

# Data Impacts on QPF Verification: A Comparison of the CCPA with StageIV for Heavy Precipitation Events in the HMT-West

Edward Tollerud<sup>1,3</sup>, John Halley Gotway<sup>2,3</sup>, Tressa Fowler<sup>2,3</sup>, Tara Jensen<sup>2,3</sup>, and Barbara Brown<sup>2,3</sup>

<sup>1</sup>Cooperative Institute for Research in the Atmosphere, Fort Collins, CO

<sup>2</sup>National Center for Atmospheric Research, Boulder, CO

<sup>3</sup>Developmental Testbed Center, Boulder, CO

## 1. Introduction

NCEP/EMC in collaboration with CPC has recently developed a new QPE product called the Climate Corrected Precipitation Analysis (CCPA; Hou *et al.*, 2012). The motivation for the CCPA was to design a QPE product at a finer scale than the available CPC gage analysis that retained the statistical properties of the original CPC analysis. Since this new product is significantly based on the existing Stage IV product, the question is raised: is it a suitable replacement for Stage IV that can be used for weather-related operational verification? For the HMT-West verification project, which has used Stage IV as one of its verification datasets for its winter exercise verification studies, the issue is one of year-to-year consistency as well as one of potential value added by the CCPA. Hou *et al.* (2012) address differences between the CCPA and Stage IV using full-CONUS accumulated precipitation, concluding that the CCPA under-estimates the heavier precipitation totals. For the present evaluation, we have concentrated on 6h totals and on the smaller HMT forecast domain in California during several heavy rain episodes during the winters of 2009-10 and 2010-11. The primary emphasis here reflects an objective of the HMT winter exercises in California, which was to evaluate the impact of the choice of QPE analyses on model verification scores during episodes of heavy and extreme precipitation.

## 2. Results

Fig. 1 shows a direct comparison between the two analyses as given by a verification score (frequency bias) that here uses Stage IV as the verification ‘observation set’ and the CCPA as the verification ‘target’ (more typically a numerical forecast). Scores are computed over the HMT domain during winters between 2005 and 2011, and for 6h values of both Stage IV and CCPA. It is clear from the figure that the CCPA (relative to the Stage IV) very slightly over-forecasts at the smallest thresholds, but significantly under-forecasts the larger amounts, a finding consistent with that of Hou *et al.* (2012). For actual model verification (now for heavy rainfall episodes during 2009-2011, also within the HMT domain), Fig. 2 illustrates the impact of using the CCPA and the Stage IV as verification analyses for model predictions. At the heavier rainfall thresholds in particular, scores of the GSS are consistently better when the QPE estimates used are those produced by Stage IV, whereas for frequency bias the CCPA produce better scores. A likely source for these differences is the apparent under-estimate (and smoothing out) of heavier precipitation events by the CCPA suggested by Fig. 1. Based on these findings, we suggest careful reliance on verification studies for heavy precipitation that compare or combine results from these two analyses.

## References

Hou, D., M. Charles, Y. Luo, Z. Toth, Y. Zhu, R. Krzysztofowicz, Y. Lin, P. Xie, D.-J. Seo, M. Pena, and B. Cui, 2012: Climatology-Calibrated Precipitation Analysis at Fine Scales: Statistical Adjustment of Stage IV towards CPC Gauge Based Analysis. *J. Hydrometeor.* doi:10.1175/JHM-D-11-0140.1, in press.

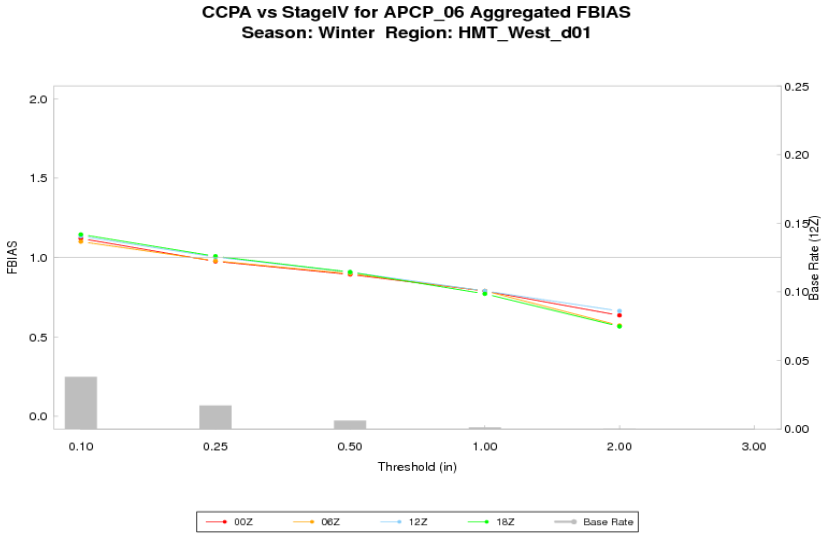


Fig. 1. Frequency bias for the CCPA relative to the Stage IV over the HMT domain for winters between 2005 and 2011 at several thresholds and 4 model valid times.

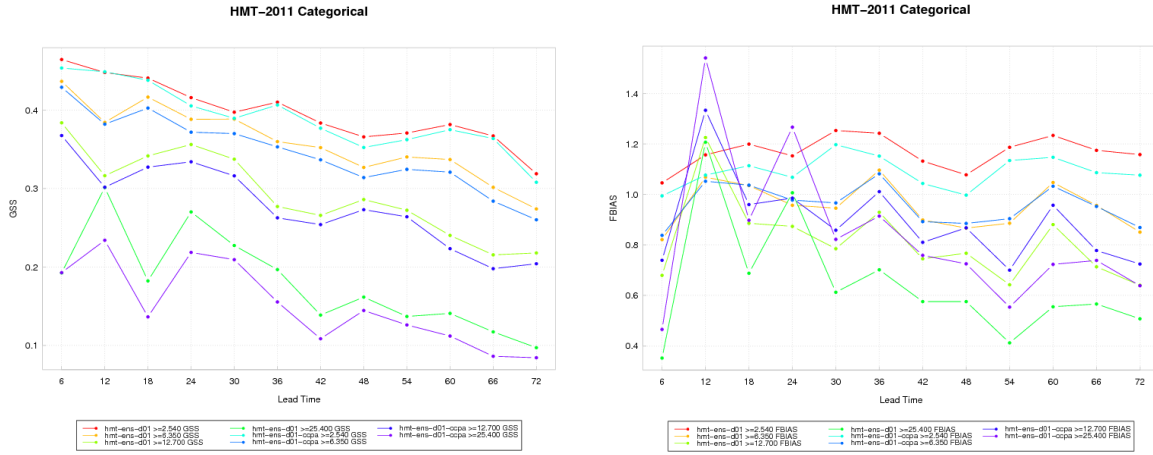


Fig. 2. Comparison of Stage IV- based and CCPA-based Gilbert skill scores (or equitable threat scores, left panel; larger values better) and frequency bias (right panel; values near 1 better) over the HMT domain for all ensemble mean forecasts at lead times and precipitation thresholds as shown. Line colors to be paired can be determined from the legends; generally, blue colors are CCPA-based and others are Stage IV-based.