



V7 Evaluation

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Modification of SRT and its effects on heavy rain estimates (mainly over land)

Shinta SETO (IIS, University of Tokyo)

1



Background

In V6, SRT had several problems. → SRT has been modified for V7

- (1) Over Land; Large biases in PIA and surface rain rates are sometimes caused by along-track spatial reference method → In V7, not only forward but backward reference is applied and the best estimates are given as an weighted average of multiple PIA estimates.**
- (2) Over Land; “Soil moisture effect (Seto and Iguchi 2007, JTECH)” is not well considered particularly in temporal reference method → In V7 2A25, An increment of +0.5dB is given to PIA over all the over-land pixels to compensate soil moisture effect.**
- (3) Over Ocean; Unnatural angle bin dependence by hybrid spatial reference method (one quadratic function is used for all angle bins) → in V7, different functions are used for inner swath and outer swath)**

Purpose of this study; How SRT is improved and what are the effects of improvement on rain rates (particularly heavy rainfall events)

Data: Jan.-Dec. 2000 (2A21 and 2A25 both in V6 and V7)

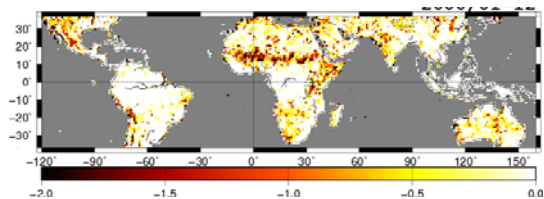
Main part of this study shows the results for over land.



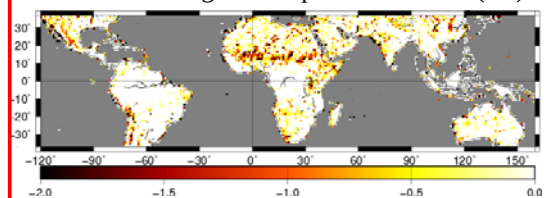
PIA estimates (over land, only where the average is negative)

V6 selects the method with higher reliability between ATSR and TR

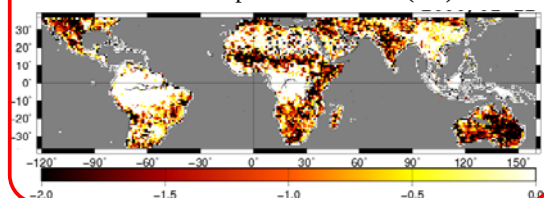
V7 takes average of the estimates in ATSR(f), ATSR(b), and TR weighted by their reliabilities



ATSR = Along Track Spatial Reference (V6)



TR = Temporal Reference (V6)

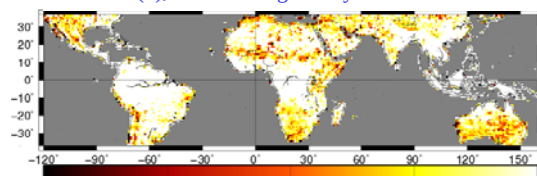


Distance to referenced pixels cannot be very long in V7

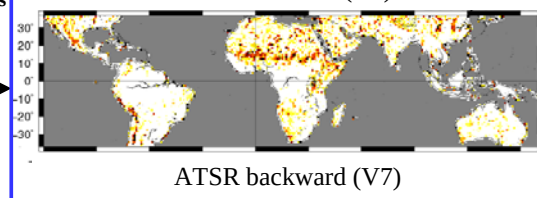
In Forward (Backward) method, referenced pixels are west (east) to the target pixel

Database
1.0deg → 0.1deg

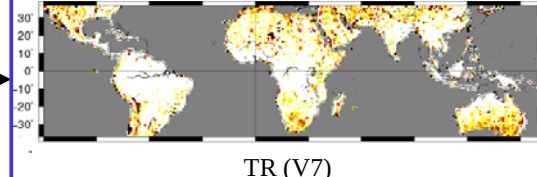
1y → 10y



ATSR forward (V7)



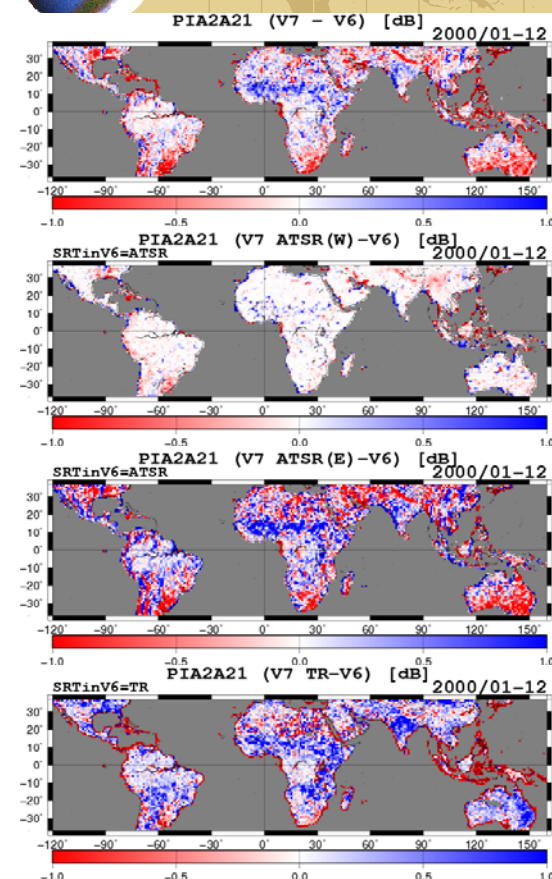
ATSR backward (V7)



TR (V7)



Difference in PIA estimates



V7—V6

V7 is higher in the Sahel and India (lower latitude)

No changes in Amazonia (tropical forest)

V6 is higher in mid. latitude (>30N/S).

V6 is much higher along the coast (where the flag shows “land”)

V7 ATSR(forward) – V6 ATSR

Basically no differences, but

V7 is higher in the western coast of India, Africa

V6 is higher in the western coast of Indochina, Indonesia, Japan and along Himalaya and Andes Mountains.

V7 ATSR(backward) – V6 ATSR

V7 is higher in the Sahel and India

V6 is higher in mid. latitude (>30N/S)

V7 TR – V6 TR

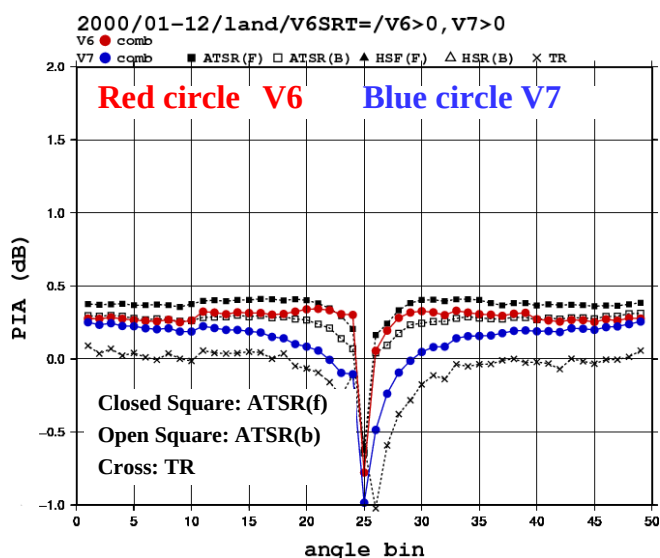
V6 is much higher along the coast (where the flag shows “land”)

V7 is generally higher except for the coast



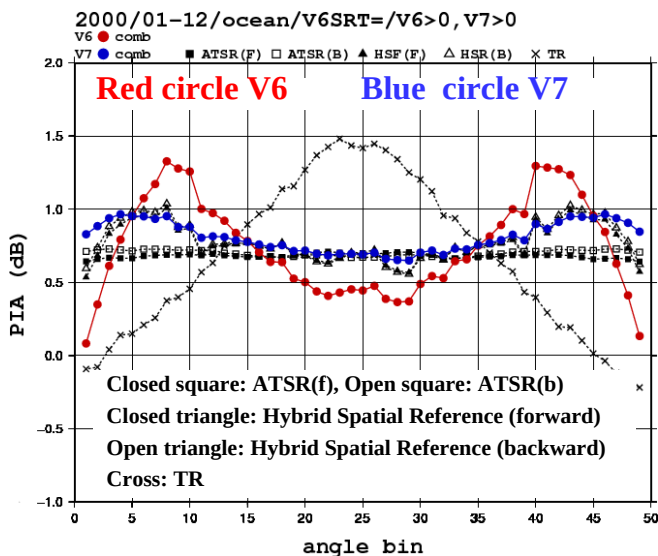
Angle bin dependence of PIA estimates

Over Land

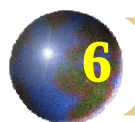


Negative biases near nadir should be examined.

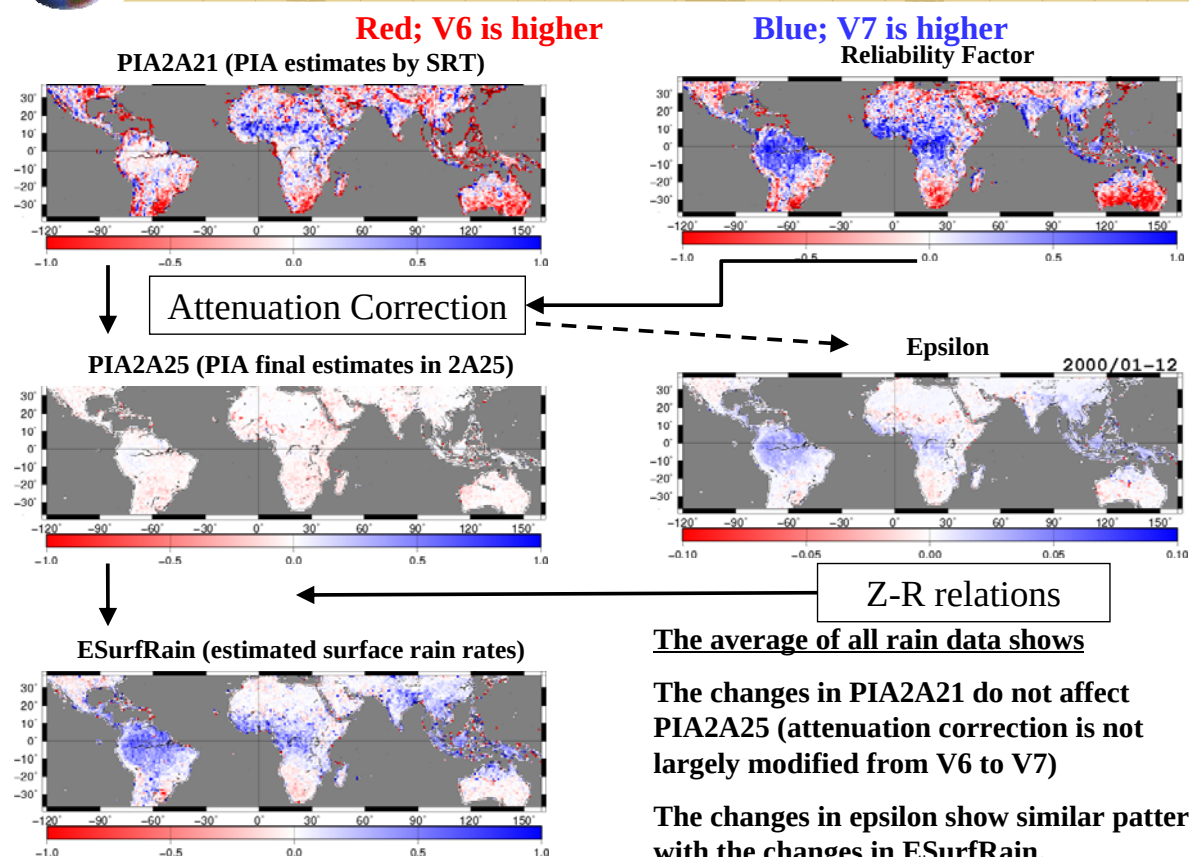
Over Ocean

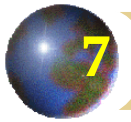


Unnatural angle bin dependence in V6 is hardly seen in V7.



Possible effects of SRT on rain rates

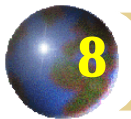




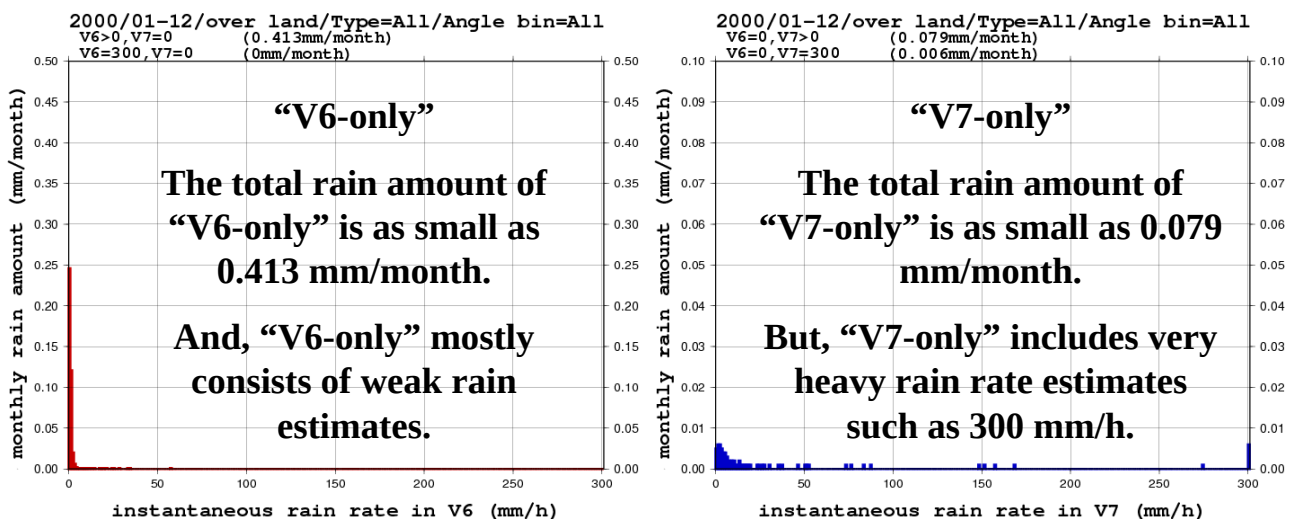
Matchup dataset

V6 and V7 products are matched up at each pixel. Pixels are categorized;

Category	Conditions
“V6-only”	V6>0mm/h, V7=0mm/h
“V7-only”	V6=0mm/h, V7>0mm/h
“Matched”	V6>0mm/h, V7>0mm/h
“V6-heavy”	V6>50mm/h, V7>0mm/h
“V7-heavy”	V6>0mm/h, V7>50mm/h



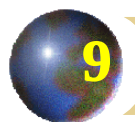
“V6-only” and “V7-only” are rare



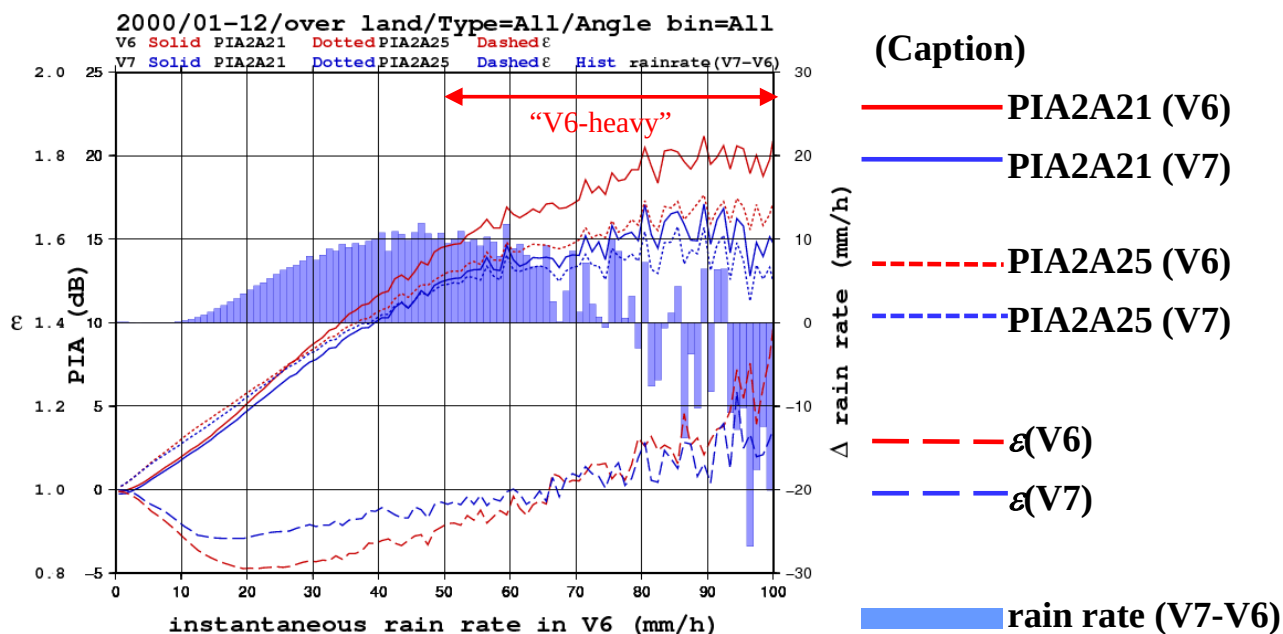
V7 sometimes (not frequently) has false heavy rain rates due to clutter misclassification.

“Matched” data may exclude the most of clutter misclassification. Later in this study, only “matched” data are used.

“Matched” V6=56.345mm/month, V7=60.051mm/month



Sorted by V6 rain rates Focus on “V6-heavy” pixels

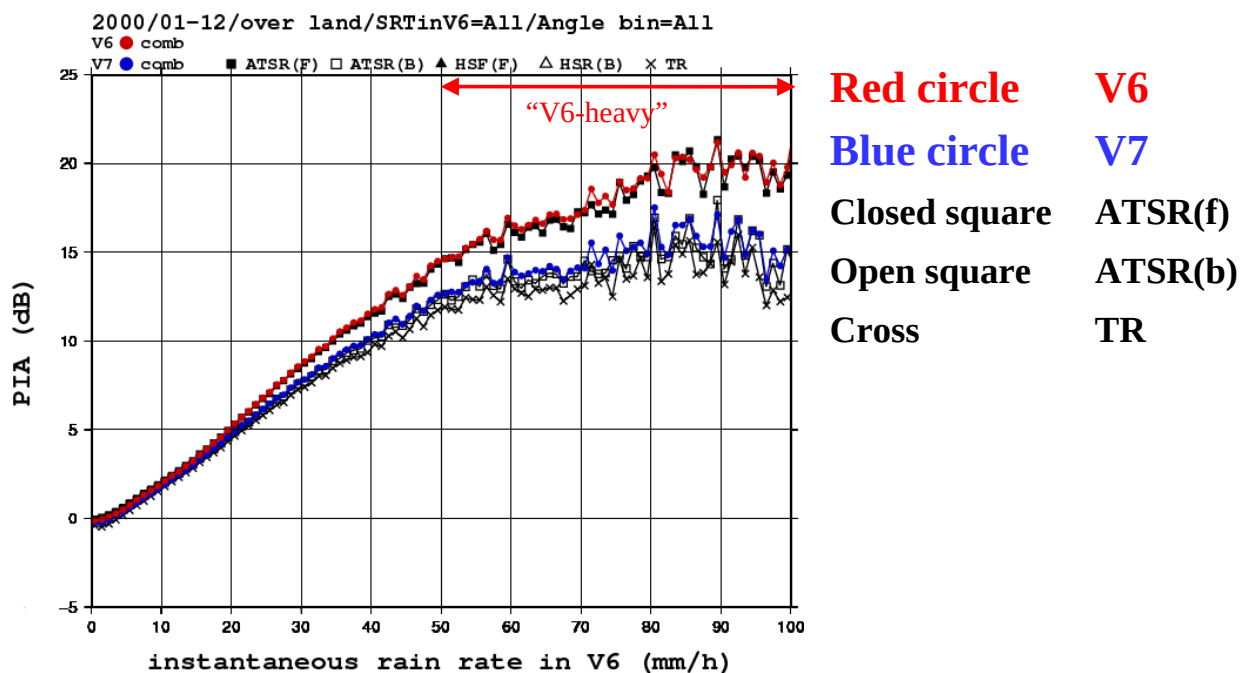


At “V6-heavy” pixels, PIA2A21 in V7 is clearly lower than PIA2A21 in V6, and PIA2A25 in V7 is lower than PIA2A25 in V6.

There are significant differences in attenuation correction.



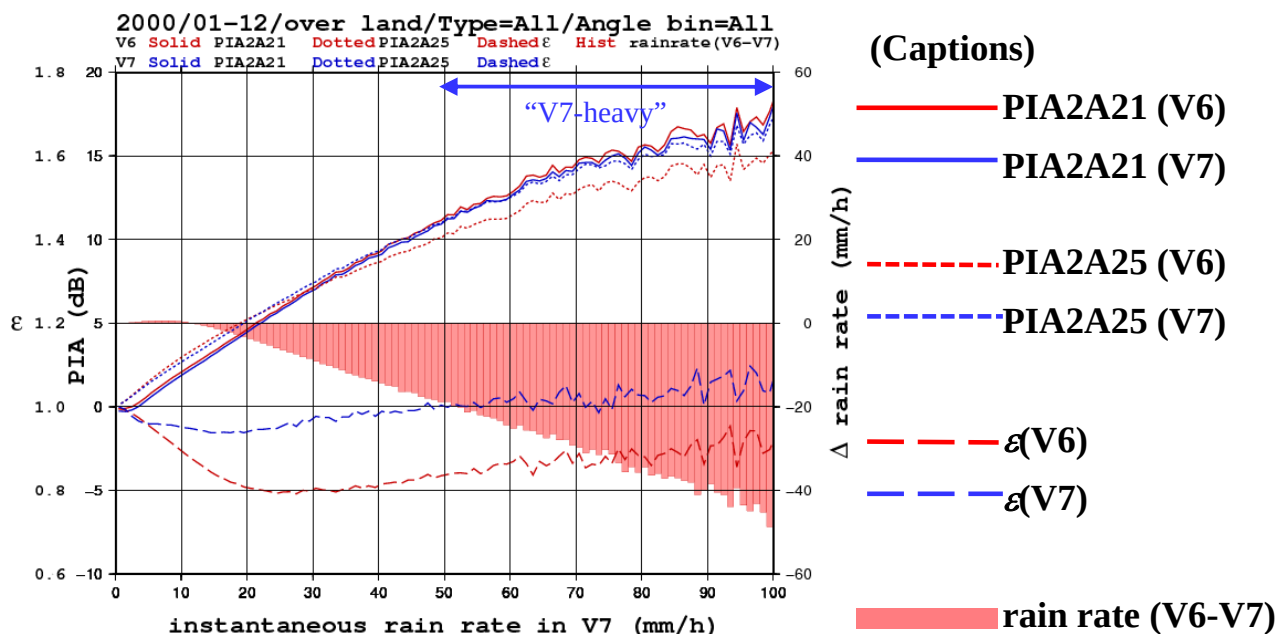
PIA estimates for “V6-heavy”



At “V6-heavy” pixels, ATSR(f) show much higher PIA estimates than ATSR(b) and TR. This suggests that PIA2A21 in V6 is largely biased and rain rates are overestimated.



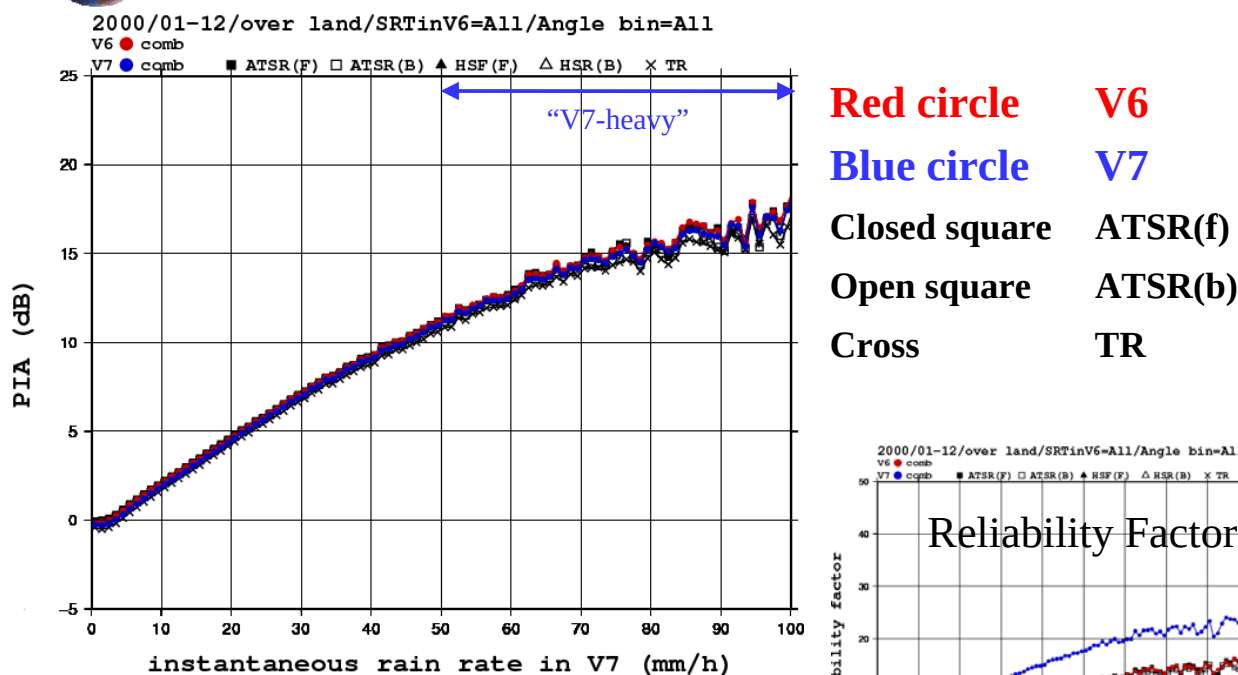
Sorted by V7 rain rates Focus on “V7-heavy” pixels



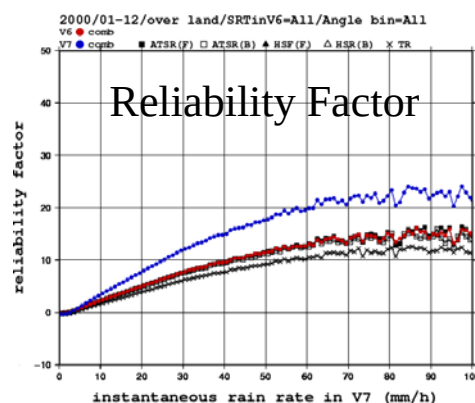
At “V7-heavy” pixels, there are no big differences in PIA2A21 between V6 and V7. PIA2A25 in V7 is higher than PIA2A25 in V6 and is closer to PIA2A21 in V7. (PIA2A25 in V6 is different from PIA2A21 in V6).



PIA estimates for “V7-heavy”



At “V7-heavy” pixels, all the three SRT methods give similar PIA estimates. In V7, by combining three methods, reliability factor becomes higher and PIA2A25 can be closer to PIA2A21.



- (1) Over Land; Large biases in PIA and surface rain rates are sometimes caused by along-track spatial reference method → In V7, not only forward but backward reference is applied and the best estimates are given as an weighted average of multiple PIA estimates.**

Some of heavy rain estimates in V6 are caused by large biases in ATSR.

Heavy rain estimates in V7 are supported by different SRTs and are reliable at least in terms of attenuation correction.

Representation of heavy rain events has been improved from V6 to V7.

- (2) Over Land; “Soil moisture effect (Seto and Iguchi 2007, JTECH)” is not well considered particularly in temporal reference method → In V7 2A25, An increment of +0.5dB is given to PIA over all the over-land pixels to compensate soil moisture effect.**

In 2A21 V7, “soil moisture effect” is not considered at all, and negative biases in PIA are expanded in some regions. The increment of “+0.5dB” in 2A25 partly compensates the underestimation in rain rates over land.

- (3) Over Ocean; Unnatural angle bin dependence is hardly seen in V7.**