Precipitation Verification Report for 2024-07-23 00:00

TAOS^{tm} Real Time Operations System
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Abstract

TAOS^{tm} WX Global Analysis system precipitation verification report for 2024-07-23 run using gfs-daysum TAOS Version 25.01-ROCKY9-GCC11:2024-192-1225, based on the following data sets:
GFS Forecast: Tue Jul 23 03:34:53 UTC 2024
GFS Hindcast: Tue Jul 23 21:38:35 UTC 2024
NASA GPM L3: Wed Jul 24 14:30:22 UTC 2024
744 GSOD stations were used in the analysis.

Report generated Fri Jul 26 05:39:53 UTC 2024 on cortex2.

List of Tables

1.1 Verification Scores for 2024-07-23 3

2.1 Average scores over last 30 days 5

List of Figures

1.1 Precipitation CSI Summary 4
2.1 Precipitation CSI 30 Day Trends 6

Chapter 1

Verification Summary for 2024-07-23

The verification report for 2024-07-23 is based on 5149 stations, of which 744 reported precipitation.

Table 1.1: Verification Scores for 2024-07-23

technique	*csi*	*bias*
Hindcast	.302	.888
Day 1 Forecast	.304	.891
Satellite	.335	.421

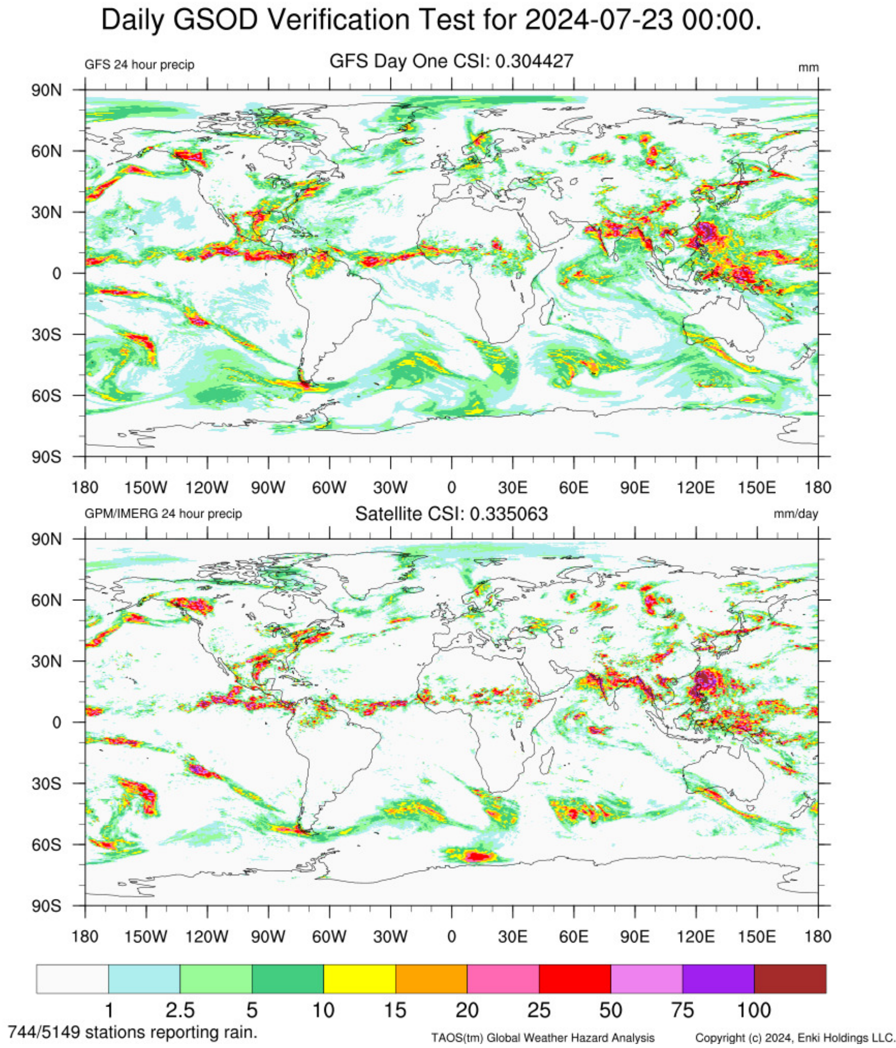

Figure 1.1: Precipitation CSI Summary

Chapter 2

Thirty Day Verification Trends

Here the trend in critical success index (CSI) over the last 30 days is shown comparing the three techniques (Hindcast, Day 1 Forecast, and Satellite) with the NOAA Global Summary Of the Day (GSOD) rain gauge data set.

Table 2.1: Average scores over last 30 days

technique	*csi*	*bias*
Hindcast	.350	.596
Day 1 Forecast	.304	.891
Satellite	.335	.421

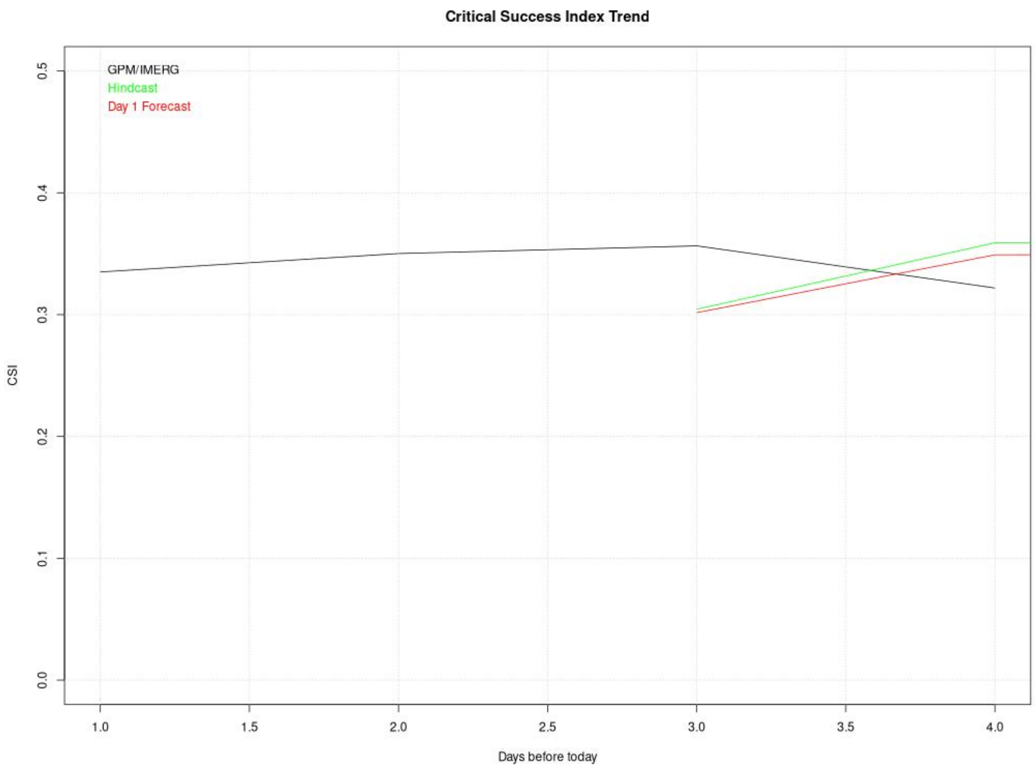

Figure 2.1: Precipitation CSI 30 Day Trends

Chapter 3

Technical Notes

The TAOS^{tm} WX Global Analysis (TAOS/WX) is part of the TAOS^{tm} storm hazard modeling system. TAOS/WX ingests global or regional weather models and, using the same graphical processing systems, statistical methodologies, exposure, and damage models as the tropical cyclone (TAOS/TC) and earthquake (TAOS/EQ) packages, generates estimates of weather hazards and the economic impact of weather hazards on those exposures.

3.1 Input Meteorological Data Processing

This chapter describes the Beta version 1.0 of TAOS/WX, which is a hindcast and five day forecast using the US National Center for Environmental Prediction Global Forecast System (GFS) as the source of raw meteorological data. This data is processed in to standard TAOS^{tm} format NetCDF files for further processing by the TAOS^{tm} graphical and analytical tools.

3.1.1 Forecasts

Each day at 08z (5am EDT) the outputs of the primary 00Z GFS run are downloaded from NCEP using either the NOMADS or NOAA telecomunications gateway servers. The raw data sets in GRIB2 format are processed and converted in to NetCDF format for compatibility with TAOS^{tm} standard tools as well as for more efficient downstream processing and storage. The GFS data are processed by a streamlined version of the TAOS/TC model to generate exposure grid level wind, wave, storm surge, rain, and inland flood products. These are then available for graphics generation or analysis by the exposure and damange processing system.

3.1.2 Hindcast

Along with the 00z forecast run, the data acqusition system fetches the simulations used by NCEP to "bootstrap" each GFS run and prepare for the next simulation. These are effectively 6 hour hindcasts, which are integrated to form hourly snapshots and maxima of the previous day. As with the forecast outputs, the GFS data are processed by a streamlined version of the TAOS/TC model to generate exposure grid level wind, wave, storm surge, rain, and inland flood products. These are then available for statistical analysis, graphics generation, or analysis by the exposure and damage processing system.

3.2 Real Time Precipitation Sources

Various precipitation sources are available for analysis. The first is the day 1 forecast. This is the forecast made at 00z GFS run for the current day. The second is the hindcast, created from the initialization runs as noted above. The third is the NASA Global Precipitation Mission (GPM) Level 3 Late (IMERG) data set. It is called "late" because it is the last real time integration, delayed to include data downloaded by low earth orbiting satellites after then pass over ground stations the next day. Note that the GPM/IMERG data is considered to be a model rather than a direct observation, since it is a rainfall estimate based on various algorithms using microwave radar data and InfraRed satellite data to compute rainfall.

The verification of these modeling methods is in comparison to rain guage reports and tabulated in the US National Weather Service "Global Summary Of the Day" or GSOD data set. This data set is updated daily, although it typically takes several days to fully update as it takes time for all of the station reports to be compiled. The GSOD data set typically contains over five thousand reports per day.

3.3 Critical Success Index (CSI)

Also called the threat score (TS), the Critical Success Indes is a verification measure of categorical forecast performance equal to the total number of correct event forecasts (hits) divided by the total number of storm forecasts plus the number of misses (hits + false alarms + misses). The CSI is not affected by the number of non-event forecasts that verify (correct rejections). However, the CSI is a biased score (in the sense biased against a favorable score) that is dependent upon the frequency of the event. The CSI calculation based on a 2x2 contengency table, mathematically the CSI = (A)/(A+B+C), where:
A is the number of event forecasts that correspond to event observations, or the number of hits;
B is the number of event forecasts that do not correspond to observed events, or the number of false alarms;
C is the number of no-event forecasts corresponding to observed events, or the number of misses.

As a calculation of bias, the number of stations reporting precipitation is also used, such that bias = (B - C)/stations. A positive bias value indicates the technique is wet, a negative bias, dry.

For reference, note that historically the human forecasters at the US National Weather Service have a CSI for 1 inch or more of rain of about 0.35 to 0.40.