



# Online Intercomparison of Satellite-based Global Precipitation Products: Challenges, Progress and Future Directions



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**Introduction:** In recent years, satellite-based global precipitation products are widely used in hydrological and other applications. It is a common practice for users and algorithm developers to evaluate these products through several IPWG sponsored web sites, or with their own observational data to better understand product characteristics and performance in their regions of interest. Furthermore, a product can be upgraded after the algorithm is improved. Users would like to know the differences due to such change. Online intercomparison of precipitation products can provide: 1) a convenience for users to intercompare similar precipitation products because downloading data and software are often not needed and results can be available after few mouse clicks; 2) customized analysis in their regions of interest; 3) customized data download for further analysis; etc. In this presentation, challenges, progress and future directions of online intercomparison of satellite-based precipitation products are presented, based on the ongoing effort to integrate the IPWG intercomparison algorithms into Giovanni (Geospatial Interactive Online Visualization AND aNalysis Infrastructure) TOVAS (TRMM Online Visualization and Analysis System) at the NASA Goddard Earth Sciences Data and Information Services Center (GES DISC).

## Challenges:

- Obtain customized precipitation product information in user defined area/point of interest around the world, through a web service
- Not just Level-3 gridded products. Co-located Level-2 products are equally important for comparison (different sensors, algorithms, etc.)
- Data volume, complex data structures, data formats, software, performance, etc.
- Facilitate ground and model verification activities by developing easy access methods and customized products

**Current Status:** Web services have been developed to assess TRMM Multi-satellite Precipitation Analysis (TMPA), TRMM monthly and other precipitation products:

- Near-Real-Time Monitoring Product (For research, use Archive Data)
- Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT): 3B42RT
- Daily Global and Regional Rainfall (3B42RT derived)
- TMPA-RT Intermediate IR Product: 3B41RT (VAR)
- TMPA-RT Intermediate Microwave Product: 3B40RT (HQ)

## Satellite Rainfall Archives

- Monthly Global Precipitation (GPCP)
- 3-hourly TRMM and Other Rainfall Estimate (3B42 V7)
- Daily TRMM and Other Rainfall Estimate (3B42 V7 derived)
- Monthly TRMM and Other Data Sources Rainfall Estimate (3B43, 3A12, 3A25 V7)

## Ground Observation Archives

- Monthly Willmott and Matsuura Global Precipitation (1950 - 1999)
- Monthly GPCC Rainfall (2007 - Present, Monitoring Product)

## Rainfall Product Intercomparison

- Inter-Comparison of Rainfall Climatology (non-java version)
- Beta Prototype: Inter-Comparison of TRMM L-3 V6 and V7 Monthly Products
- Beta Prototype: Inter-Comparison of 3-hourly Precipitation Products
- Beta Prototype: Inter-comparison of Daily Precipitation Products
- Beta Prototype: Inter-comparison of Rainfall Climatology

## Climatology

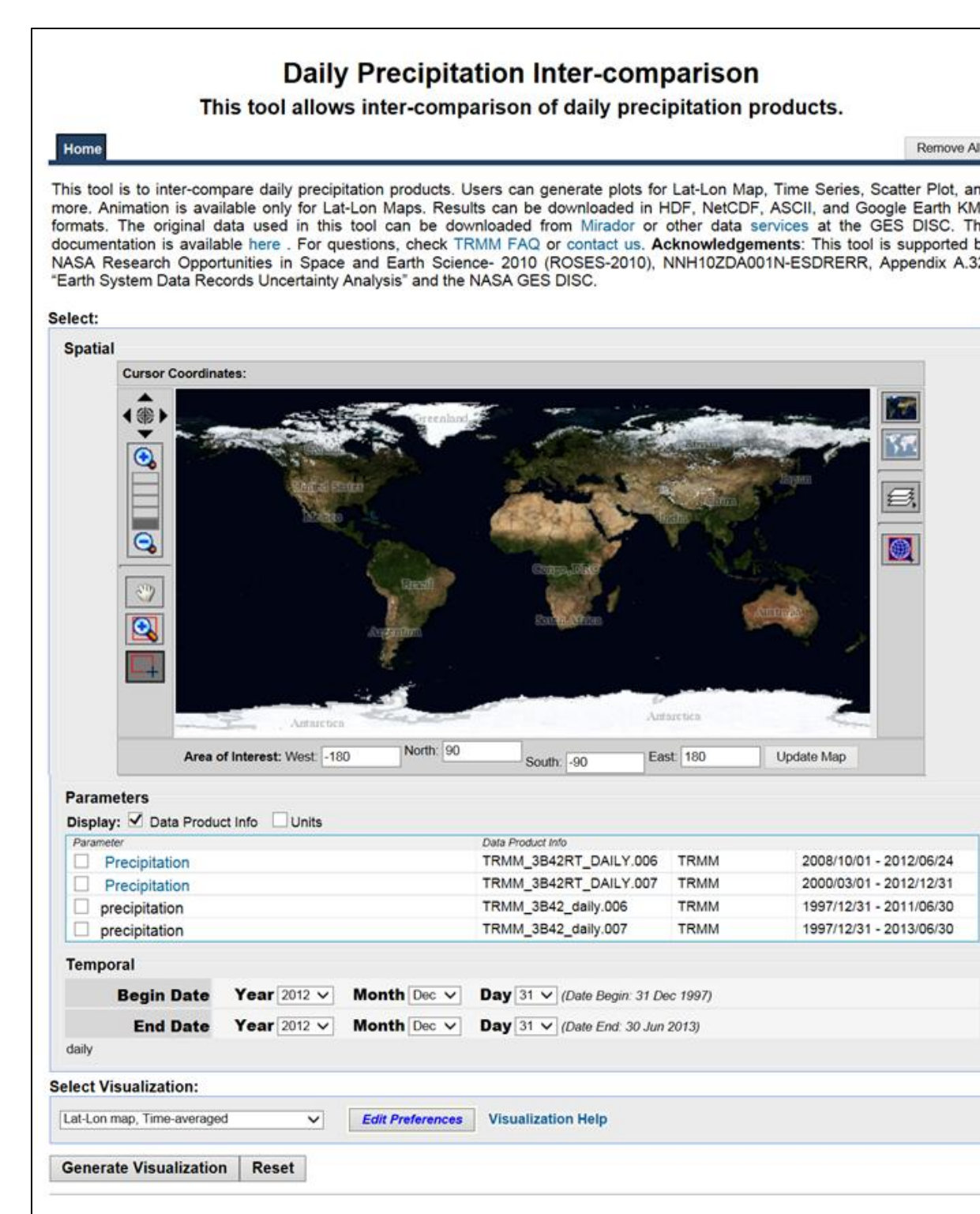
- TRMM Composite Climatology

**Reference:** Liu, Z., Ostrenga, D., Teng, W., Kempler, S., Milich, L., 2014, Developing GIOVANNI-based online prototypes to intercompare TRMM-related global gridded-precipitation products, Computers & Geosciences, volume 66, issue , year 2014, pp. 168 - 181

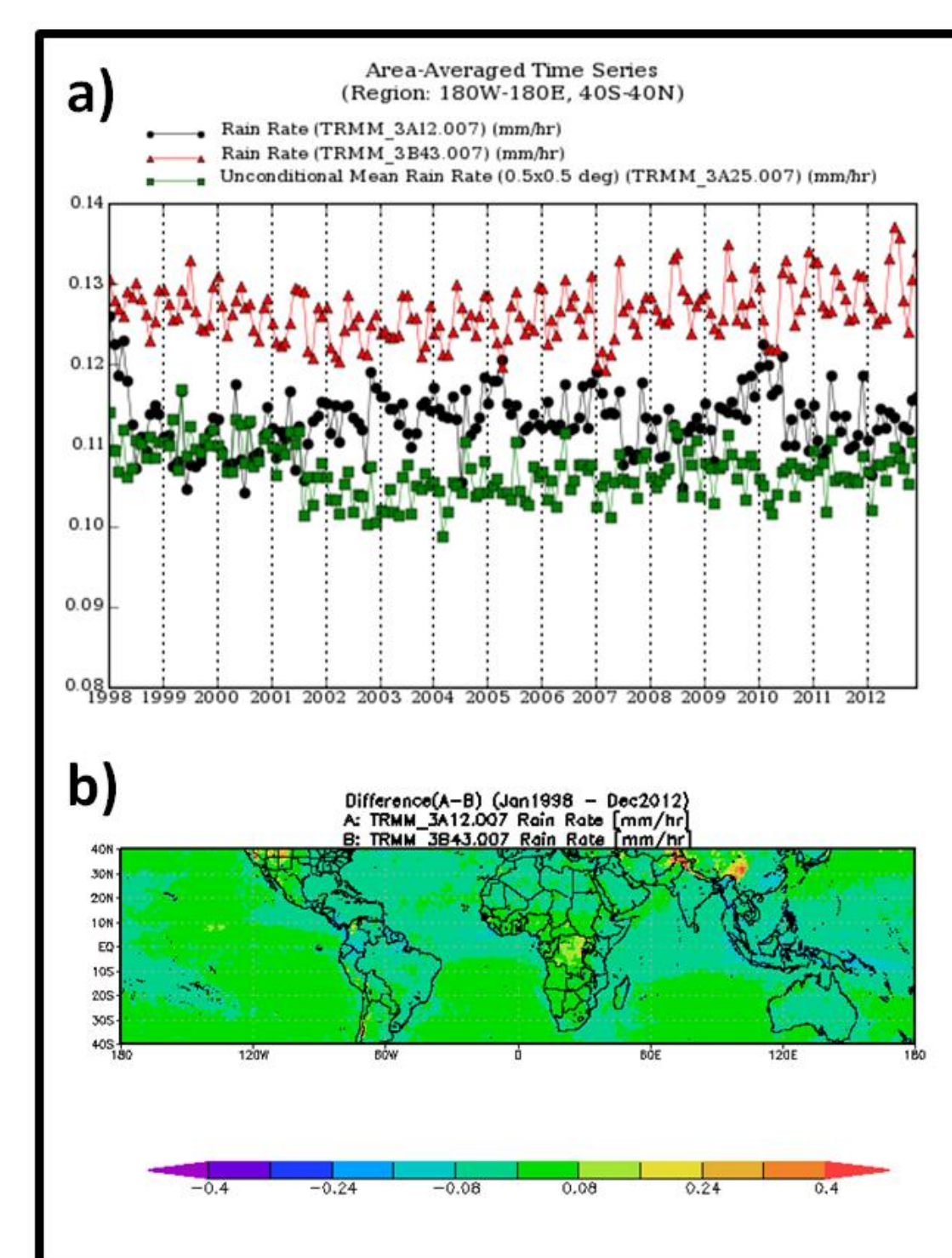
## Future Directions:

- GPM GPROF daily and monthly gridded products from different satellites
- IMERG (early, late, final) and TMPA comparison
- TRMM Level-2 product comparison (see the plot on the right)
- GPM Level-2 product comparison
- Facilitate ground verification by allowing station data upload for comparison
- Facilitate model verification (AIST pending)

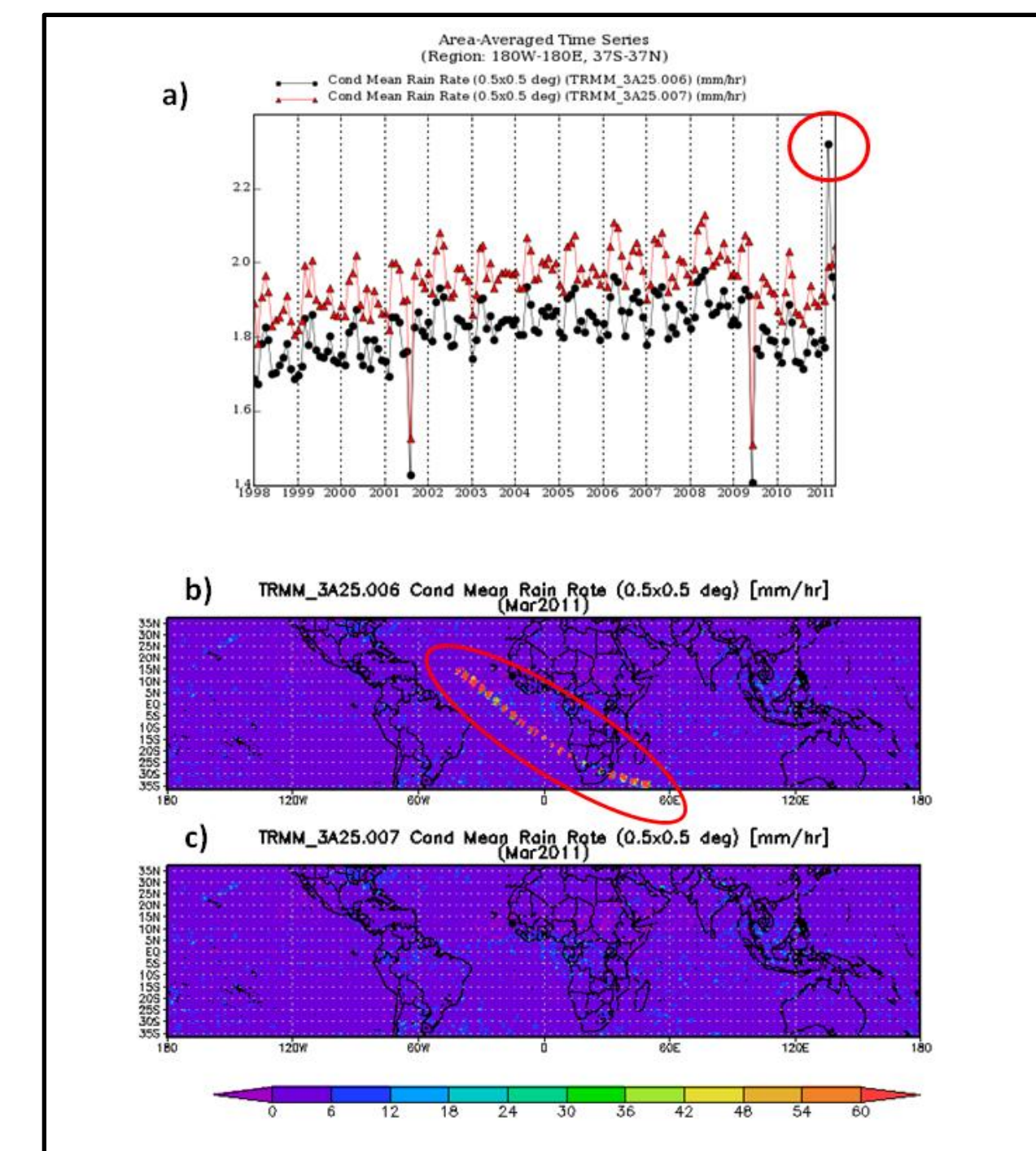
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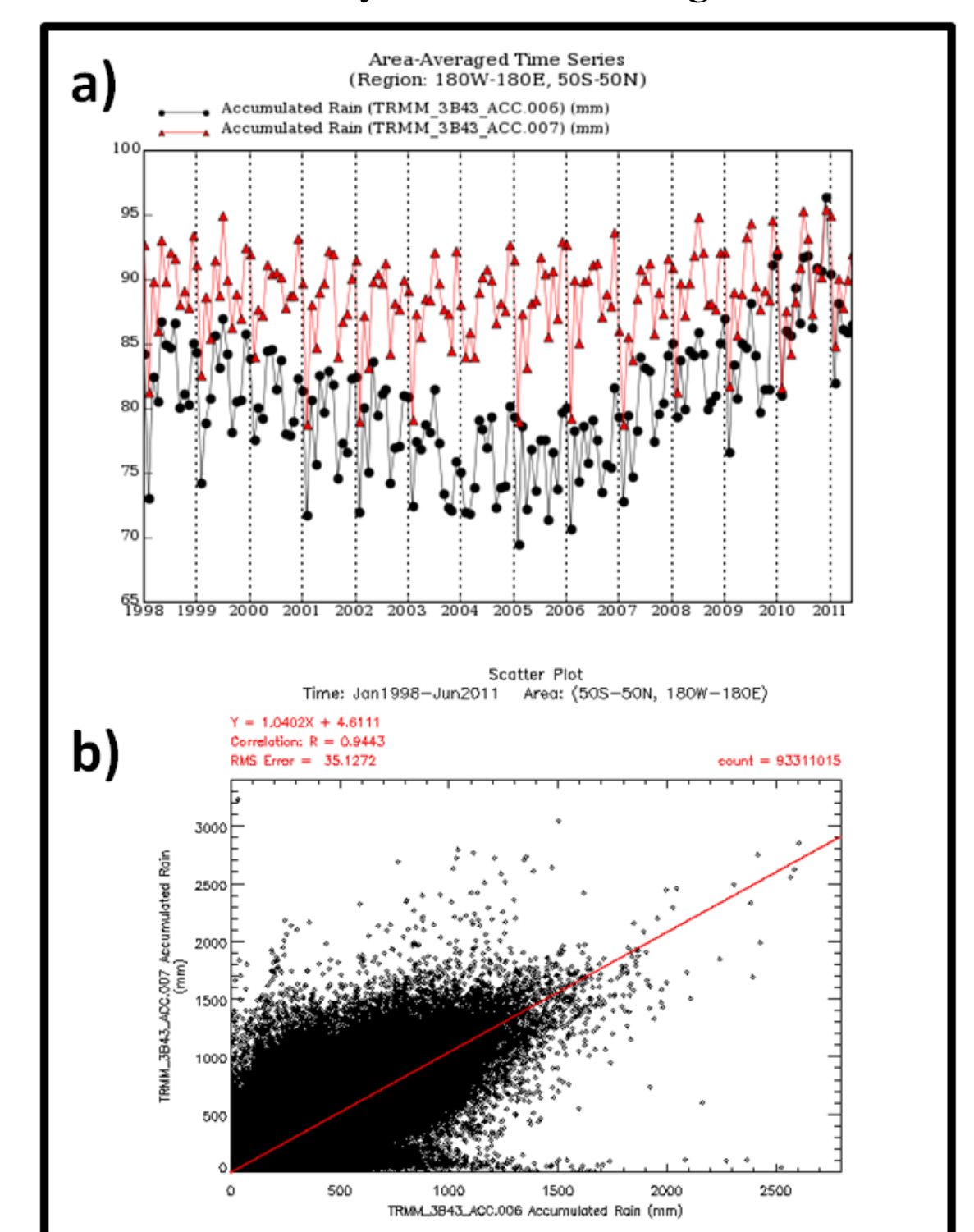
Screen shot of the homepage for the intercomparison of TRMM Version 6 and Version 7 TMPA 3B42 and 3B42RT daily precipitation products.



Time series of Version 7 TRMM 3A12, TMPA 3B43 and TRMM 3A25; b): Difference map between Version 7 TRMM 3A12 and TMPA 3B43.



a) Time series of Version 6 and Version 7 TRMM monthly PR derived precipitation (3A25) in mm/hr and the abnormal rain rate in March 2011 is circled in red; b) The abnormal precipitation values (circled in red) in Version 6; and c) The new Version 7 3A25 where the abnormal values in b) have been removed by the 3A25 algorithm.



a): Time series of Version 6 and Version 7 TMPA 3B43, averaged over the entire data domain; b): Scatter plot of both products.

