INTERCOMPARISON OF OSTM/AMR AND AMSR-E CLOUD LIQUID RETRIEVAL ALGORITHMS

Sharmila Padmanabhan and Shannon Brown

Jet Propulsion Laboratory, California Institute of Technology,
4800 Oak Grove Drive, Pasadena, CA 91109

1. INTRODUCTION

In this paper, we compare the vertically integrated water content or cloud liquid water path (LWP) retrieved from the passive microwave brightness temperature measurements made by the Advanced Microwave Radiometer (AMR) with the LWP derived from the CloudSat as well as the LWP retrievals made using the Advanced Microwave Scanning Radiometer (AMSR-E) passive microwave observations.

2. AMR INSTRUMENT DESCRIPTION

The Advanced Microwave Radiometer (AMR) is an instrument flying on the Ocean Surface Topography Mission (OSTM/Jason2) radar altimetry satellite. OSTM/Jason2, which is designed to produce global maps of ocean surface topography, was launched on June 20, 2008 from the Vanderburg Air Force Base in California. AMR is included to measure the atmospheric path delay of the altimeter signal due to water vapor and cloud liquid water in the troposphere. If the path delay in the altimeter signal is left uncorrected, the errors in the altimeter range measurement will be large (3-45 cm). AMR operates at 18.7, 23.8 and 34 GHz with a nadir-viewing geometry and is a follow-on to the highly successful Jason1 mission which was launched on December 7, 2001 [1]. AMR is required to retrieve the wet tropospheric path delay with an RMS accuracy of 1.0 cm.

2. DISCUSSION AND RESULTS

Figures 1a, 1b and 1c are the maps of gridded six-month averages of the LWP retrieved from AMR, CloudSat (precipitation threshold of 500 um [2]), AMSR-E and TMI. Figure 1d is the zonal average of the LWP plotted as a function of the latitude for the variety of the retrievals being compared. The zonal average LWP estimated using CloudSat measurements is in good agreement with those retrieved using the AMR measurements. However, there is a large disagreement between AMSR-E (as well as TMI) and the AMR zonal averages of the LWP. This

disagreement is more pronounced at the poles and the tropics. The LWP retrievals from AMSR-E and TMI measurements are done using the same retrieval algorithm [3].

To investigate the cause of the disagreement, the differences between the SSM/I and the AMR retrieval algorithm [4] were compared in a quantitative fashion.
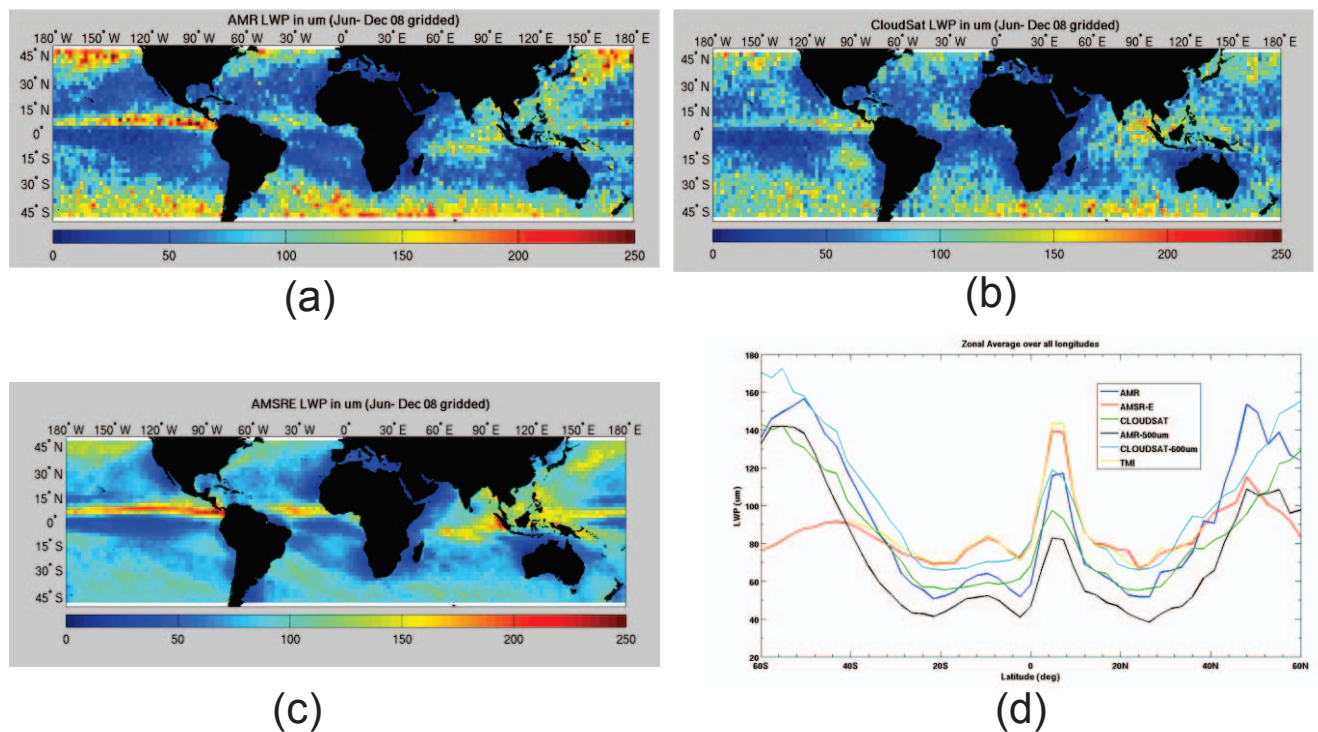

(a)

(b)

(c)

(d)

Figure 1(a) Six-month gridded averages of the LWP retrieved using AMR measurements; 1(b) same as 1(a) except for CloudSat retrieved LWP; 1(c) same as 1(a) except for AMSR-E retrieved LWP; 1(d) Zonal average as a function of latitude compared for AMR, AMSR-E, CloudSat and TMI.

11. REFERENCES

[1] S. Brown, C. Ruf, S. Keihm and A. Kitiyakara, "Jason Microwave Radiometer Performance and On-Orbit Calibration", Marine Geodesy, Vol. 27, No. 1 and 2, pp. 199-220.

[2] S. Kida, S. Shige, T. Manabe, T. S. L'Ecuyer and G. Liu, "Validation of rain/no-rain threshold value of cloud liquid water for microwave precipitation retrieval algorithm using Cloudsat precipitation product", Proc. SPIE, Vol. 7152, 715209 (2008).

[3] Wentz, FJ, 1997, "A well calibrated ocean algorithm for Special Sensor Microwave / Imager", Journal of Geophysical Research, 102, 8703-8718.

[4] Keihm, S.J., Janssen, M.A. and Ruf, C.S.,"TOPEX/Poseidon microwave radiometer (TMR). III. Wet troposphere range correction algorithm and pre-launch error budget", IEEE Transactions of Geosciences and Remote Sensing, Vol. 33, No. 1, Jan. 1995, pp. 147-161.