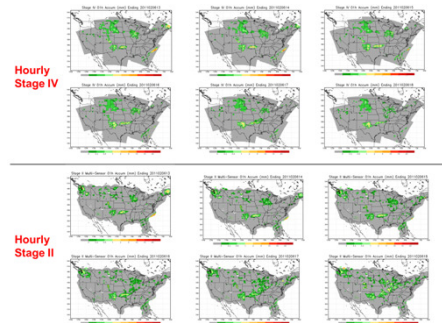
In addition to the existing 6-hourly accumulated analysis, CCPA product has been extended to include 3-hourly accumulations in recent upgrade. In response to a need for higher temporal resolution precipitation analysis for use in short range forecast calibration and verification, 3-hourly analysis has been developed and successfully implemented within the CCPA production package since July 2011. CCPA 3-hourly accumulated precipitation analysis is produced by splitting each 6-hourly accumulated precipitation analysis based on a proportion calculated from hourly Stage II (over the Northwest River Forecast Center) or Stage IV (all other CONUS River Forecast Centers) estimation at each HRAP grid cell. It is then interpolated/extrapolated to the other grids. The CCPA 3-hourly analysis covers the same domain as the CCPA 6-hourly analysis and is available for the same five grids. Its long term historical archive will be generated in the future.

OBJECTIVE

- To generate 3-hourly precipitation analysis over the CONUS domain, in addition to the existing 6-hourly products.

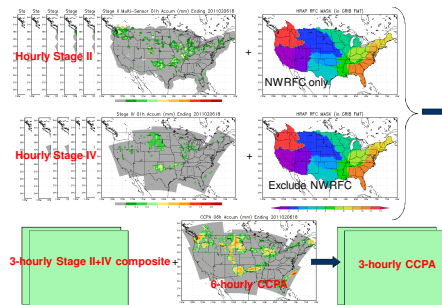
DATA BACKGROUND

- Datasets employed to derive 3-hourly CCPA:
 - Hourly Stage II&IV
 - 6-hourly CCPA
- Data spatial coverage, quality, format, etc:
 - No hourly Stage IV data in NWRFC
 - Better data quality in Stage IV than Stage II
 - Same HRAP grid and format as 6-hourly CCPA



APPROACH

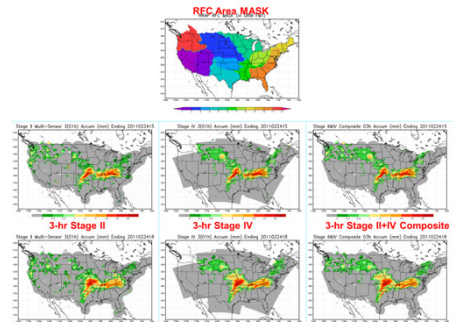
- Based on 6-hourly CCPA and hourly data from Stage II and Stage IV.
- Use hourly Stage II and Stage IV data as weights to temporally disaggregate 6-hourly CCPA.



METHOD

Steps to compute 3-hourly composite:

- Sum the three hours of hourly into 3-hourly for Stage II&IV, respectively.
- Take 3-hourly Stage II precipitation only including NWRFC using RFC area mask.
- Take 3-hourly Stage IV precipitation over CONUS excluding NWRFC using RFC area mask.
- Combine results from 2&3 to obtain 3-hourly Stage II+IV Composite (3hr-STCOMP).



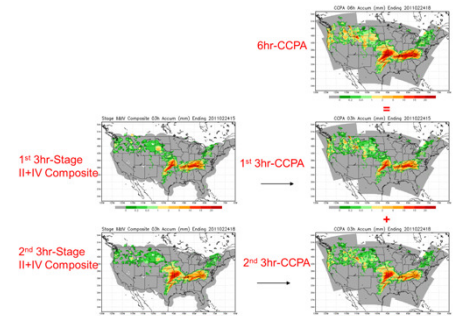
Calculation of 3-hourly CCPA:

$$3hr\text{-CCPA}_i = 6hr\text{-CCPA} \times \text{Weight}_i, i=1,2$$

Where $3hr\text{-STCOMP}_1 \neq 0$,

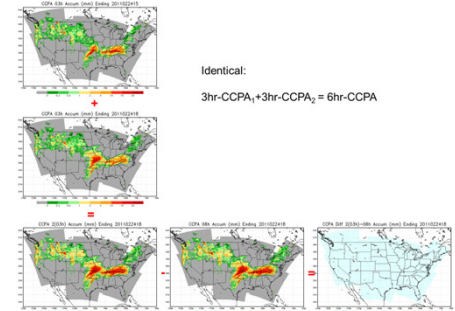
$$\text{Weight}_1 = \frac{3hr\text{-STCOMP}_1}{3hr\text{-STCOMP}_1 + 3hr\text{-STCOMP}_2}$$

Where both $3hr\text{-STCOMP}_1 = 0$, and $6hr\text{-CCPA} \neq 0$,
 $\text{Weight}_1 = 0.5$



RESULTS

Verifying 3-hourly CCPA w.r.t. 6-hourly CCPA:



Identical:
3hr-CCPA₁ + 3hr-CCPA₂ = 6hr-CCPA

SUMMARY

- Currently 3-hourly CCPA is generated by deriving 3-hourly disaggregation weights from hourly Stage II and Stage IV data to split a 6-hourly CCPA field into two 3-hourly CCPA.
- Using this technique, for the common accumulation period, a summation of two successive 3-hourly CCPA can exactly reproduce the corresponding 6-hourly CCPA.

In the Future:

- Expectation of full CONUS coverage in hourly Stage IV
 - Request NWRFC to provide hourly Stage IV
 - Greatly simplify the deriving procedure for 3-hourly CCPA
- Filling data gap: CMORPH data will be used when both hourly Stage II and Stage IV data are unavailable.

REFERENCES and CONTACT INFO

- Product
 - Real-time data
<ftp://ftp.prd.ncep.noaa.gov/pub/data/nccf/com/gens/prod/>
 - Real-time image
<http://www.emc.ncep.noaa.gov/gmb/yluo/CCPA.html>
 - Historical data
ftp://ftp.emc.ncep.noaa.gov/gc_wmb/yluo/CCPA_v0/
- Reference
 - Manuscript
http://www.emc.ncep.noaa.gov/gmb/yzhu/qif/pub/Manuscript_CCPA_20101216-1.pdf
- Contact information: Yan.Luo@noaa.gov