Evaluation of TRMM 3B42 Daily Estimates of Tropical Cyclone Rainfall

over the Pacific and Australia

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Related Papers

- Chen, Y., E. E. Ebert, K. J. E. Walsh, and N. E. Davidson (2013), Evaluation of TRMM 3B42 precipitation estimates of tropical cyclone rainfall using PACRAIN data, *J. Geophys. Res. Atmos.*, 118, 2184-2196, doi:10.1002/jgrd.50250.

- Chen, Y., E. E. Ebert, K. J. E. Walsh, N. E. Davidson (2013), Evaluation of TMPA 3B42 daily precipitation estimates of tropical cyclone rainfall over Australia, *J. Geophys. Res. Atmos.*, minor revision.

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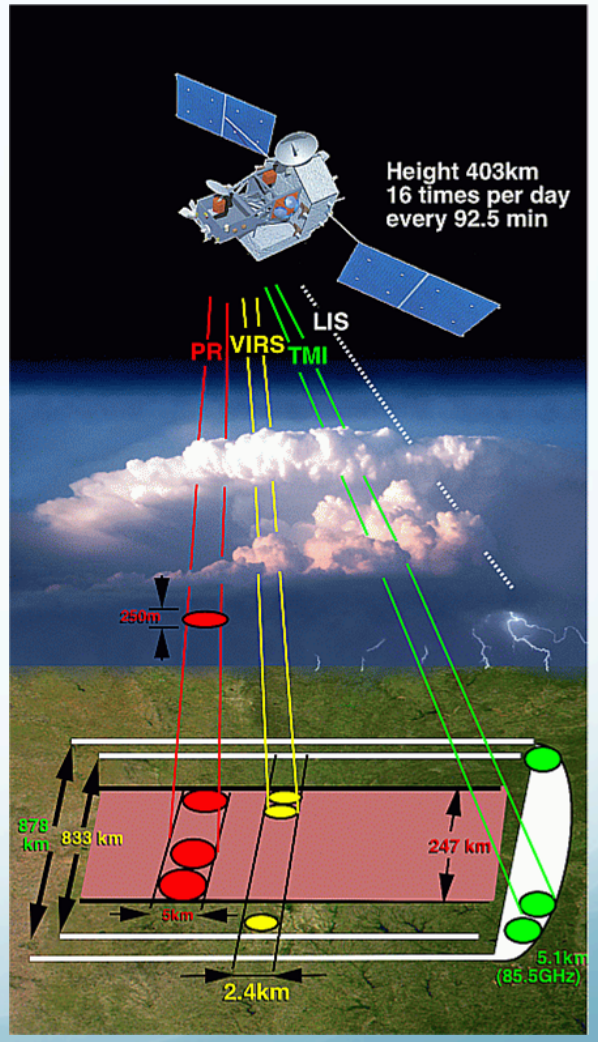
TRMM 3B42

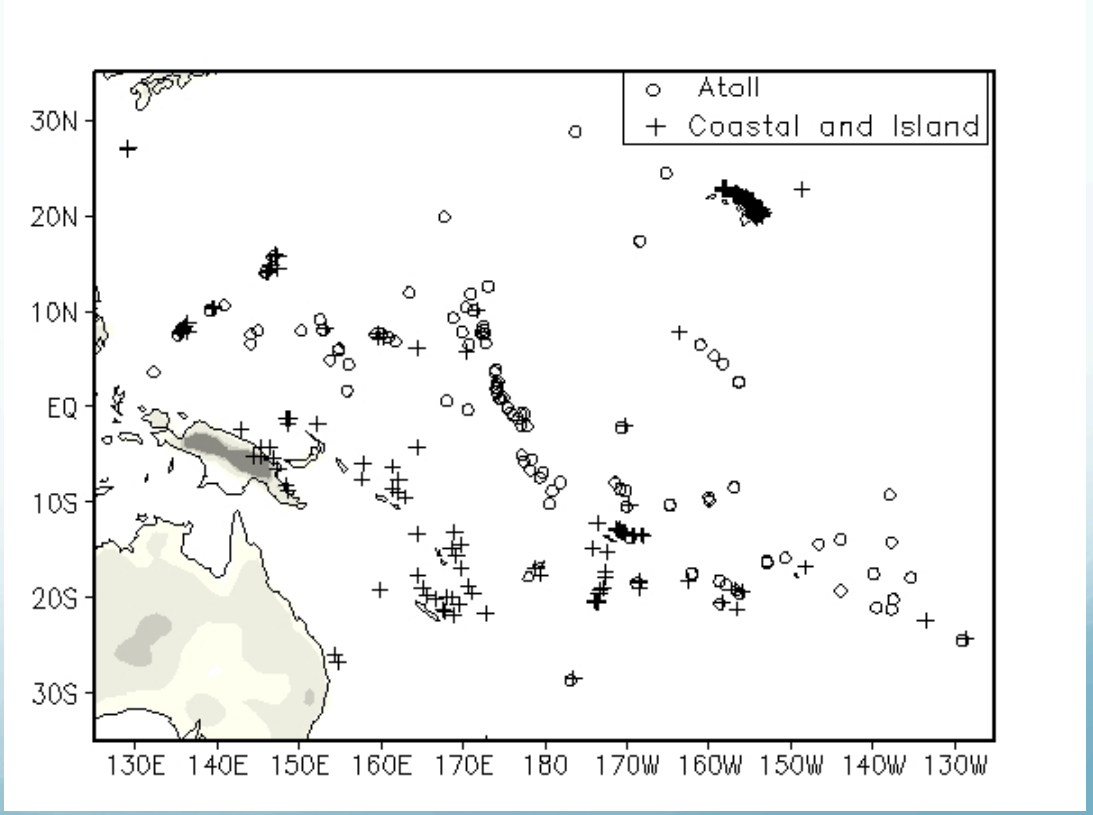
- The TRMM Multi-satellite Precipitation Analysis (TMPA) 3B42
- 3-hourly, 0.25°×0.25°
- From the Tropical Rainfall Measuring Mission (TRMM):
  PR — Precipitation Radar
  TMI — TRMM Microwave Imager
- Other passive microwave: SSM/I, SSMIS, AMSR-E, AMSU-B, MHS
- Infrared (IR)
- Global Precipitation Climatology Centre (GPCC) monthly rain gauge analyses



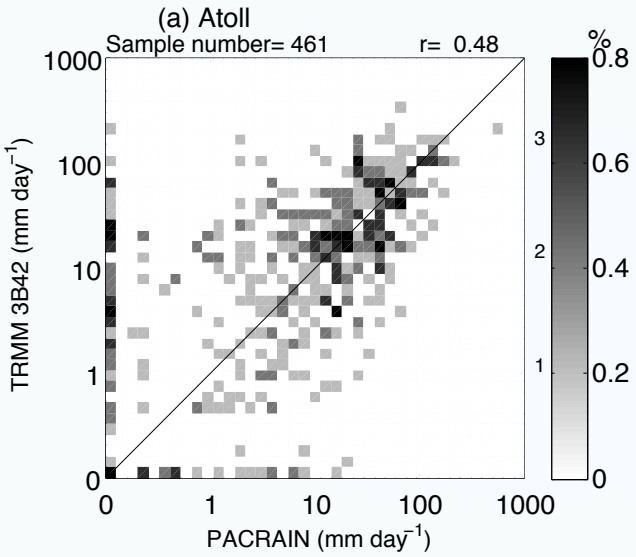
Over the Pacific

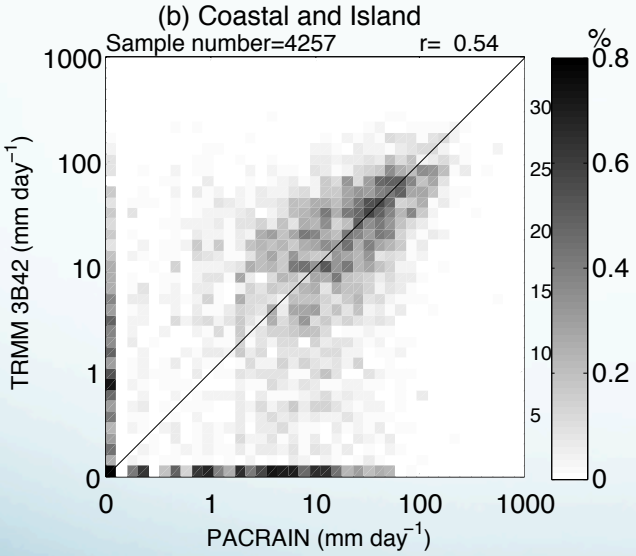
- The Comprehensive Pacific Rainfall Database (PACRAIN)

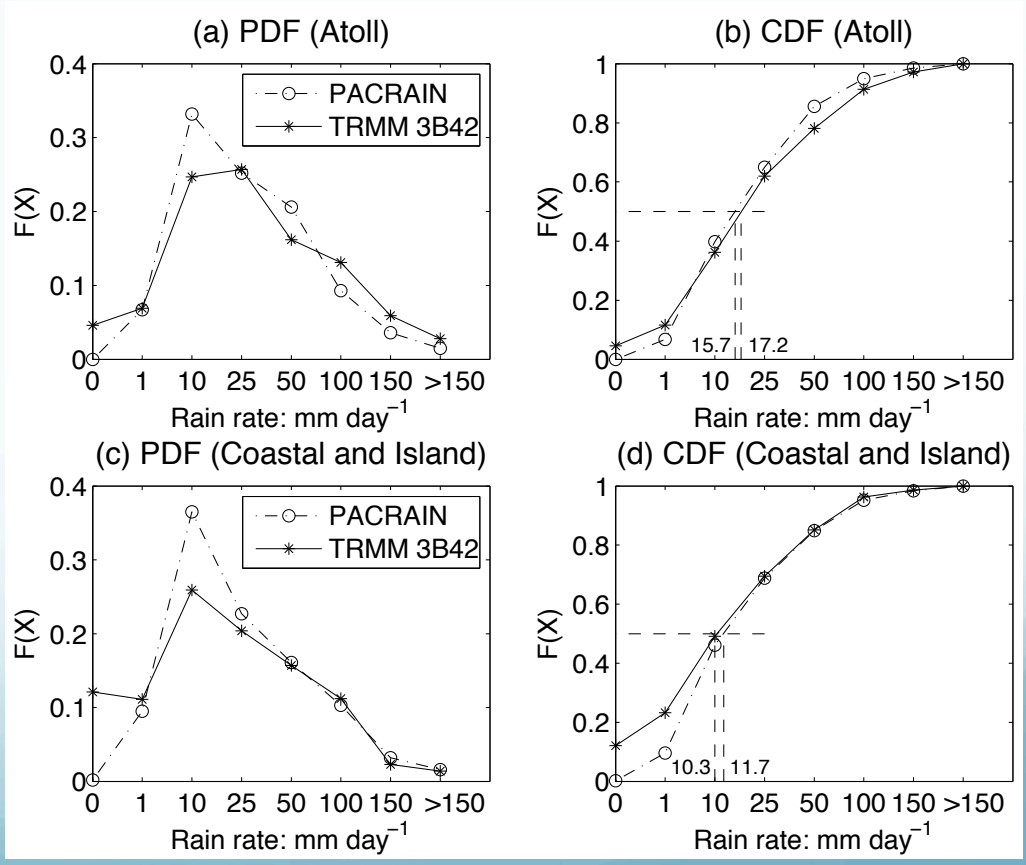
- Atoll
- Coastal and islands
- PACRAIN website
- http://pacrain.evac.ou.edu/



Scatter plots and probability distributions

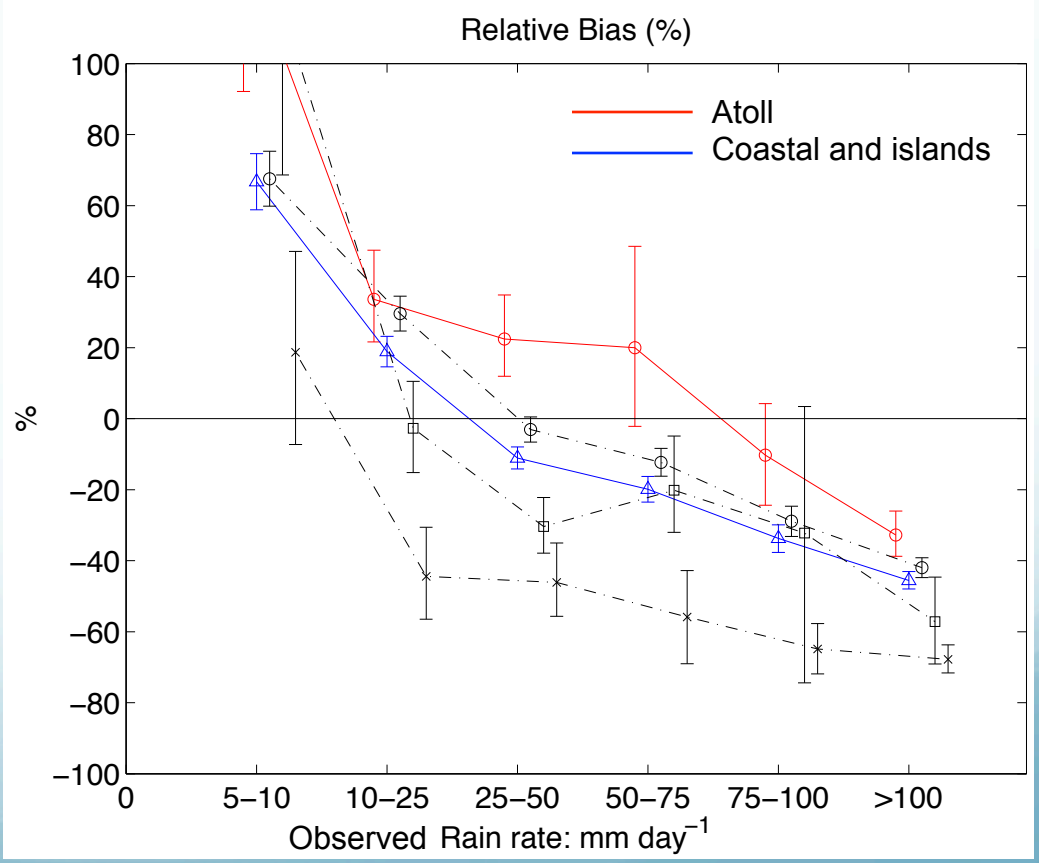




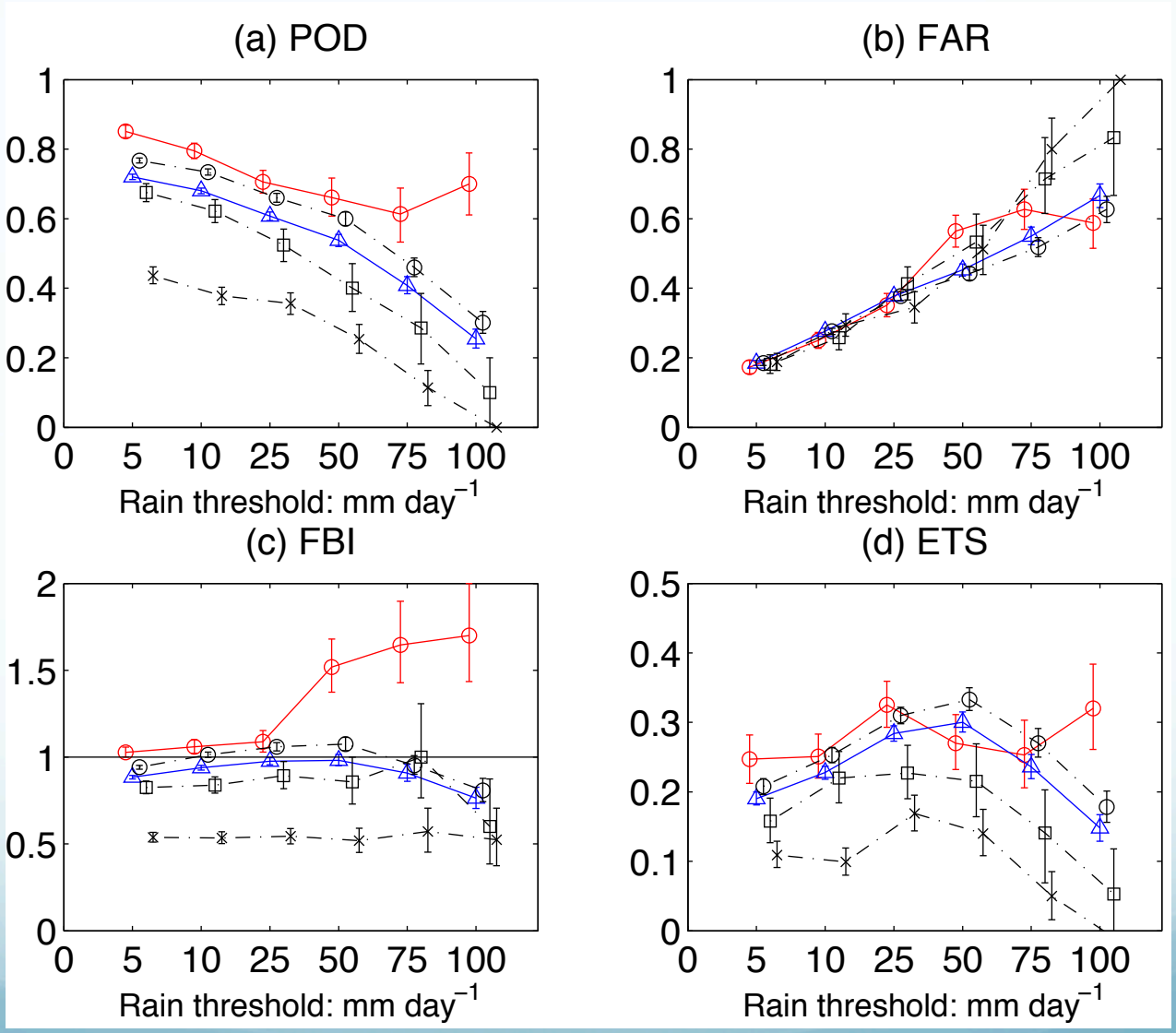


Relative bias

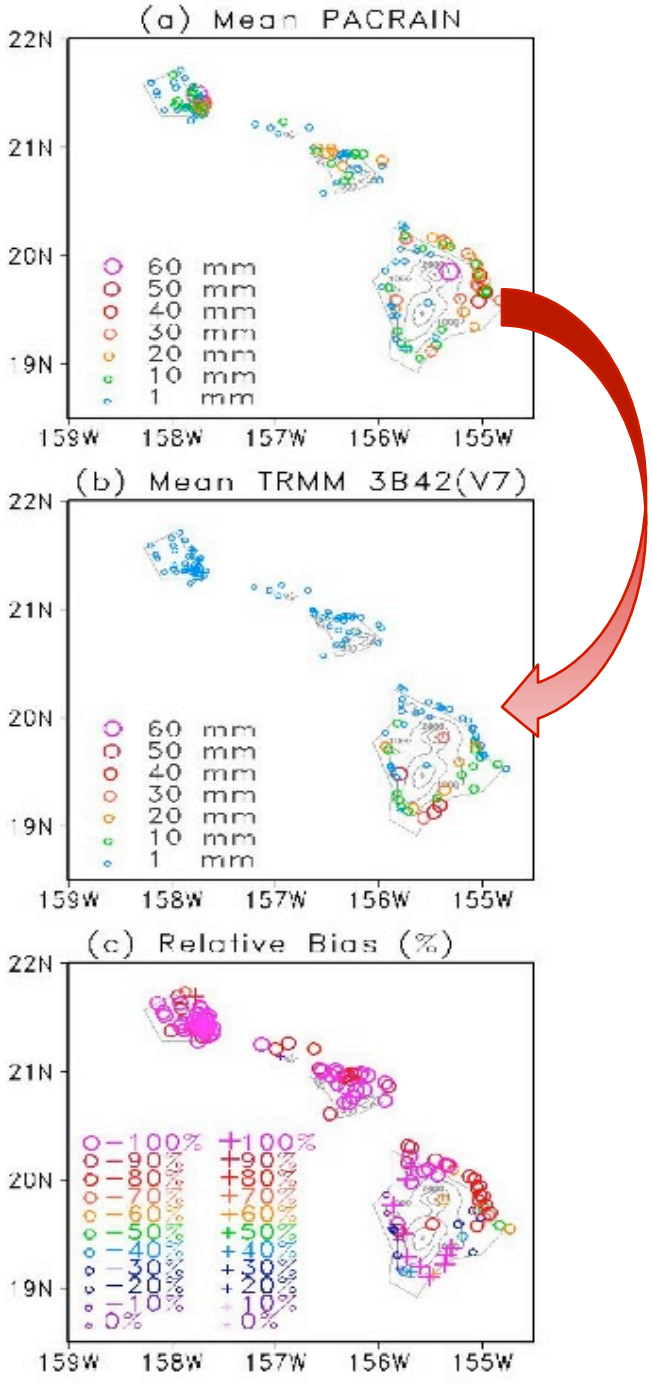
- Atoll (red) vs. Coastal and islands (blue)
- Coastal and islands sites were separated into three subgroups:
  - <100m (black circle)
  - 100-200m (black square)
  - >200m (black cross)



Skill scores



Hawaiian Islands: topographic influence

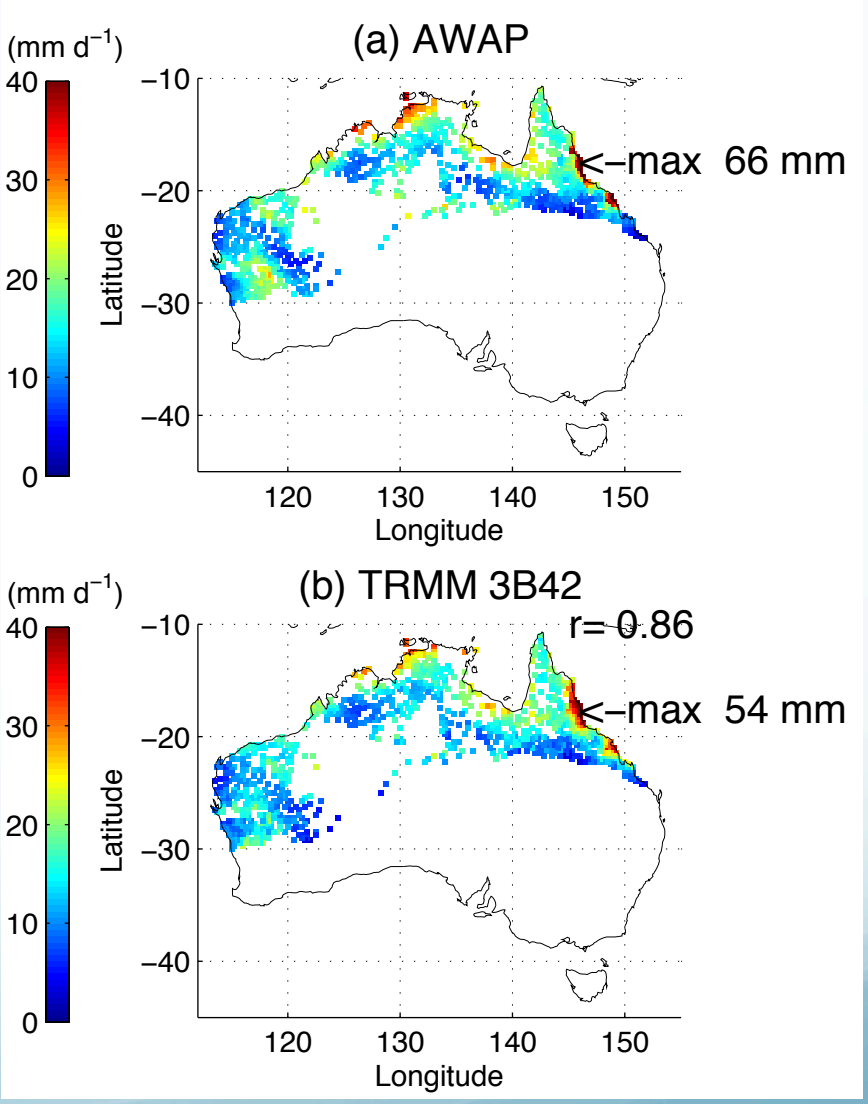


Summary 1: The Pacific

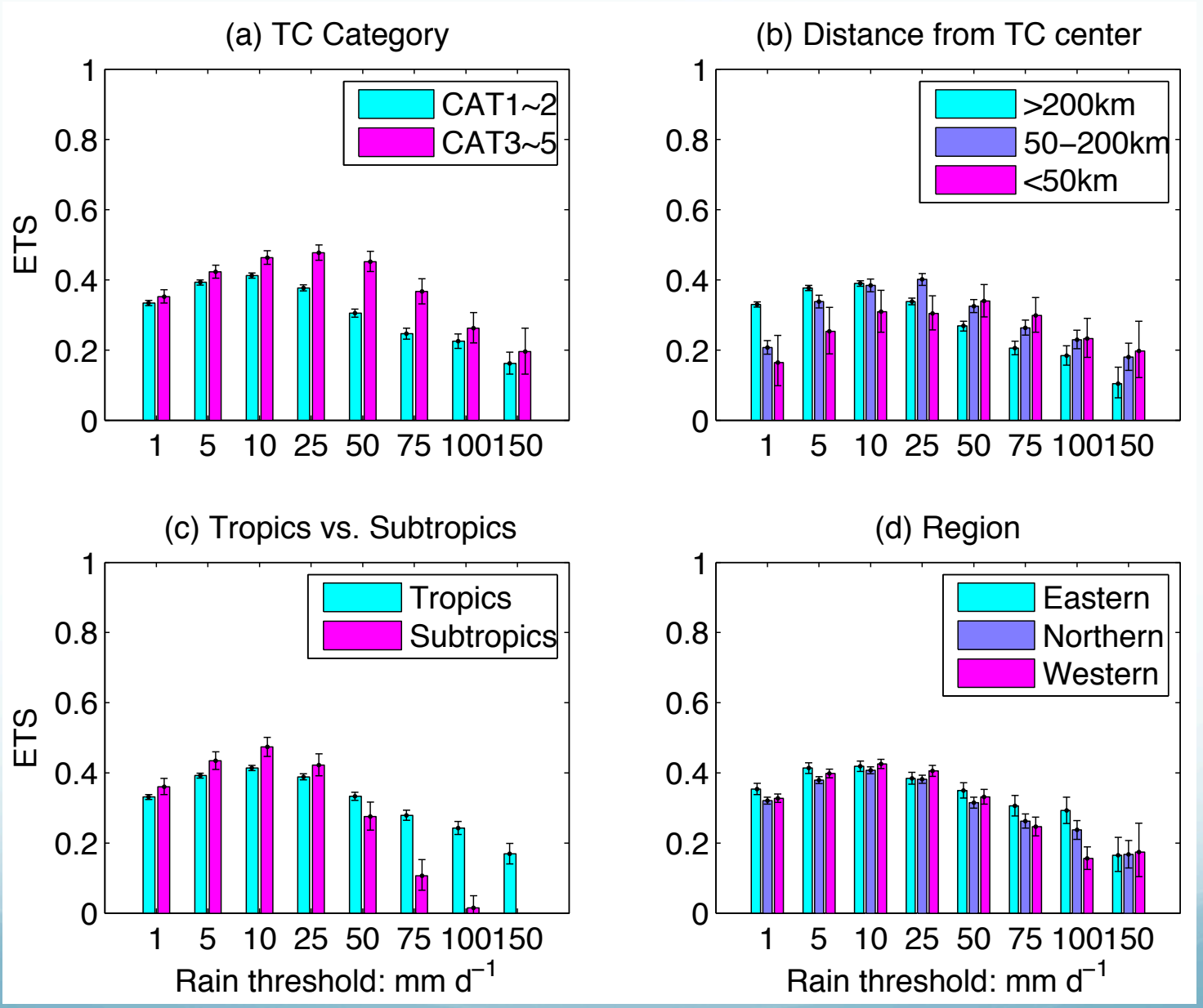
- TRMM 3B42 shows reasonable skills at detecting tropical cyclone rainfall
- Overestimates light rain / underestimates heavy rain
- Better performance on atolls (over ocean)
- Poorest performance on coastal and island sites with higher elevation
  - Not able to detect orographic enhancement
- Algorithm difference between ocean and land

TC rainfall over Australia

- The Australian Water Availability Project (AWAP)
- Good spatial correlation
- Underestimation of heavy rain



Under different TC conditions



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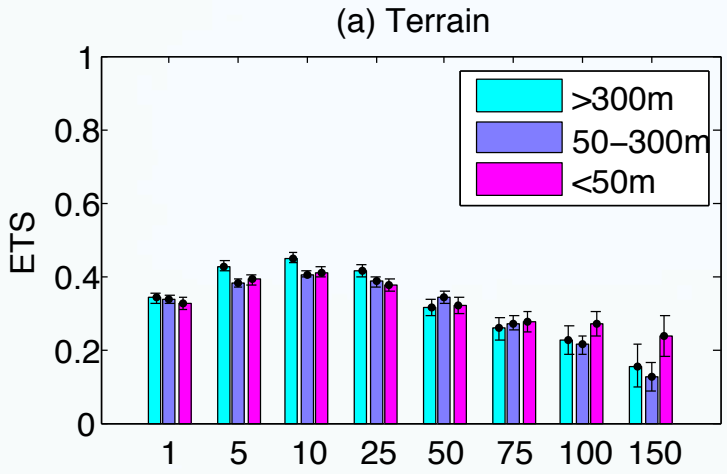
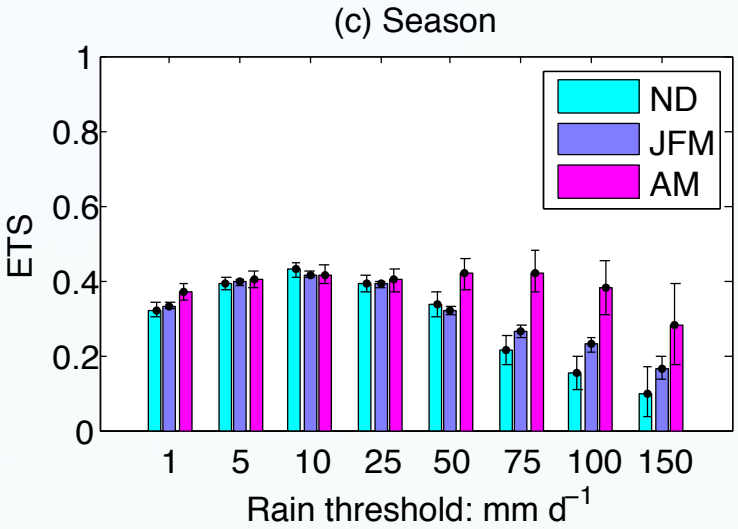
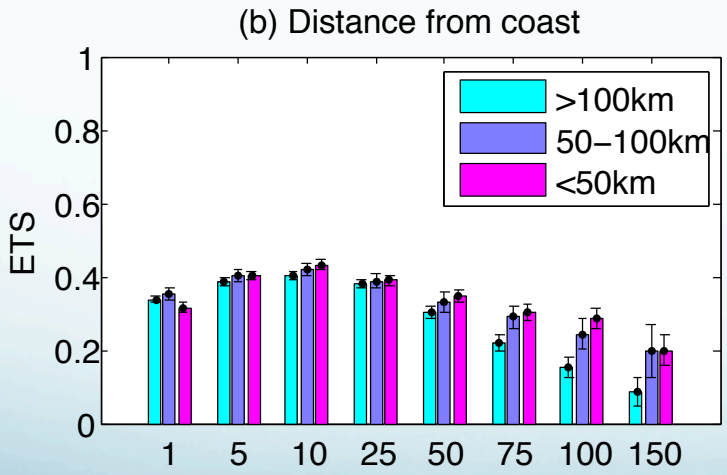
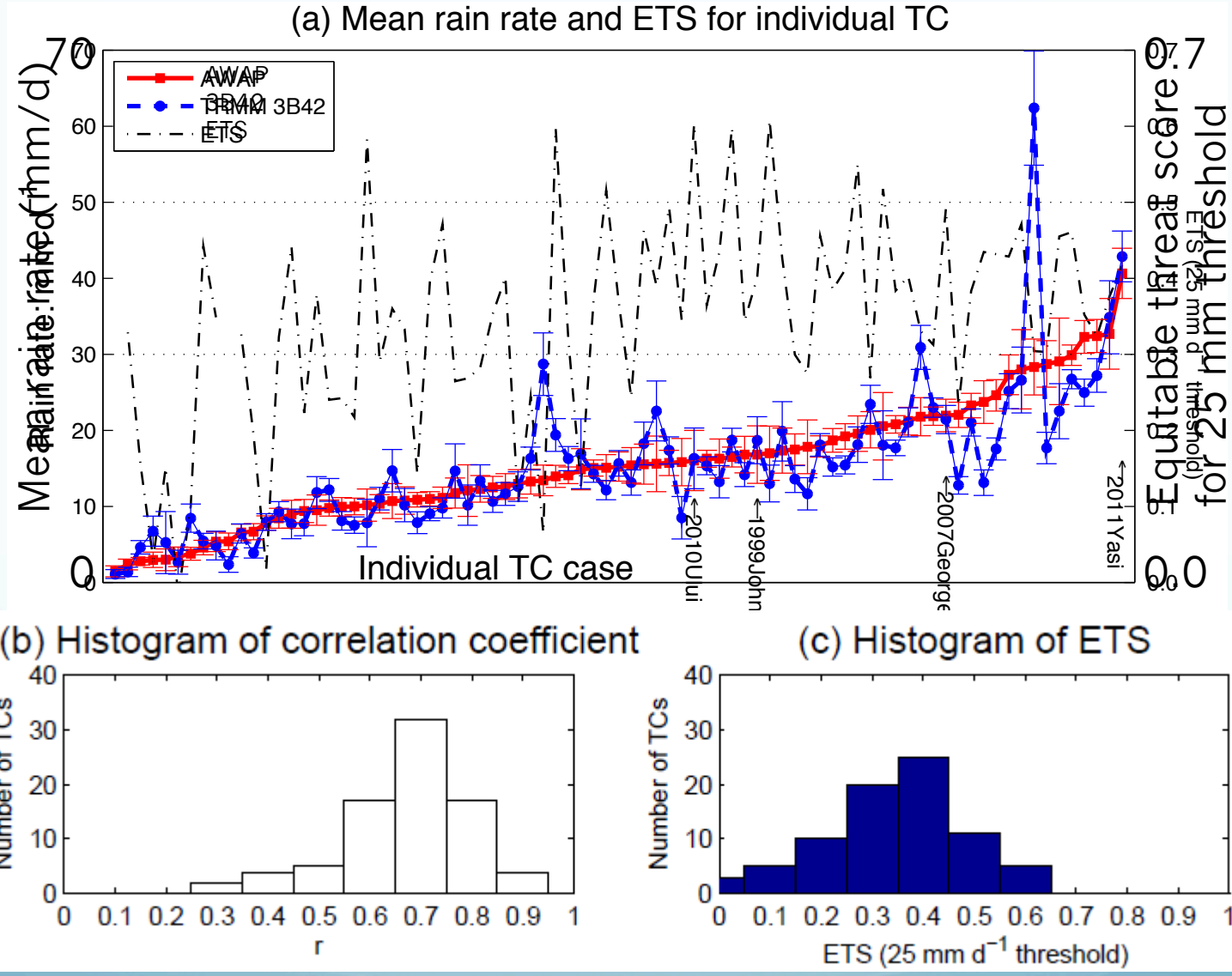






Performance varies from case to case



Summary 2: Australian Region

- TRMM 3B42 produces similar “climatological” mean TC rainfall pattern to that in gauge analysis.
- Overestimates light rain / underestimates heavy rain
- TC intensity, distance from TC center, latitude and TC seasons show the most significant influence on 3B42’s heavy rain detection ability.
- 3B42’s performance on TC rain at landfall varies from case to case.

Take home message…

- TRMM 3B42 is suitable for TC rainfall study,

✔ especially over ocean.

But…

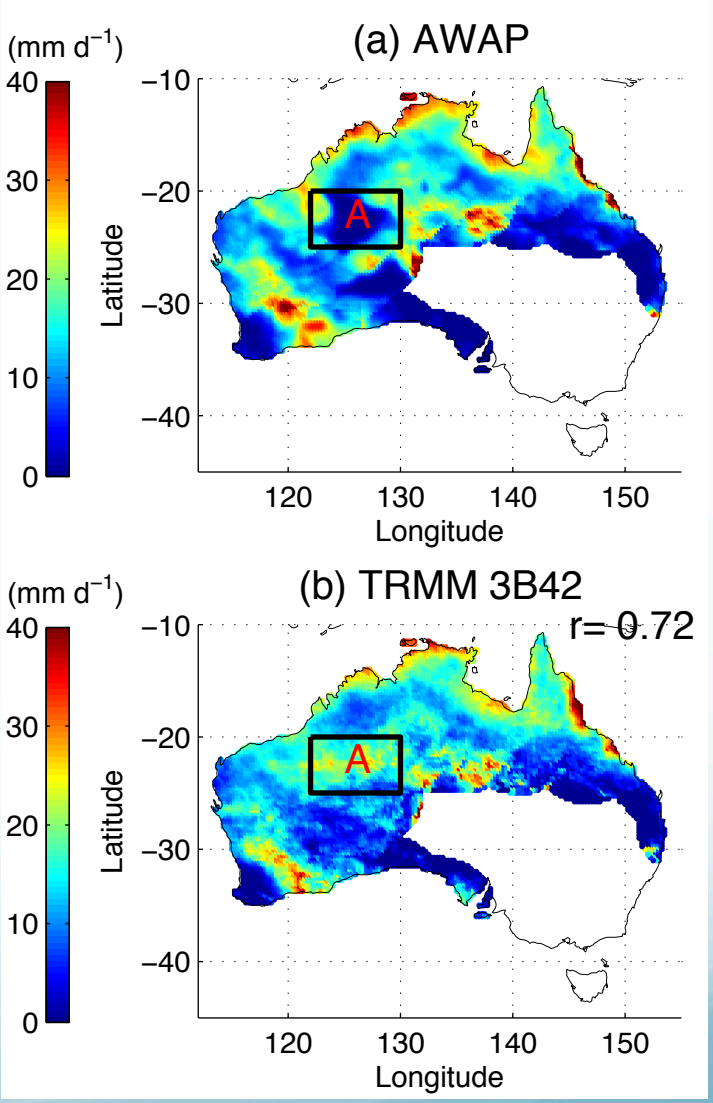
- be careful at locations where topography has an influence.

Thank You!

- More results in the papers
- Questions and comments: send to Jun Chen (yingjc@student.unimelb.edu.au)

TRMM 3B42 vs. AWAP

- 3b42's advantage at places where rain gauges are not available (re.g. region A).



Case study: Yasi

- Similar rain pattern;
- Not able to reach the heavy rain amount;
- Underestimation near the TC center; overestimation at outer rainband.
- Example of not able to detect orographic enhancement?