Comparing GPCP and IMERG in the broader North American monsoon region

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What is the North American Monsoon (NAM)?

- The NAM is characterized by changes in **atmospheric circulation** that bring moisture from the Gulf of Mexico, Gulf of California, and the Pacific[1, 3, 4]
- The peak monsoon season is from **June to September (JJAS)**[1, 3, 4]
- As our climate changes, we need to better understand precipitation patterns in regions affected by **extreme droughts and flooding**[3]
- Monthly precipitation for June-September (JJAS) 2001-2021 is from Global Precipitation Climatology Project (GPCP), available at a 2.5° resolution[5], and Global Precipitation Mission (GPM) Integrated Multi-SatellitE Retrievals for GPM (IMERG) Version 7 Final Run, available at a 0.1° resolution[6]
- Daily Precipitation for JJAS 2001-2021 is from GPCP, at a 1° resolution[7], and IMERG, at a 0.1° resolution
- GPCP 1° Daily Precipitation was resampled to monthly by taking the monthly mean, resulting in three precipitation products
- **Does IMERG capture NAM precipitation better than GPCP?**

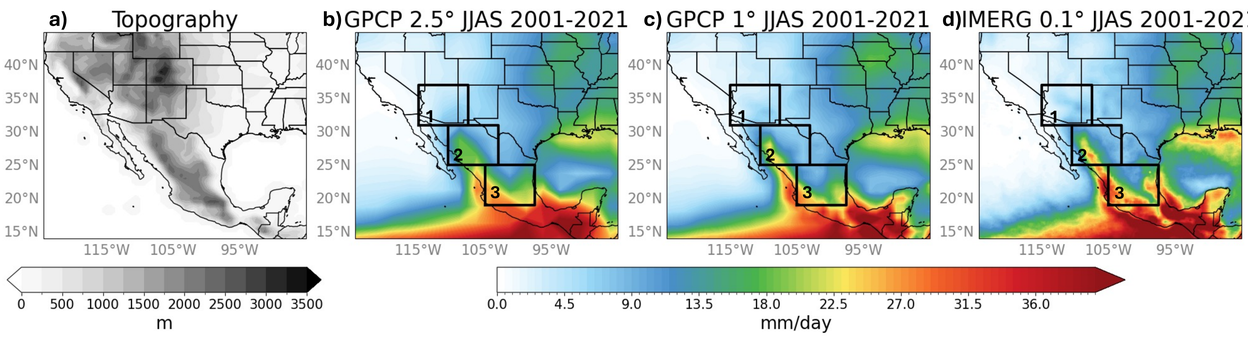


Fig 1 a) Topographical map of the South–Western U.S. and Mexico. Average JJAS precipitation from 2001-2021 from b) GPCP Monthly 2.5° resolution, c) GPCP 1° resolution Daily resampled to monthly, and d) GPM IMERG Monthly 0.1° resolution. Black boxes labeled 1, 2, and 3 represent the three regions of focus – Arizona New Mexico (AZNM), North-Western Mexico (NWM), and South-Western Mexico (SWM), respectively.

Methods

- We explore the NAM in **three precipitation products** over a 20-year period 2001-2021
- Calculated mean JJAS precipitation for three regions AZNM (115°-107.5°W, 31-37°N), NWM (110.5°-103°W, 25°-31°N), and SWM (105°-97.5°W, 19°-25°N) for each product
- Calculated mean monthly precipitation for three regions for each precipitation product
- Calculated number of extreme events using 90th percentile for daily data (GPCP 1° and IMERG 0.1°)[2]
- Calculated Niño 3.4 Index

References & Acknowledgements

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[7] Adler et al (2017): Global Precipitation Climatology Project (GPCP) Climate Data Record (CDR), Version 1.3 (Daily). NOAA National Centers for Environmental Information. doi:10.7289/V5RX998Z, 1 July 2024.
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Results

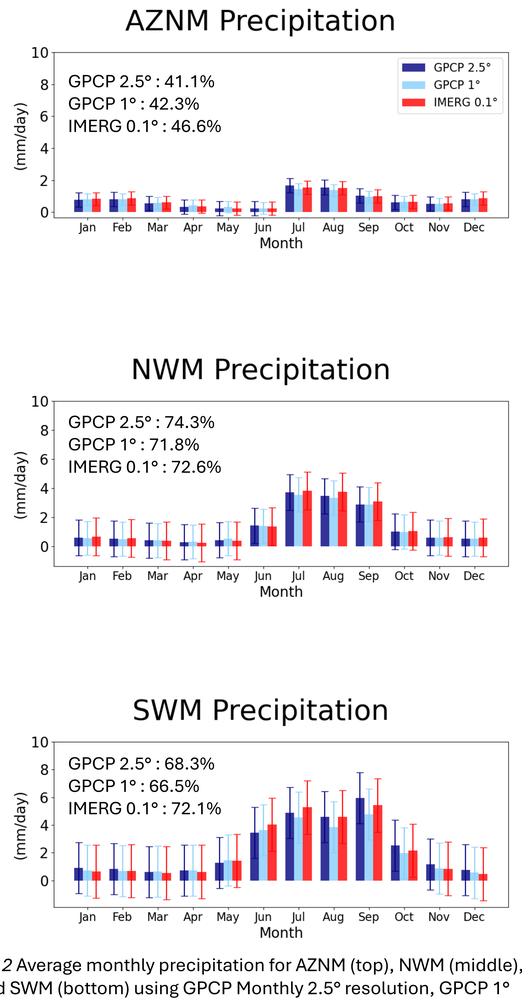


Fig 2 Average monthly precipitation for AZNM (top), NWM (middle), and SWM (bottom) using GPCP Monthly 2.5° resolution, GPCP 1° resolution Daily resampled to monthly, and IMERG Monthly 0.1° resolution. Percentages in top left represent amount of annual rainfall that occurs during JJAS for each precipitation product.

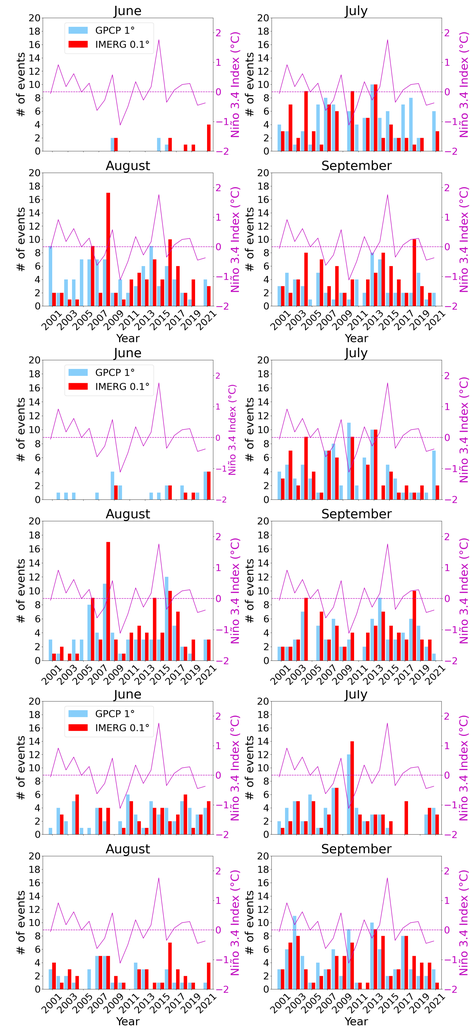


Fig 3 Number of extreme events for AZNM (top), NWM (middle), and SWM (bottom) using GPCP Daily 1° resolution and IMERG Daily 0.1° resolution compared to Niño 3.4 Index averaged over JJAS.

Conclusions

- IMERG generally shows higher rates of precipitation (*Fig 1, Fig 2*), with rates as high as 32 mm/day in SWM, and higher percentages of annual rainfall that occurs during JJAS.
- In AZNM, IMERG follows a threshold of 6.3 mm/day compared to GPCP's 3.0 mm/day for extreme events, meaning IMERG does a better job at capturing higher rates of precipitation than the other products
- We find no significant relationship between Niño 3.4 Index and the number of extreme events, which corroborates previous findings[1]

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