

Microwave Emission brightness Temperature Histogram Technique (METH): TRMM Boost, One Degree Product and SSMIS Processing

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Modified METH to account for TRMM-Boost

TRMM satellite was boosted from 350km to 402km in August 2001 to extend mission life, thus changing the Earth Incidence Angle (from 52.8° to 53.4°) and effective field of view of TRMM Microwave Imager (TMI). We change the Rain Rate-Tb relation for the Pre- and post-boost configuration and produce a modified algorithm that accounts for the TRMM boost, thus allowing TRMM to provide climate scale rainfall for long-term climate studies.

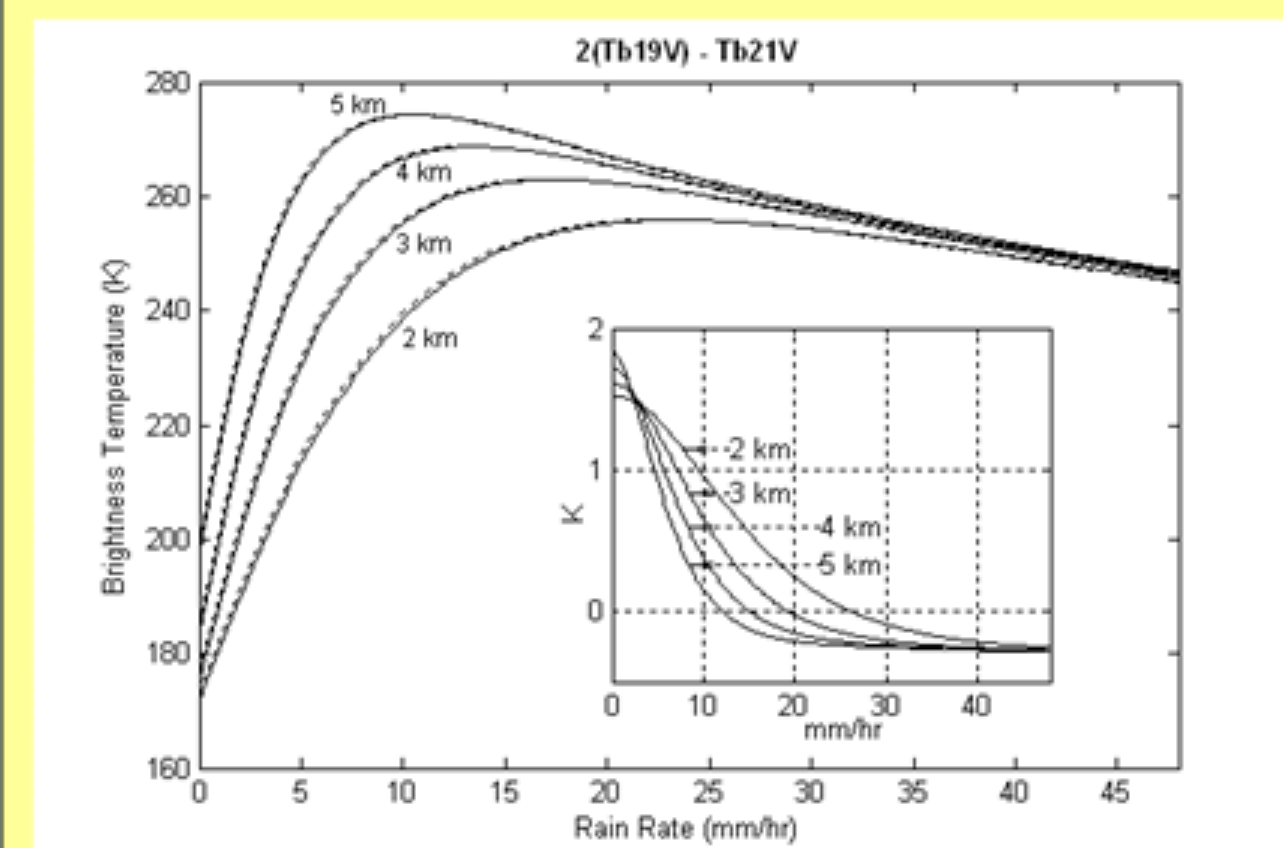


Fig 1. Rain Rate – Tb relation for pre (solid) and post (dotted) boost. Tb is a combination channel of 2*19V-22V. Insert shows their differences

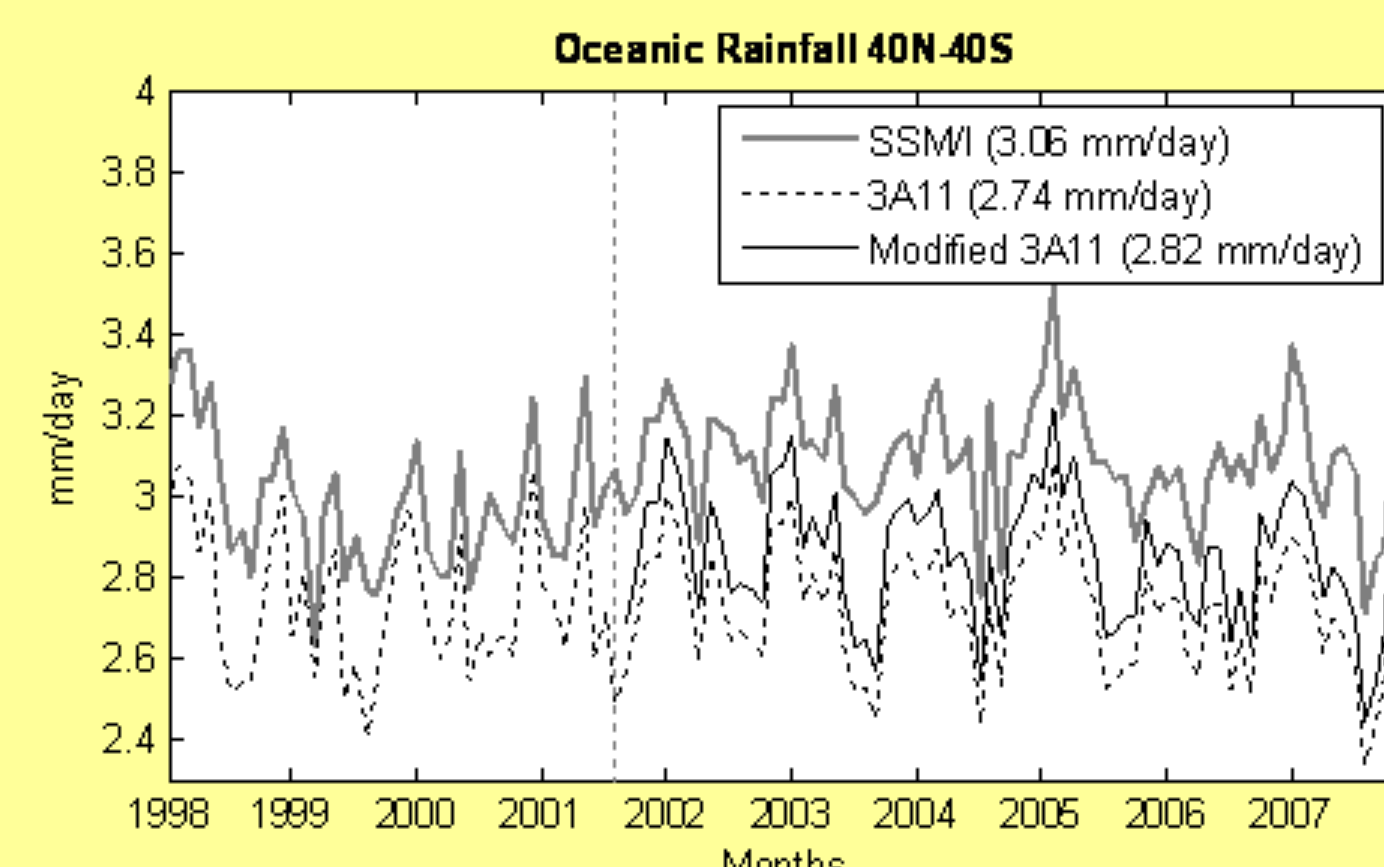


Fig 2. Time series of domain (35N-35S) average uncorrected 3A11, modified 3A11 and SSM/I monthly rain rates 1998-2007

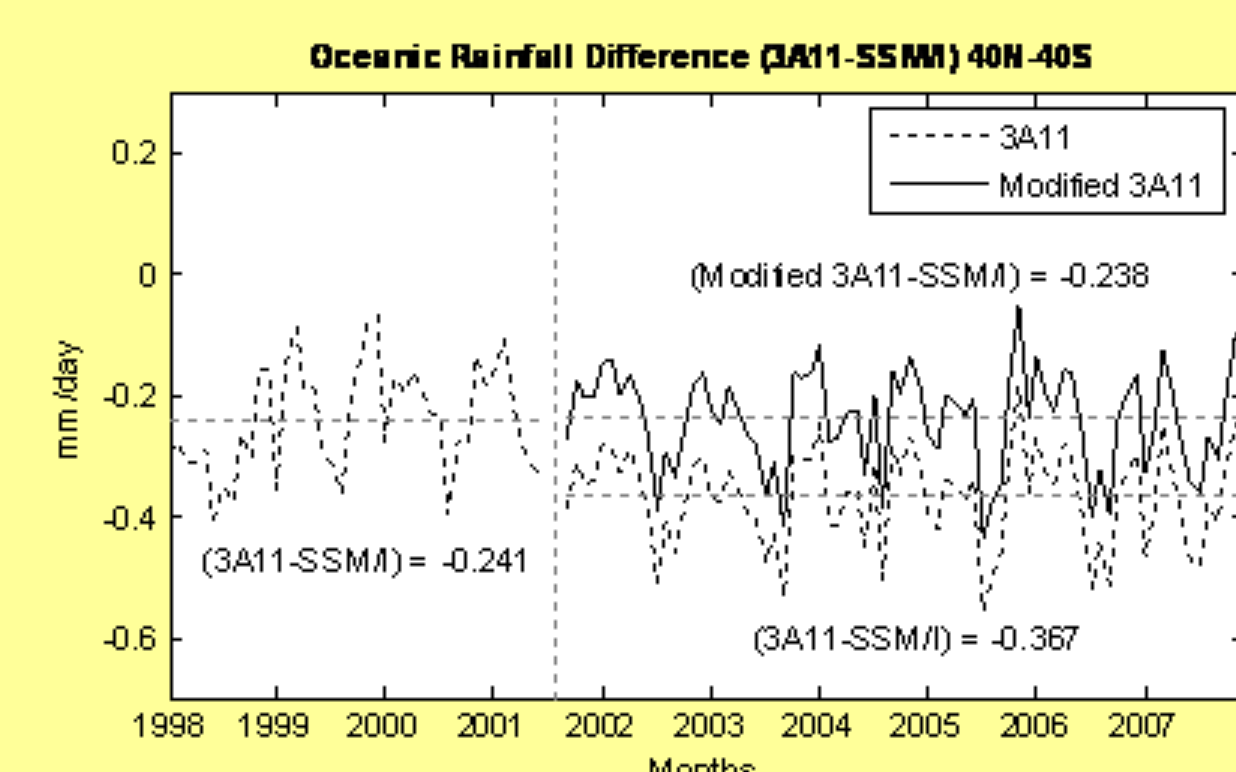


Fig 3. Time series of rain rate (RR) and freezing level (FL) difference between unmodified and modified 3A11 and F13 SSM/I

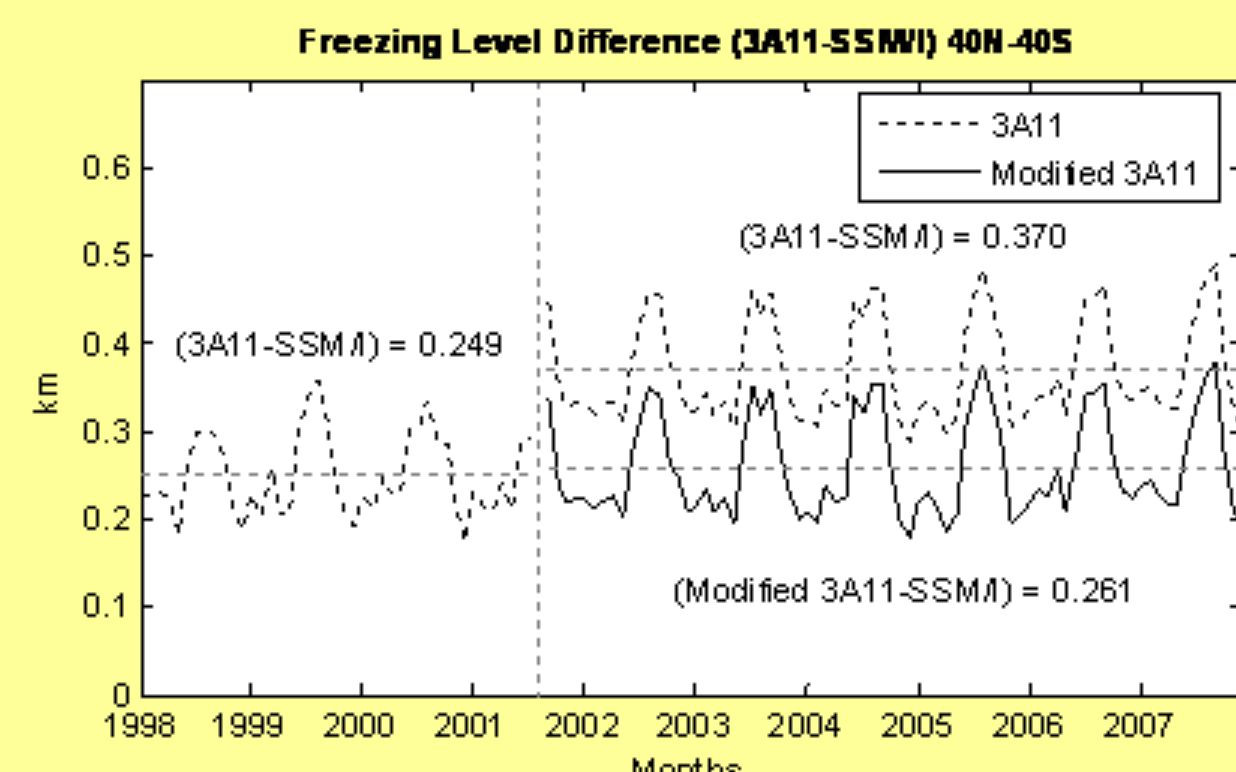


Fig 4. Trend analyses show no significant trend in monthly rainfall whereas the modified 3A11 show linear trend comparable to the SSM/I rain rate

Ref: Chiu, Chokngamwong and Wilheit, 2010, TGRS, 48, 3081-3086; Chiu and Chokngamwong, 2010, J.Appl. Met. Clim, 49, 115-123;

Shin and Chiu, 2009: JTech, 25, 1888-1893

One-degree TRMM Monthly Oceanic Rainfall

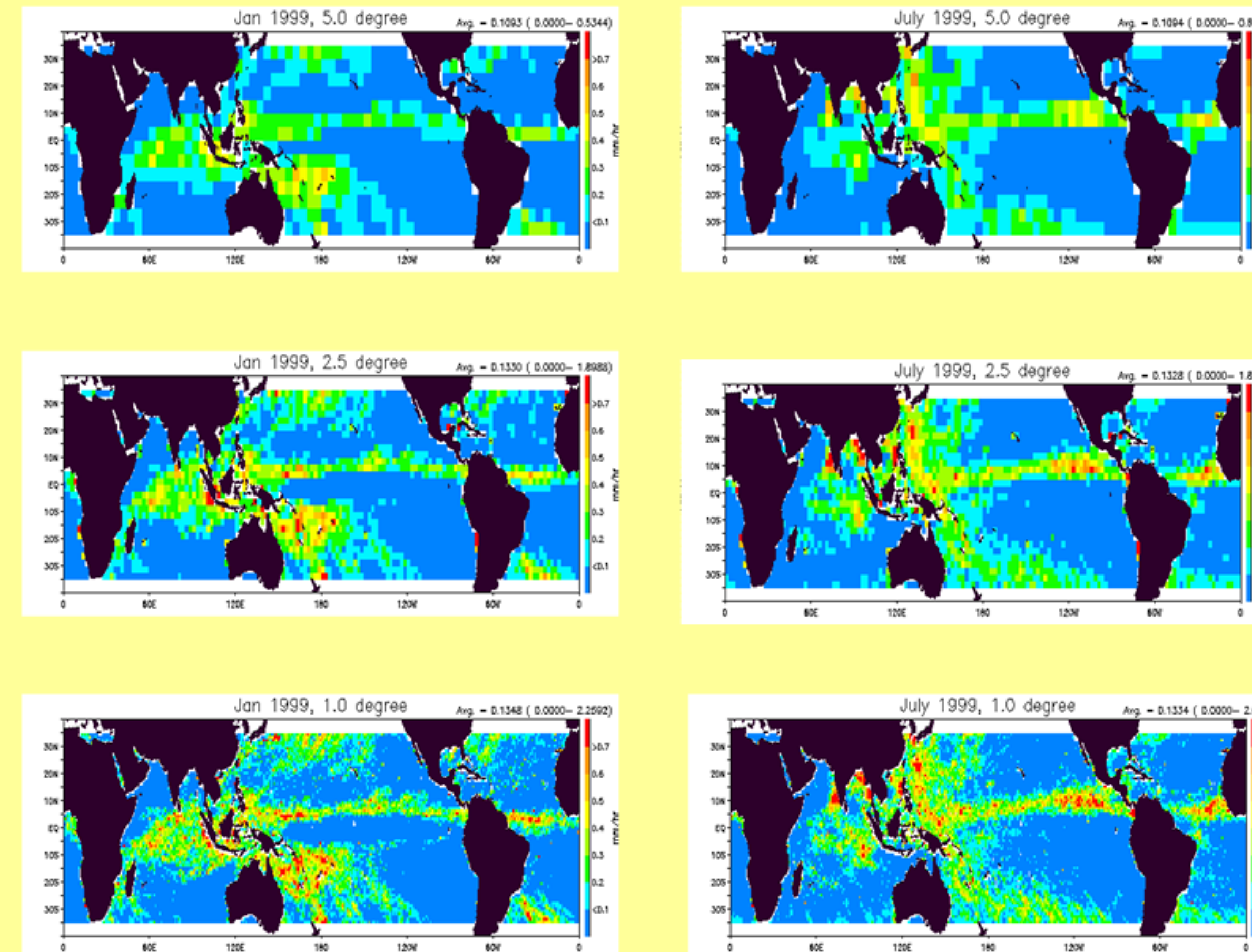


Fig 6. Prototype V7 3A11 at 2.5 degree (middle panel) and 1 degree (lower panel) resolution for January 1999 (left) and July 1999 (right) panels. 5 degree 3A11 for the two months are shown on the top panels

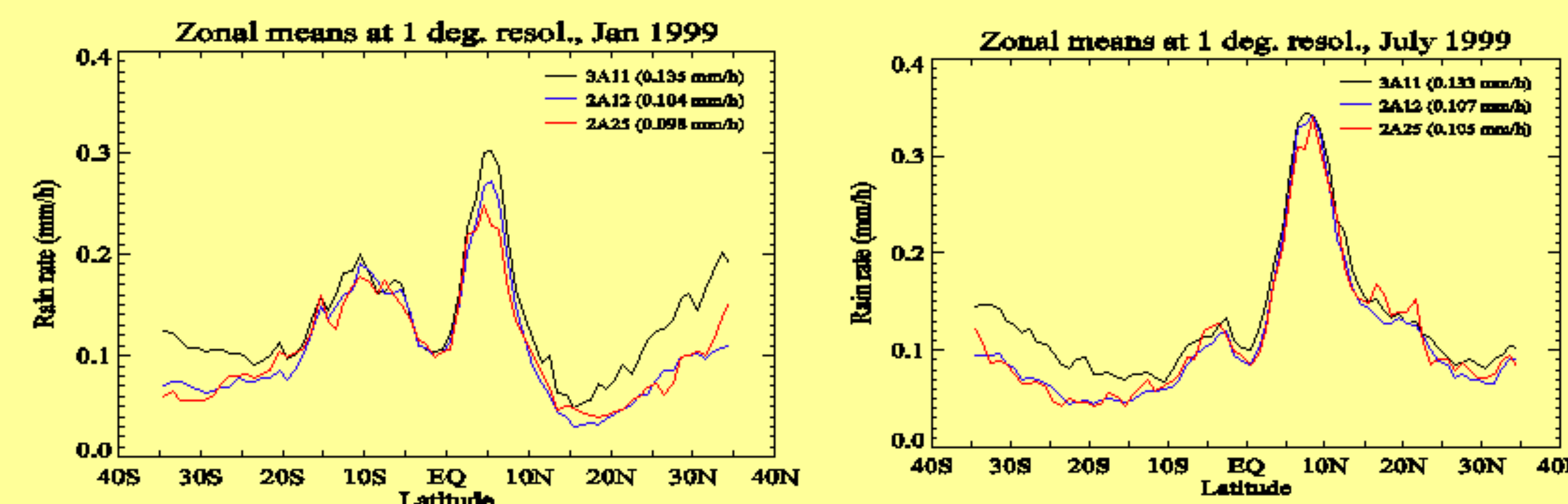


Fig 7. Comparison of prototype 3A11 1 degree product with zonal average PR 2A12 and TMI 2A25

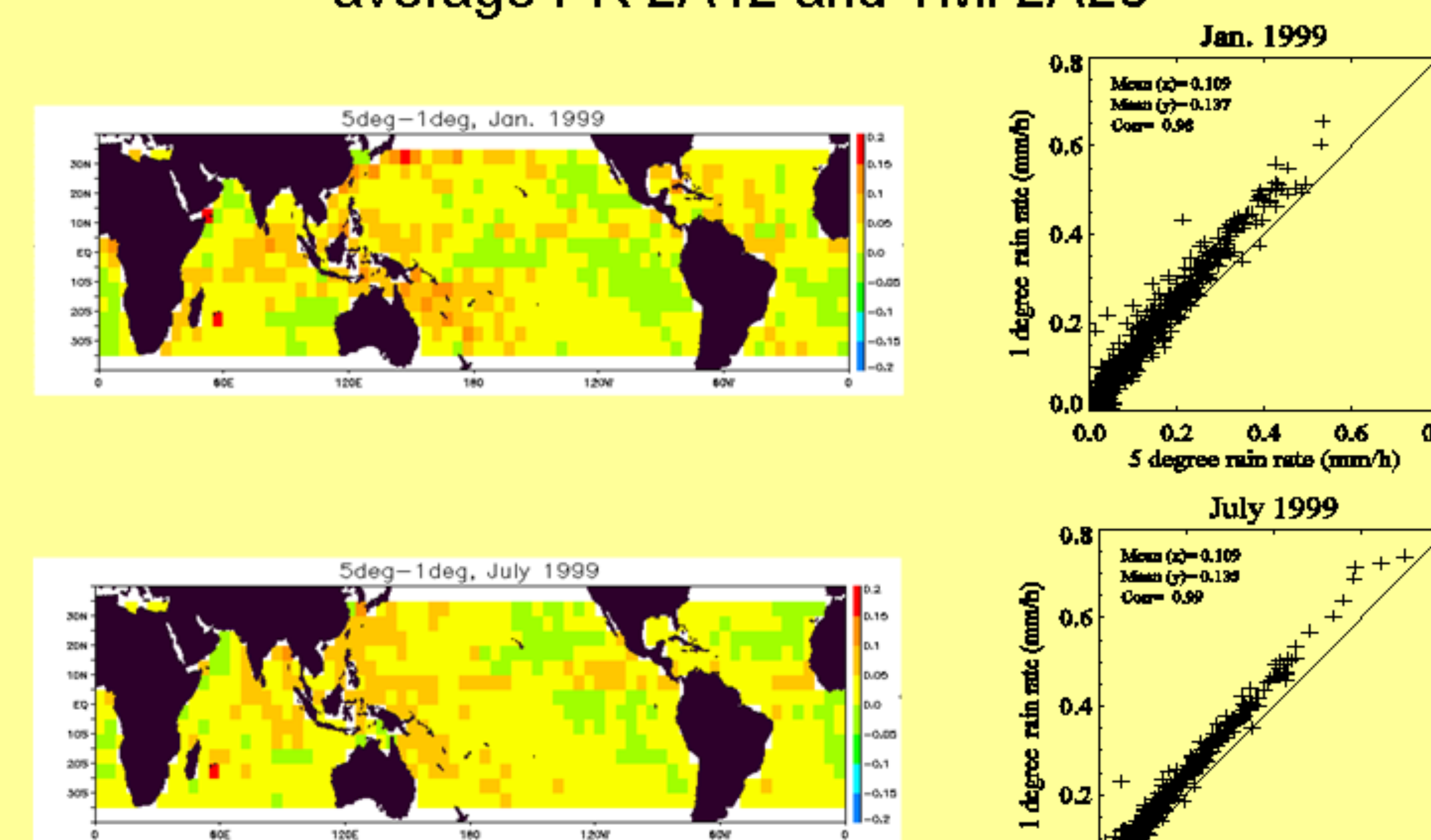


Fig 8. Maps of difference between average 1 degree product (5x5) and 5 degree product (left panel) and scatter plot of the 5 degree and 5x5 averaged 1 degree products for Jan 1999 and July 1999.

Ref: Chiu L. and D-B Shin, IGARSS IEEE Xplore, June 2011, Vancouver, Canada

SSMIS Processing

Collaborators: R. Adler, G. Huffman, E. Nelkin and D. Bolvin
With the demise of the SSM/I series, we examine the continuity of oceanic rainfall with SSMIS. Preliminary analysis shows a T_0 bias of -0.81K and large global mean differences occurs when fitting parameter χ^2 is large. An adjustment of 0.83 K was made and the χ^2 requirement was relaxed

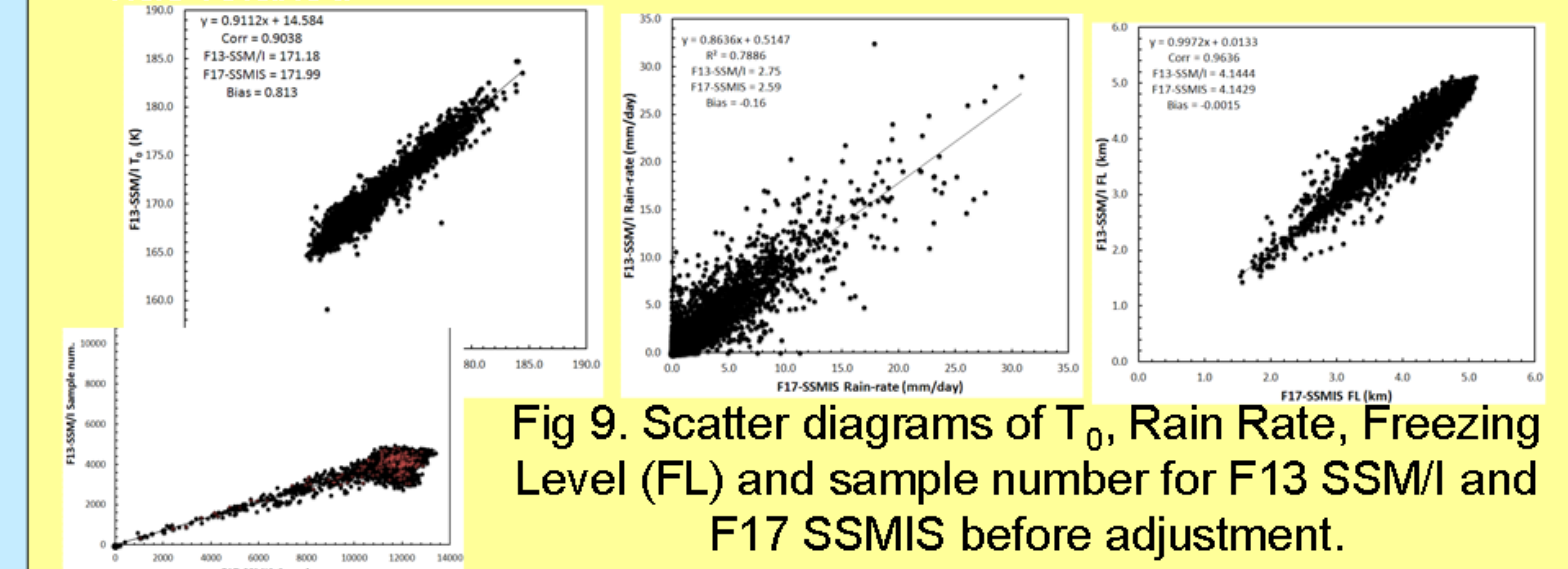


Fig 9. Scatter diagrams of T_0 , Rain Rate, Freezing Level (FL) and sample number for F13 SSM/I and F17 SSMIS before adjustment.

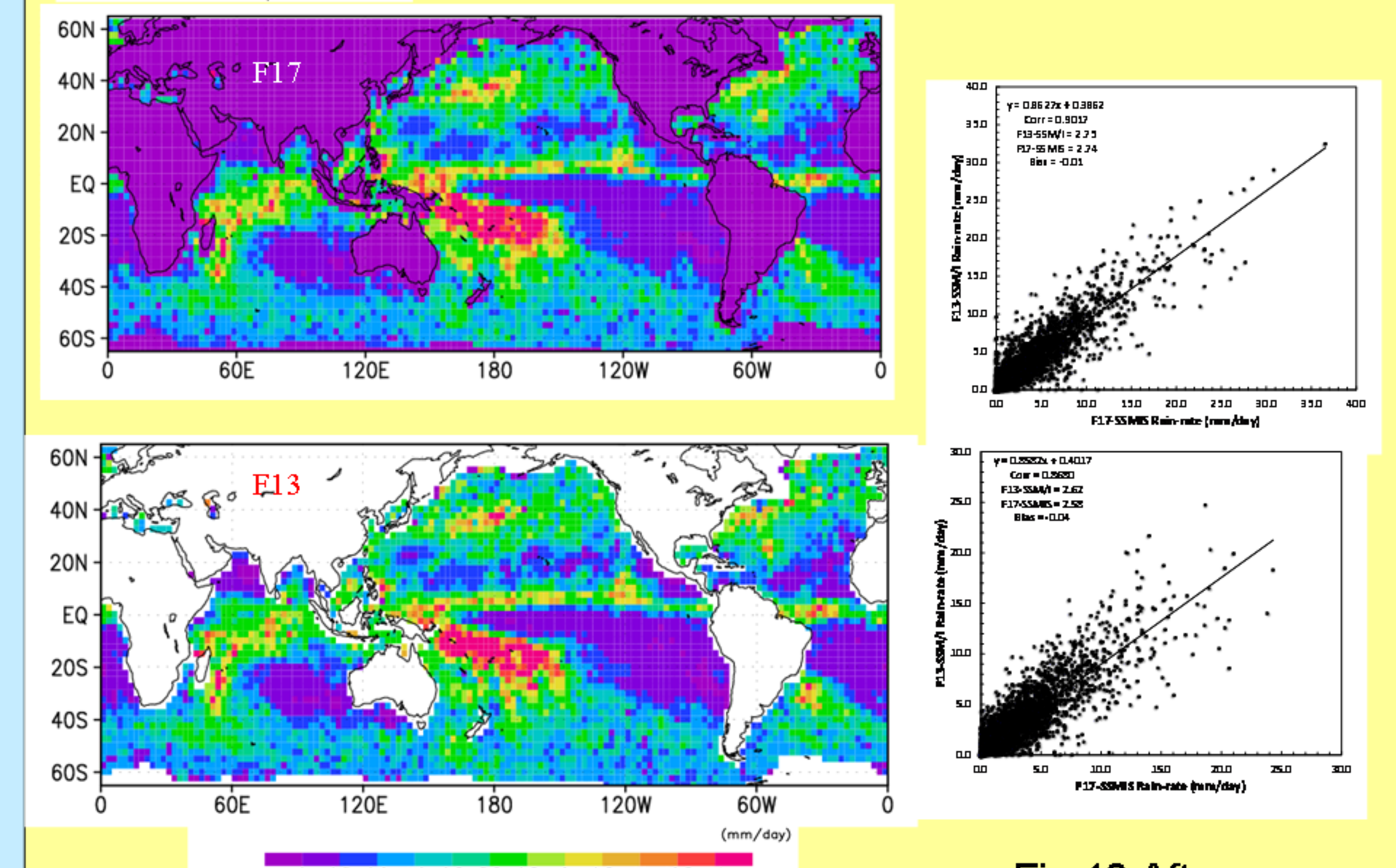
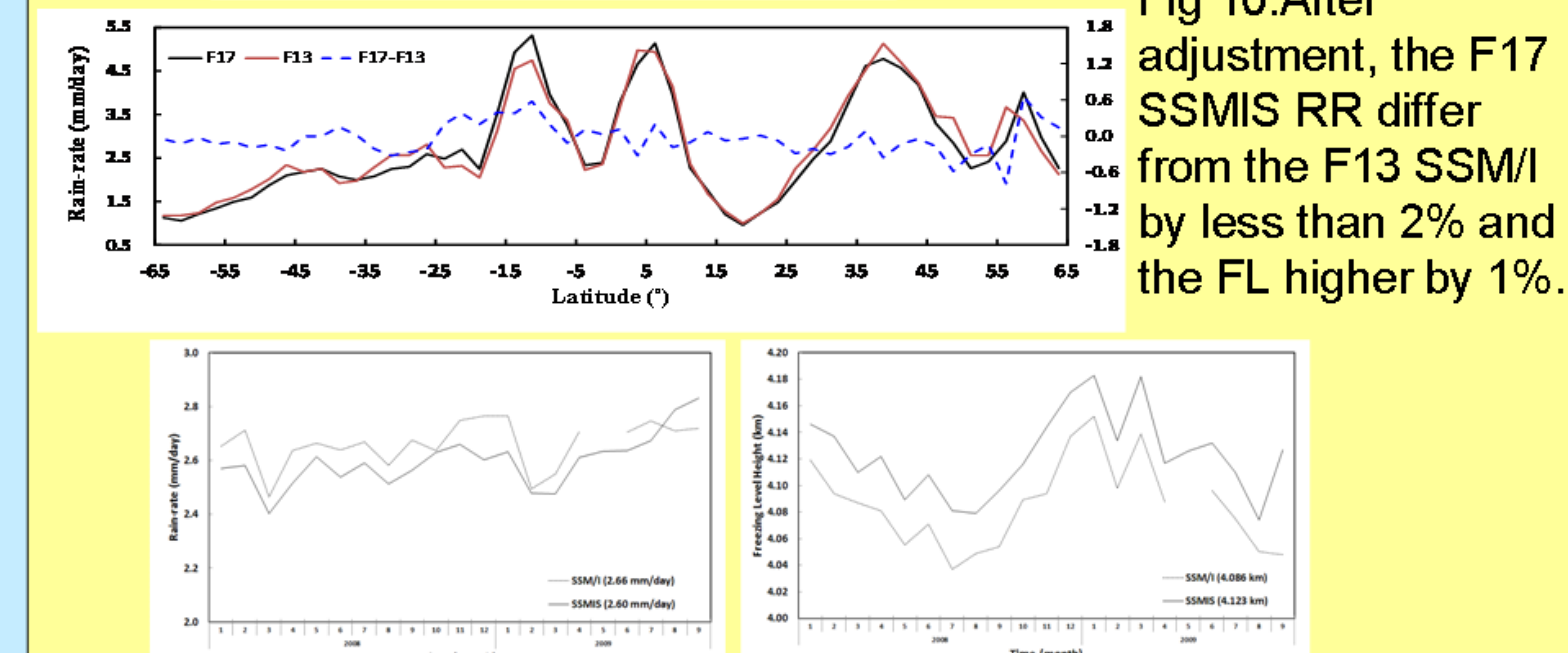


Fig 10. After adjustment, the F17 SSMIS RR differ from the F13 SSM/I by less than 2% and the FL higher by 1%.



Acknowledgment

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