TRMM Tropical Rainfall Measuring Mission

JAXA

Initial validation of PR V7 Products

Japanese PR V7 Validation Team
and
JAXA/EORC

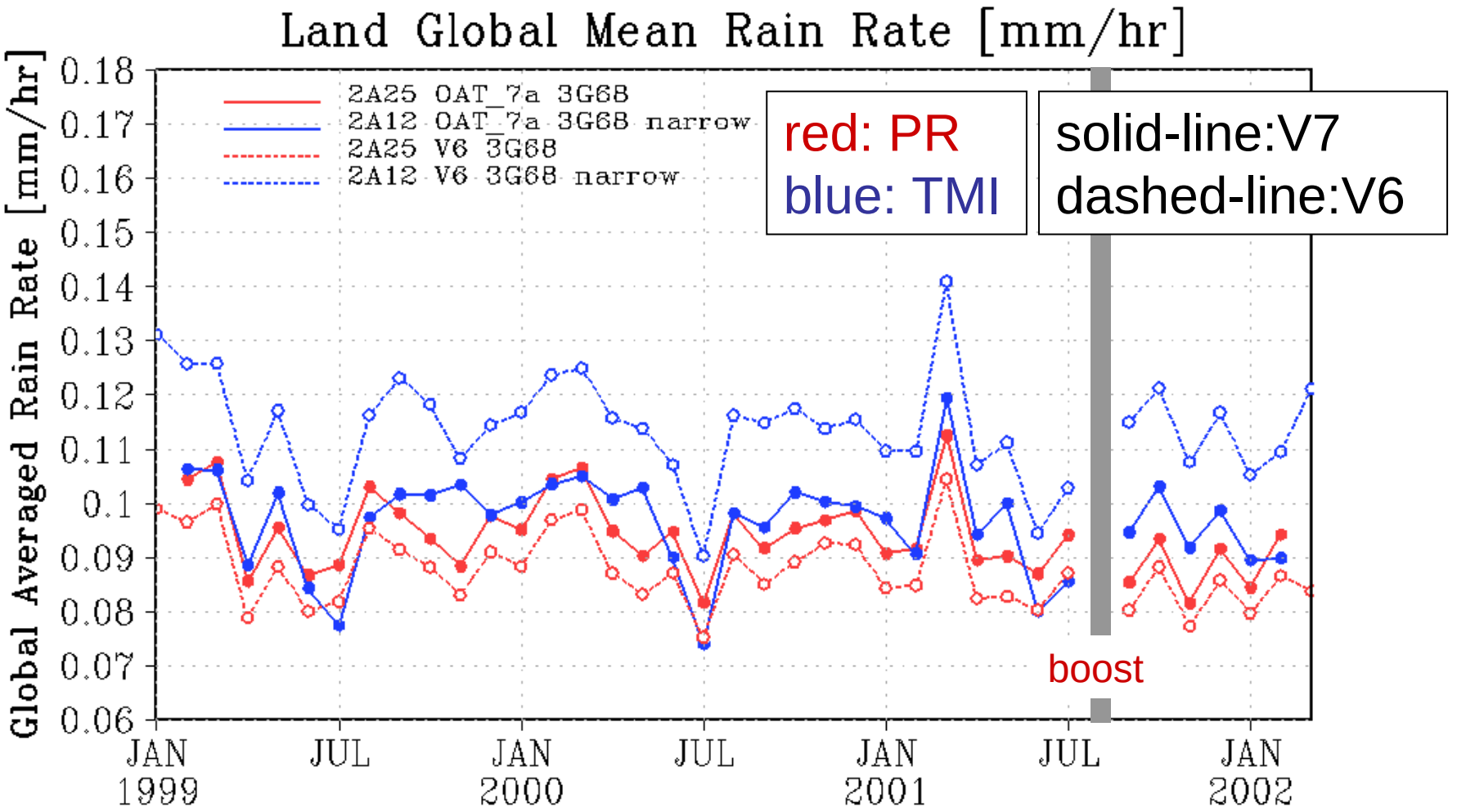
Objectives of Initial Evaluations

- TRMM/PR Version 7 (V7) algorithms were developed to improve rainfall retrievals based on careful examination of the model physics of clouds and precipitation. Therefore, there are theoretical advantages of the release of the TRMM/PR V7 product, switching from V6.

- In order to confirm the advantages of V7 from the resultant product values, we performed initial evaluations of V7 to validate the adequacy of the V7 product release. Focus was placed on the following points:
  1. Discrepancies of statistics between PR and TMI products
  2. Underestimation of heavy rainfall in PR V6 product compare to ground validation results
  3. Underestimation of total rainfall over land in the PR V6 product
  4. Continuity of product values before and after the satellite boost in Aug. 2001, as well as the switch to a redundancy system in Jun. 2009

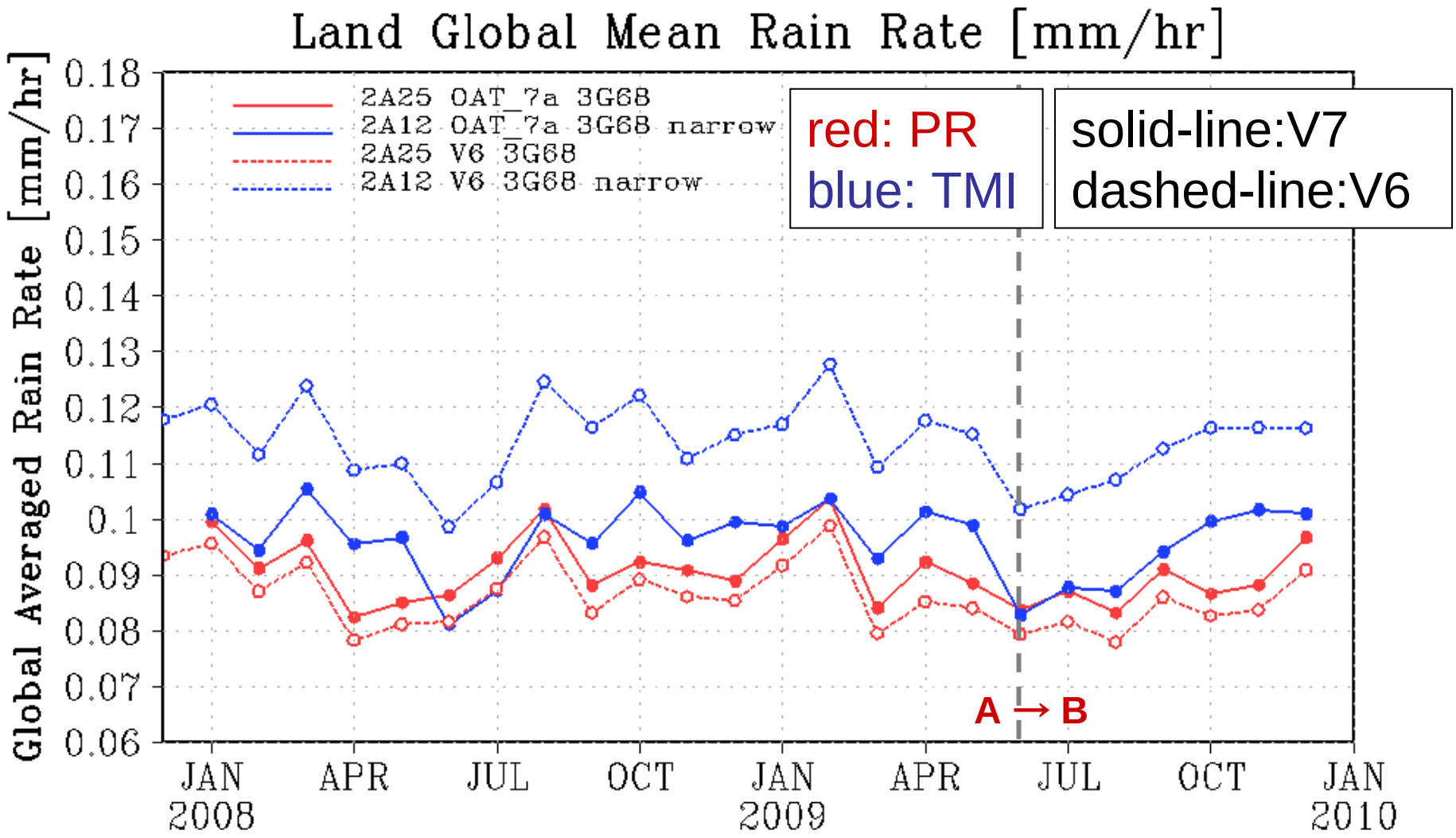
- Periods of validation data
  1. Feb. 1999 – Feb. 2002 (including the satellite boost in Aug. 2001)
  2. Jan. 2008 – Dec. 2009 (including the switch to a redundancy system in Jun. 2009)

Time series: Land: before Boost



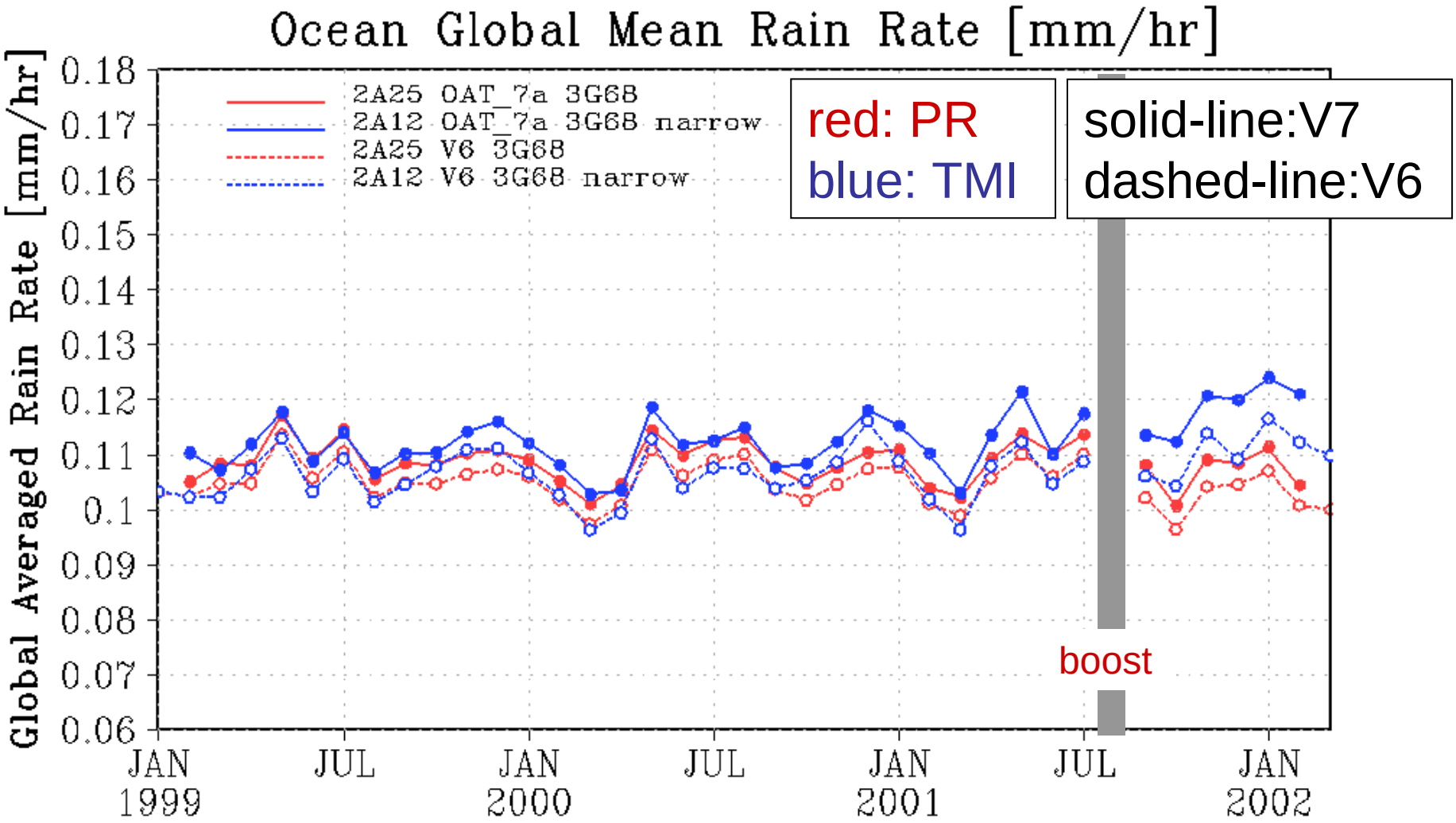
In V6, PR and TMI rainfall over land showed large differences (TMI>PR). Those differences significantly improved in V7. PR rainfall increased, but the decrease of TMI rainfall was more significant. This tendency was the same before and after the boost.

Time series: Land: after Boost



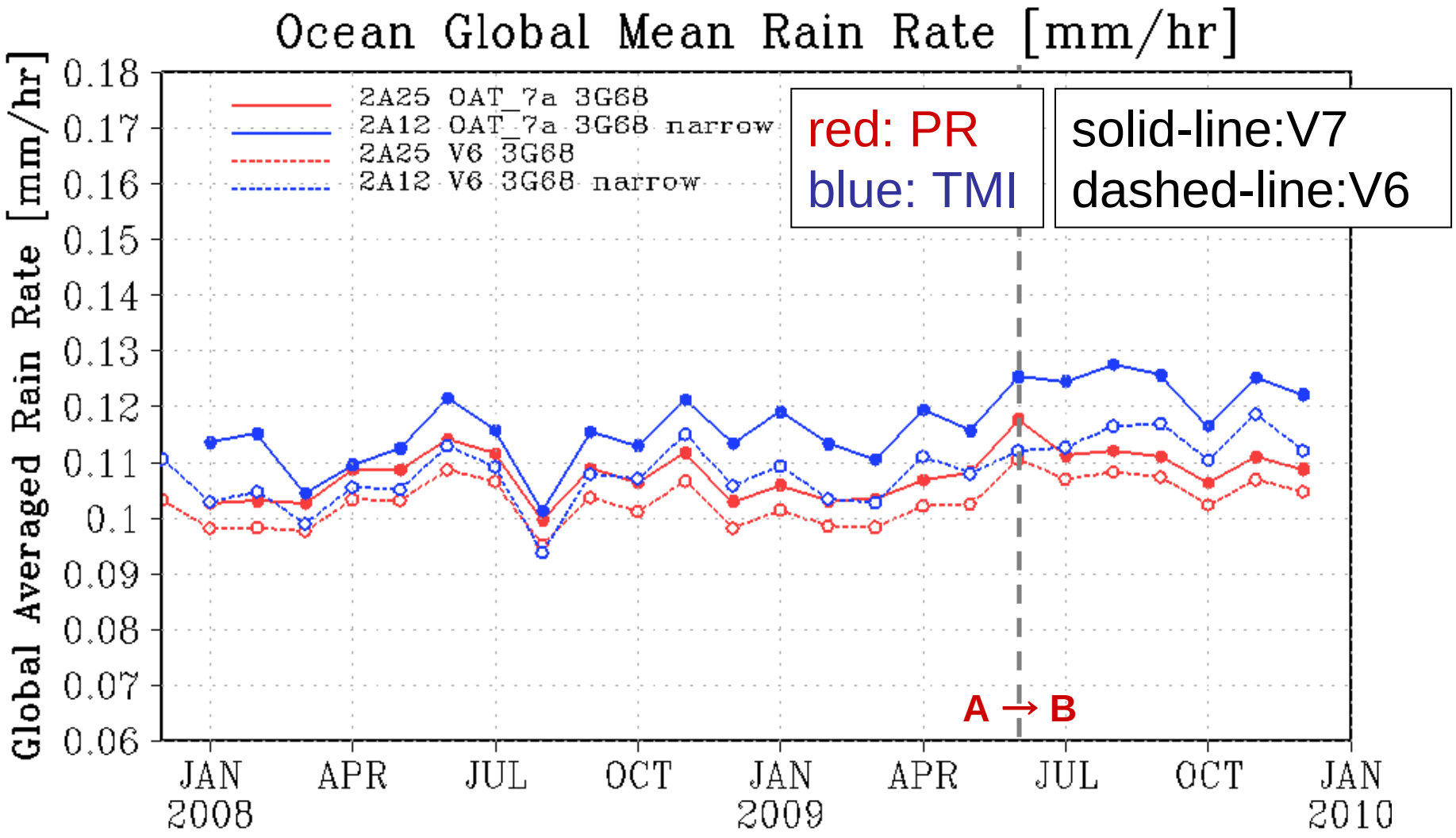
In a recent period, discrepancies between PR and TMI rainfall over land were also reduced. The switch to a redundancy system showed no problem.

Time series: Ocean: before Boost



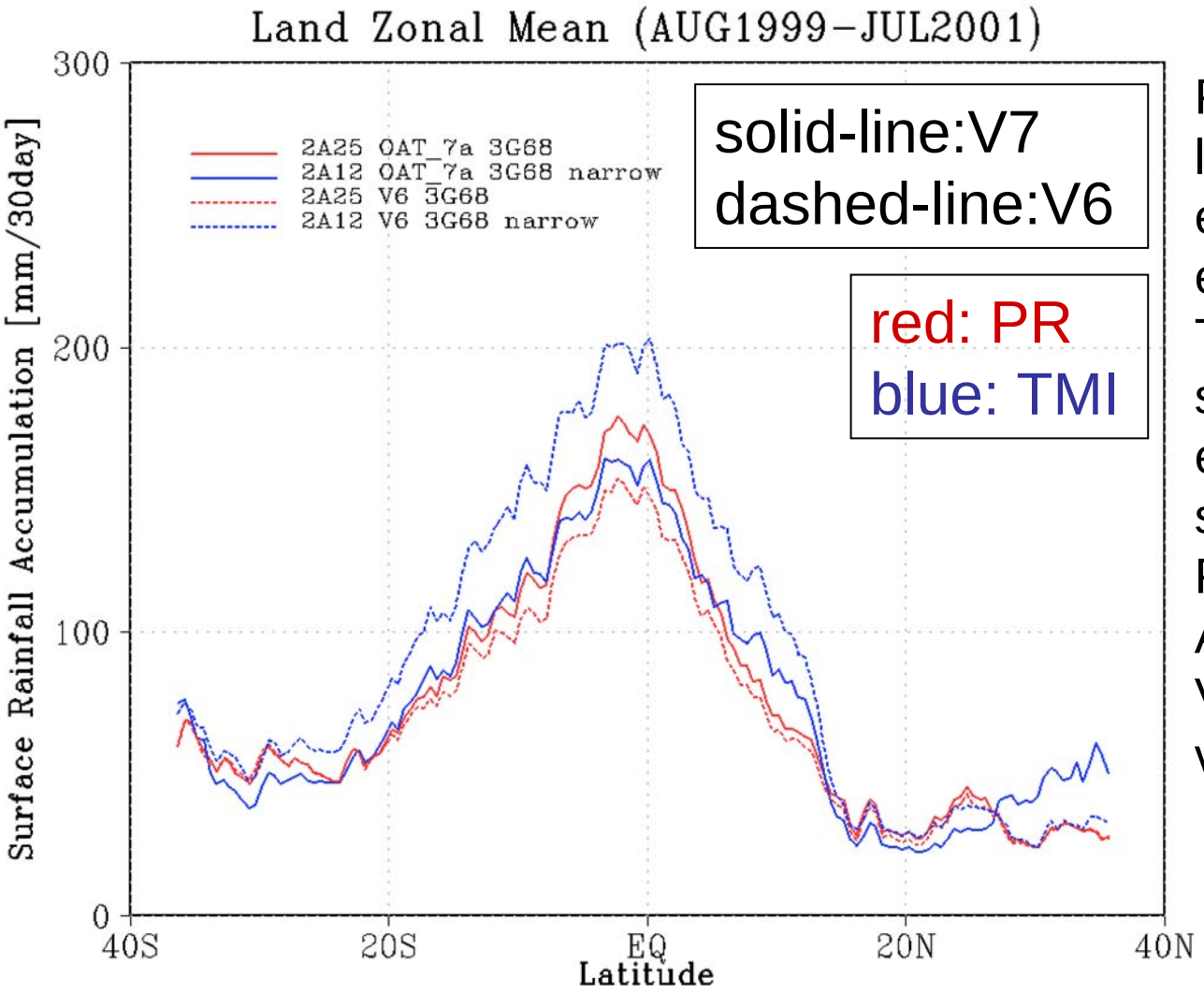
Differences between PR and TMI over the ocean were small in both V6 and V7.
Differences look slightly larger after the boost than before it in both V6 and V7.

Time series: Ocean: after Boost



The switch to a redundancy system showed no problem.

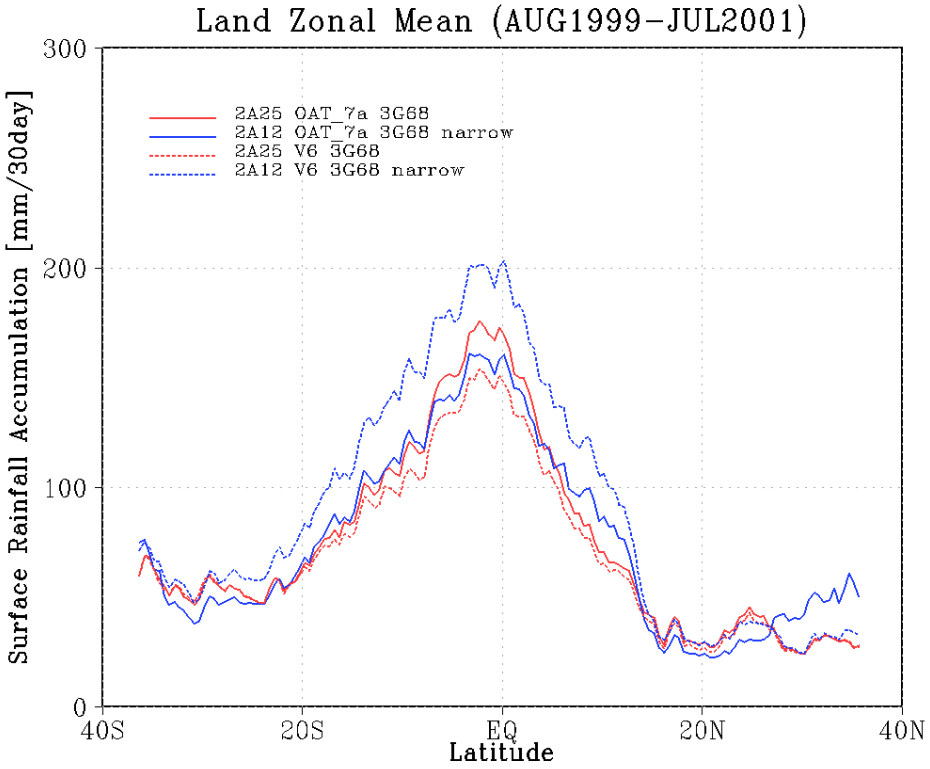
Zonal Mean: Land: before Boost (2-yr)



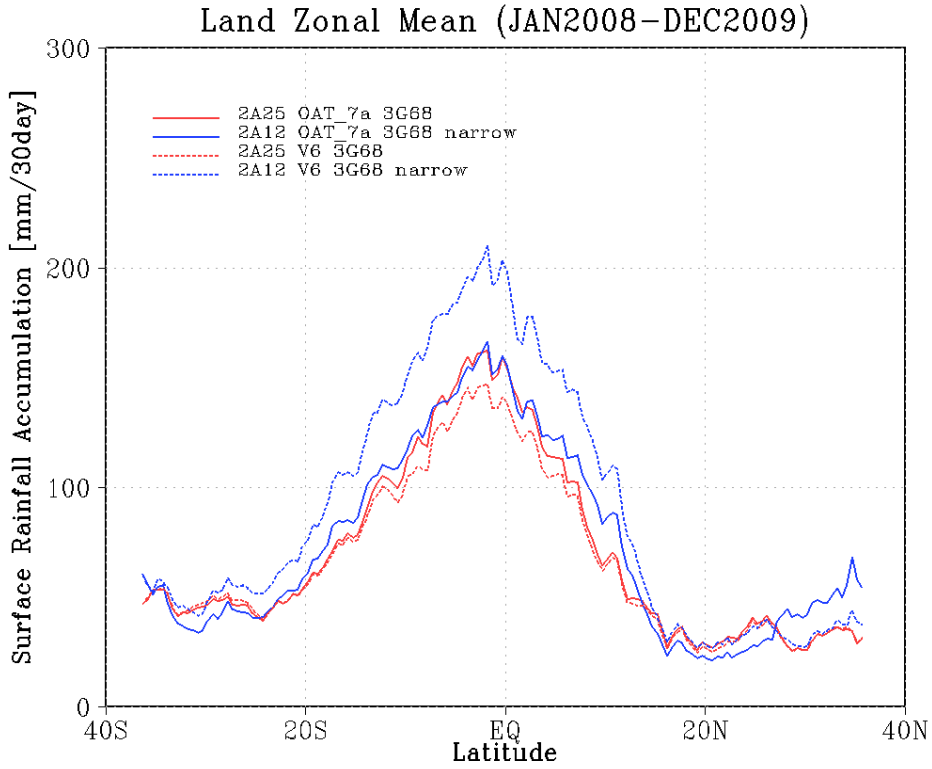
PR V7 increased over land globally, especially over the equatorial region.
TMI V7 decreased significantly. Near the equator, TMI V7 was sometime lower than PR V7.
Around 30-40N, TMI V7 showed larger values.

Zonal Mean: Land

before Boost (2-yr)



after Boost (2-yr)

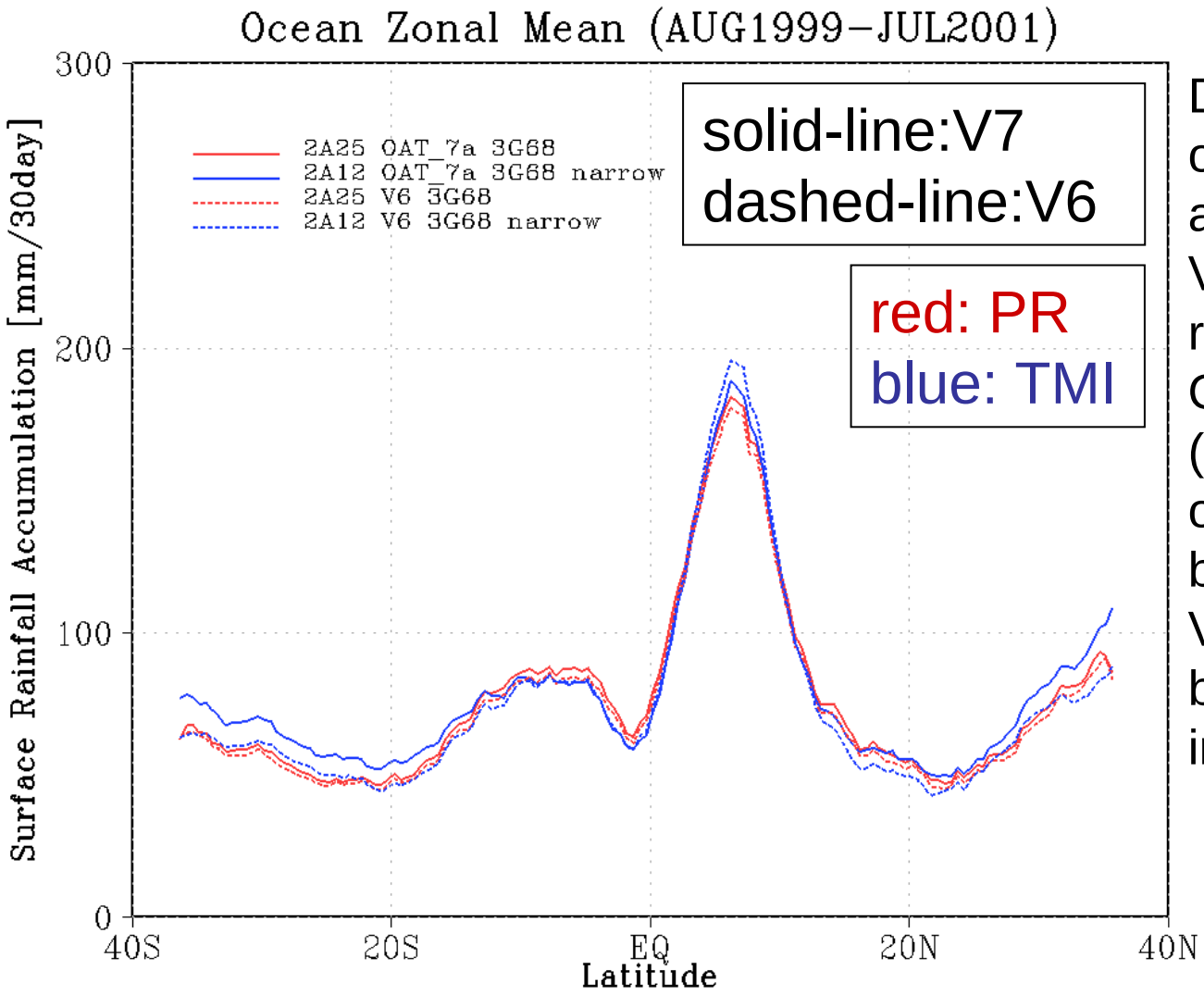


red: PR
blue: TMI

solid-line:V7
dashed-line:V6

The tendency was the same before and after the boost. The reverse of PR and TMI rainfall (PR > TMI) at the equatorial region is not shown.

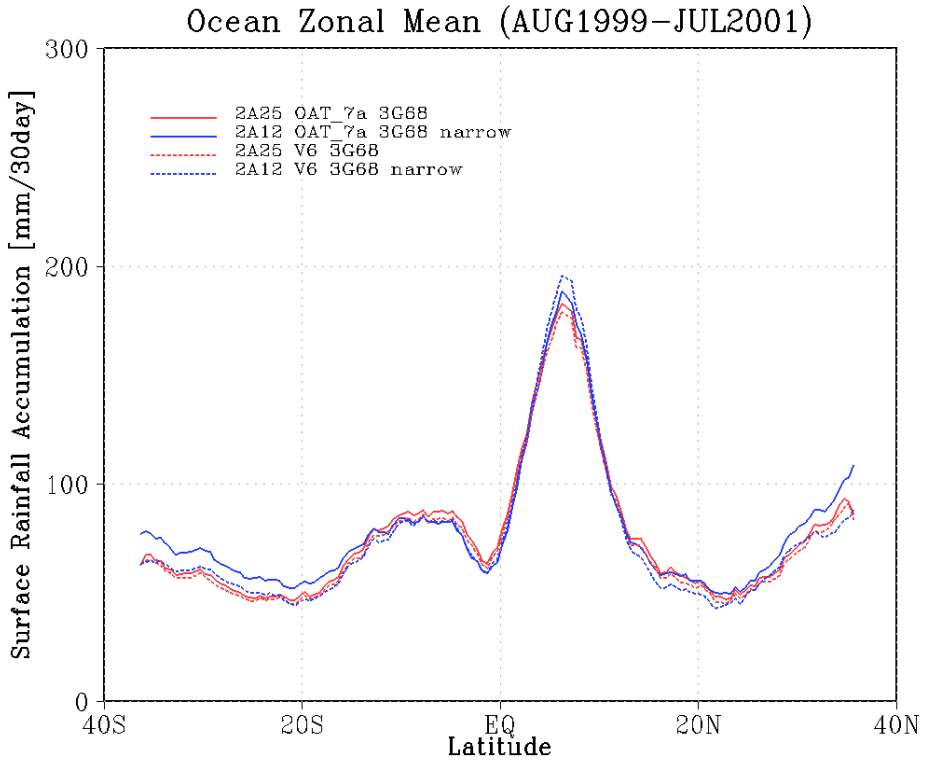
Zonal Mean: Ocean: before Boost (2-yr)



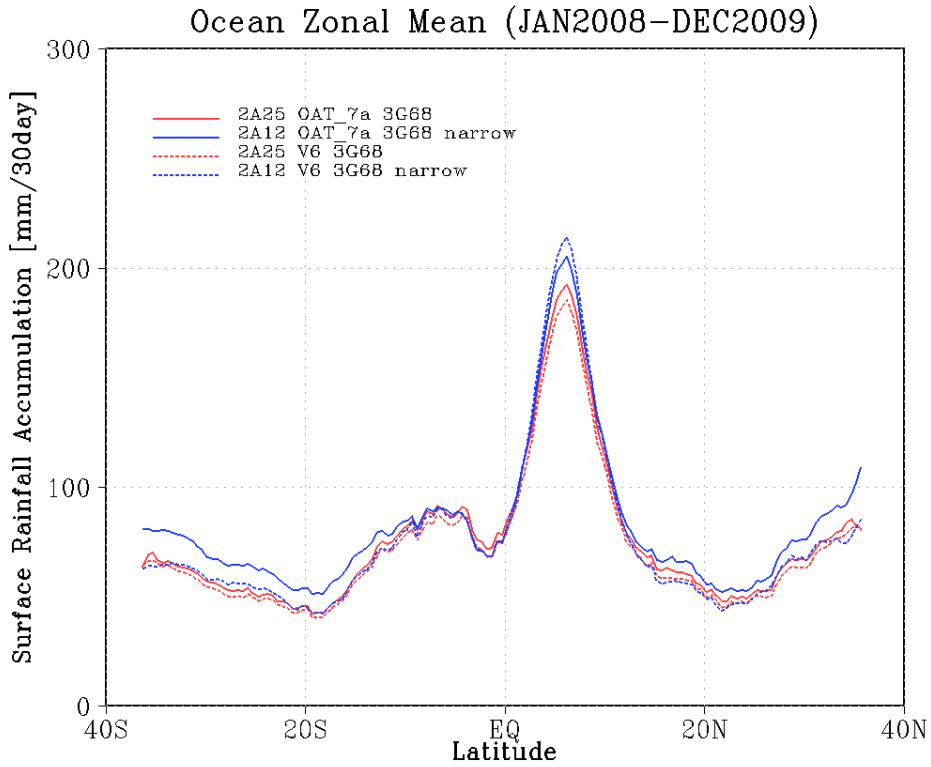
Differences over the ocean were small in V6, and became smaller in V7 over the ITCZ region.
Over the extra-tropics (north of 20N and south of 15S), differences between PR and TMI V7 became larger because TMI V7 increased.

Zonal Mean: Ocean

before Boost (2-yr)



after Boost (2-yr)



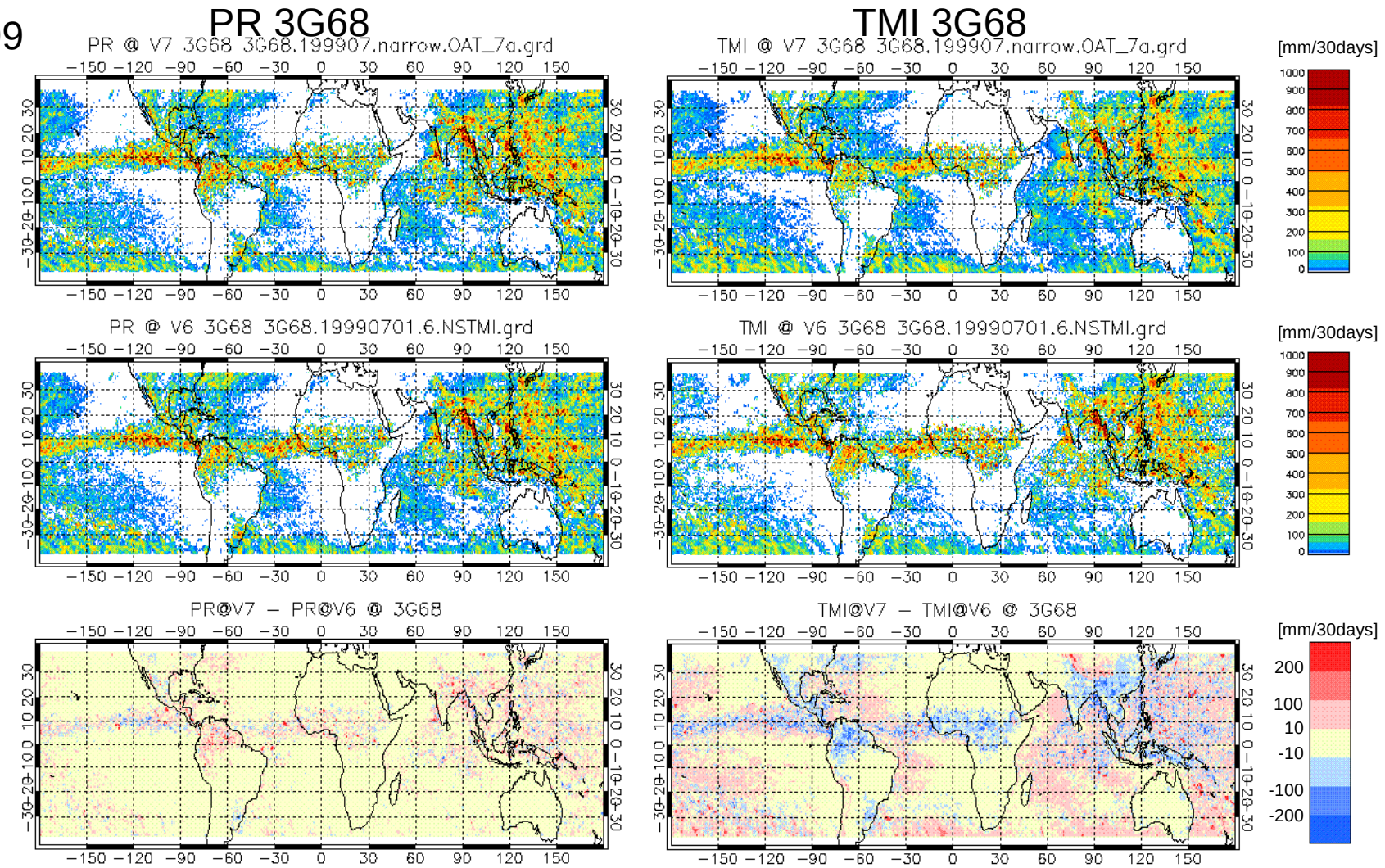
red: PR
blue: TMI

solid-line:V7
dashed-line:V6

The tendency was the same before and after the boost.

Monthly Global Map

July 1999



Differences between V6 and V7 were larger for TMI than PR especially over the tropical land. TMI V7 might underestimate over the Asian region.

%difference (TMI-PR)/((TMI+PR)/2)

	Land (Pre Boost) 1999-2001	Ocean (Pre Boost) 1999-2001	Land (Post Boost) 2008-2009	Ocean (Post Boost) 2008-2009
V6	7.25	0.43	7.89	1.45
V7	0.47	0.67	1.41	1.96

Differences between PR and TMI significantly decreased over land. Over the ocean, differences slightly increased, but almost the same.

Other Validation Team Presentations

Please visit the link below for individual details.

- PR V7 2A25 evaluation using conventional radars in Japan (K. Nakagawa, N. Yoshida, T. Higashiuwatoko)
- Comparison between PR and AMeDAS ground gauge network (N. Kawamoto)
- Comparison of TRMM V7 3A25 with Singapore rain-gage network data (T. Kozu and N. Yoshida)
- On 2A23 (J. Awaka)
- Clutter Routine and 2A25 (J. Awaka)
- The comparison of precipitation statistics between TRMM-PR 2A25 V6 and V7 (F. Shiratsu, F. A. Furuzawa, K. Nakamura)
- Comparisons between PR V7 and TMI V7 instantaneous values, and between PR V6 and PR V7 averaged statistical values (F. A. Furuzawa)
- Modification of SRT and its effects on heavy rain estimates (S. Seto)
- Filtering suspicious large values in ITE233_2A25 “extreme rain” (A. Hamada, Y. N. Takayabu)
- Incidence-angle dependency check (M. Hirose)
- L3 OAT7, ITE233, V6 Comparison (N. Yoshida, T. Higashiuwatoko)

Conclusions

- TRMM/PR V7 products have several advantages compared to the V6 products. From the initial evaluations, we strongly support the transfer of the standard product from V6 to V7.

- Focus points were evaluated as follows:
  1. Discrepancies of statistics between PR and TMI products

     IMPROVED (especially over LAND)
  2. Underestimation of heavy rainfall in PR V6 product compare to ground validation results

     IMPROVED
  3. Underestimation of total rainfall over land in the PR V6 product

     IMPROVED
  4. Continuity of product values before and after the satellite boost in Aug. 2001, as well as the switch to a redundancy system in Jun. 2009.

     NO PROBLEM