

The 7th GPM International Planning Workshop  
Bellesale Kudan, Tokyo, Japan  
Dec. 7 (Fri) 2007

# The Global Satellite Mapping of Precipitation (GSMaP) Project

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K. Aonashi, M. Kachi, R. Oki, and collaborators

# Web Site Open (Since Nov. 2007)

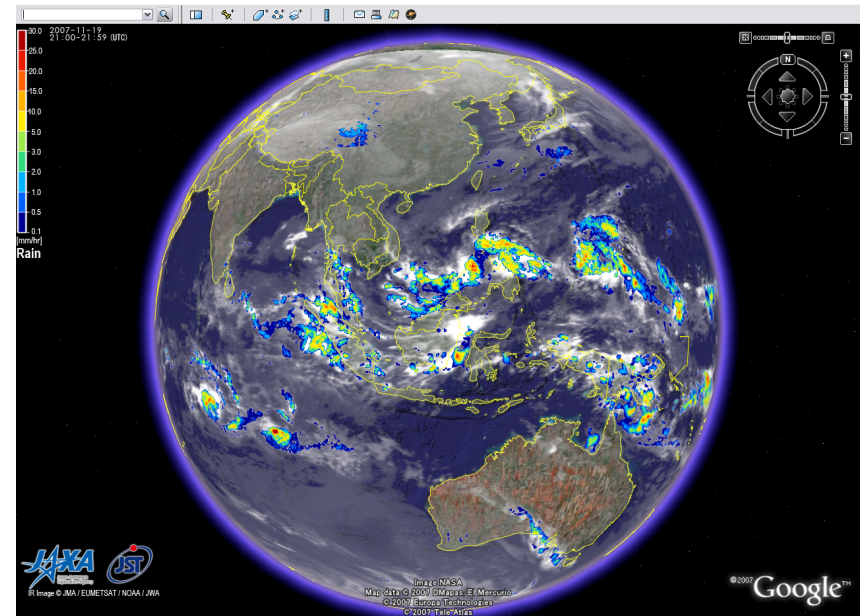
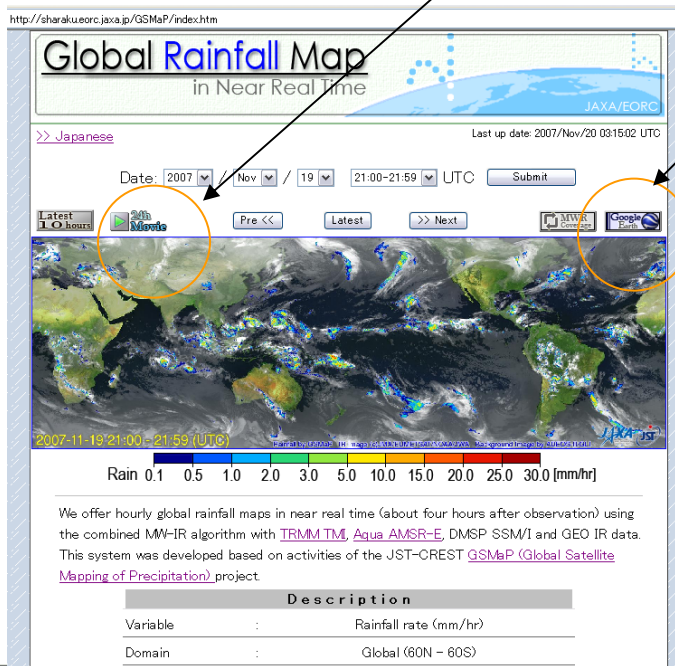
## Global Rainfall Map in Near Real Time by JAXA/EORC

<http://sharaku.eorc.jaxa.jp/GSMaP/>

We have started to release hourly global rainfall data (0.1x0.1deg. lat/lon) in near real time (about **four hours** after observations) and visualize the latest data quickly.

Movie Button

Google Earth Button

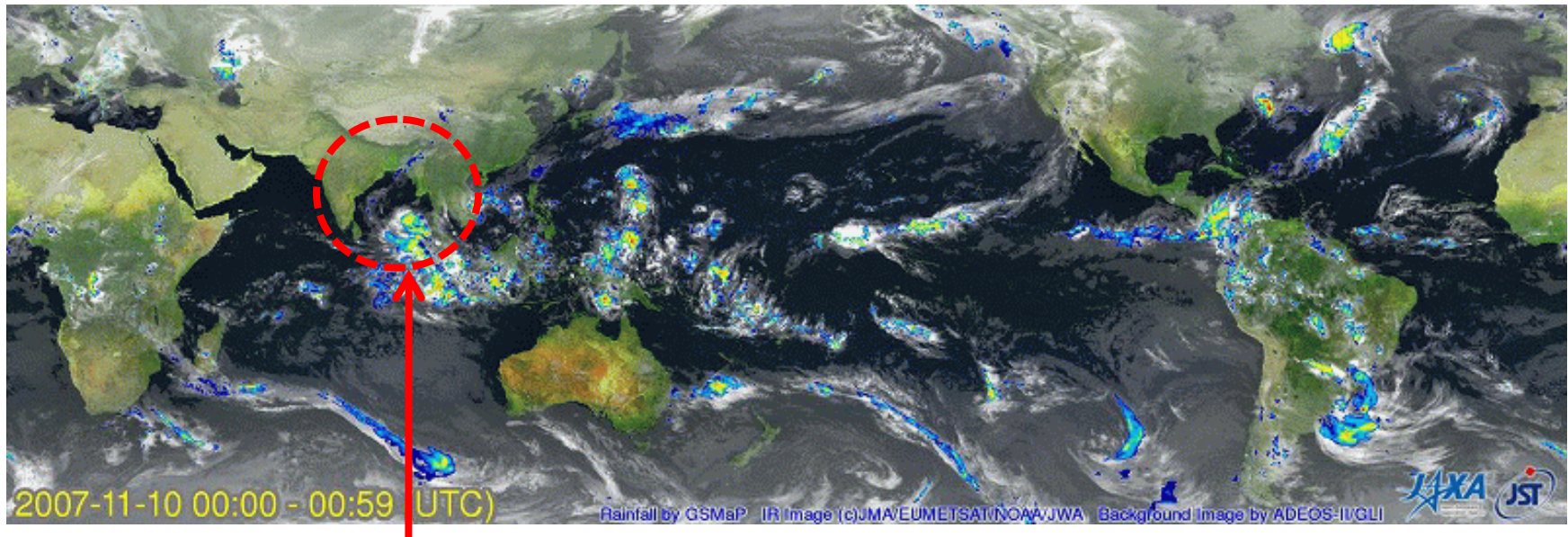




# Examples of the global rainfall maps

Global rainfall maps (overlapped with IR images)  
in the Near-Realtime system

Animation from 10th to 16th November 2007



A cyclon "SIDR" hit  
the coast of Bangladesh  
from the Bay of Bengal.

A movie made using figures in  
<http://sharaku.eorc.jaxa.jp/GSMaP/>

# System development

- ❑ The system was constructed using algorithms of the **Global Satellite Mapping of Precipitation (GSMaP)** project.
- ❑ Outline of the GSMaP project
  - ❑ A project sponsored by Japan Science and Technology Agency (JST)
  - ❑ P. I. : Prof. K. Okamoto (Osaka Pref. Univ., Japan)
  - ❑ Research activities from Nov. 2002 to Oct. 2007
- ❑ The algorithms are mainly composed of
  - ❑ Microwave radiometer (MWR) algorithm
  - ❑ Blended MWR-IR algorithms

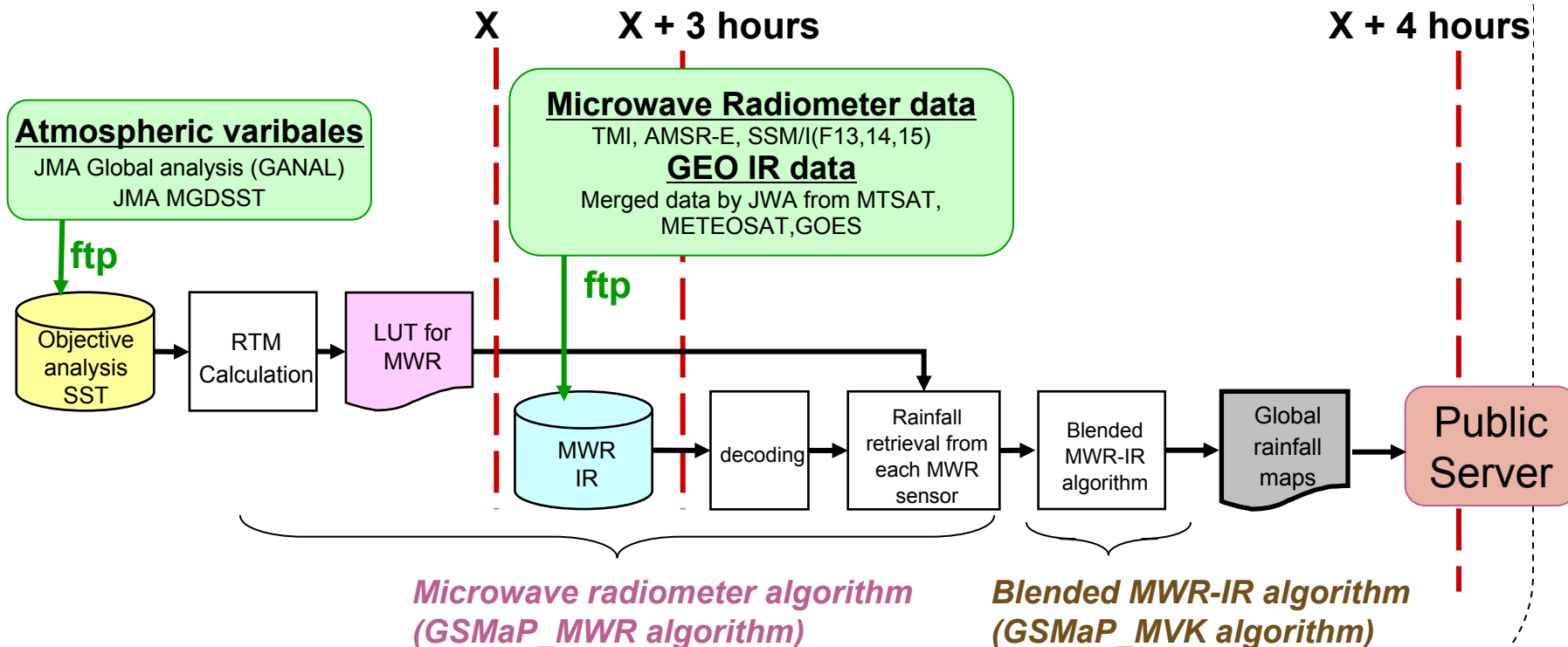
# Flowchart of the GSMaP NRT System

Look-up Tables for daily  
5.0 deg. resolution

Data collection in first three hours, and  
calculation within an hour

Look-up Tables for MWR  
retrievals (once a day)

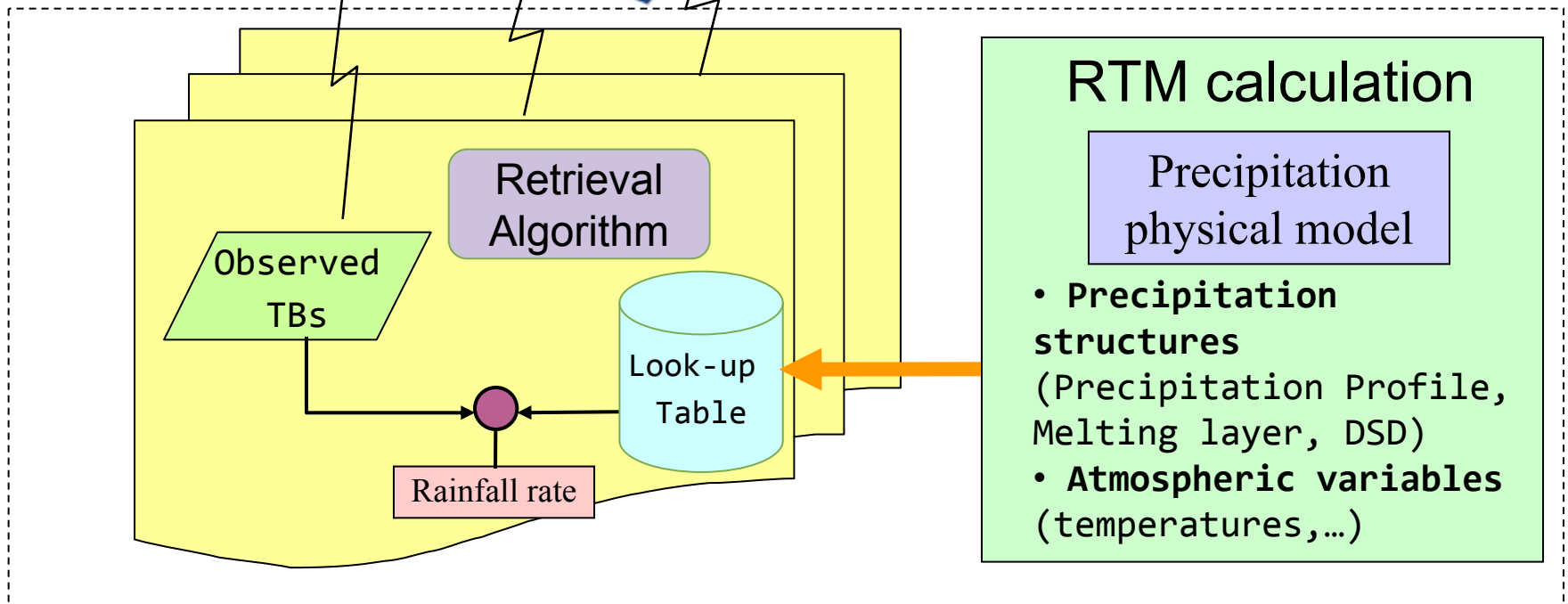
Production of Global Rainfall Map (hourly)





# Basic idea of the GSMaP\_MWR Algorithm

(Aonashi and Liu 2000,  
Kubota et al. 2007)



- Physical algorithm based on the Radiative Transfer Model (RTM)
- Necessary for assuming precipitation physical model for RTM calculations and developing methods such as Rain/No-rain classification

# Developments of GSMaP\_MWR algorithm

## Improvement of scattering algorithm

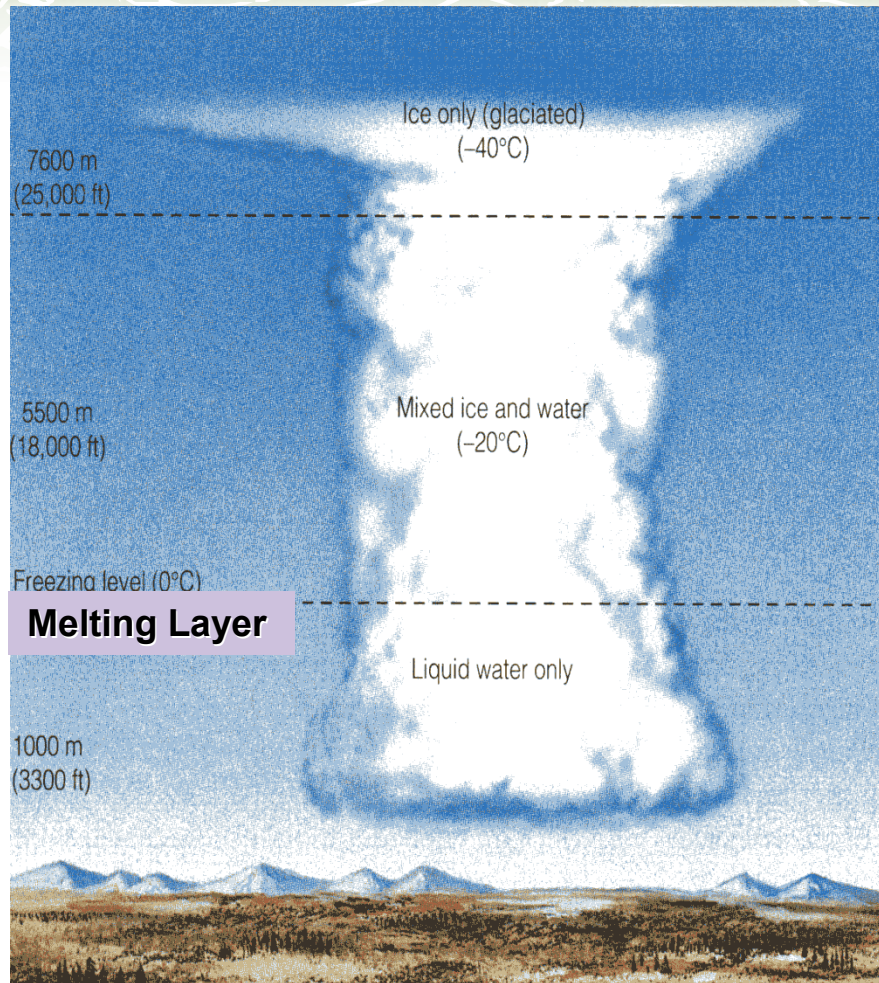
Utilization of PCTs at 85GHz and 37GHz  
(by Dr. Aonashi)

## Melting layer model

Common model of PR2A25 algorithm (Nishitsuji model) by Prof. Awaka and Dr. Takahashi

## Rain drop size distribution (DSD) model

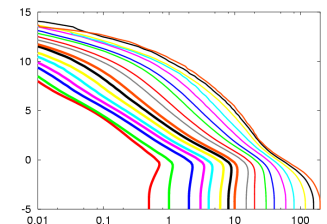
Gamma DSD model estimated from epsilon values of TRMM PR  
(by Prof. Koza)



## Rain/No-rain Classification (RNC) Method Tb Database method by Dr. Seto

## Precipitation profile model

Statistical Profiles derived from TRMM PR



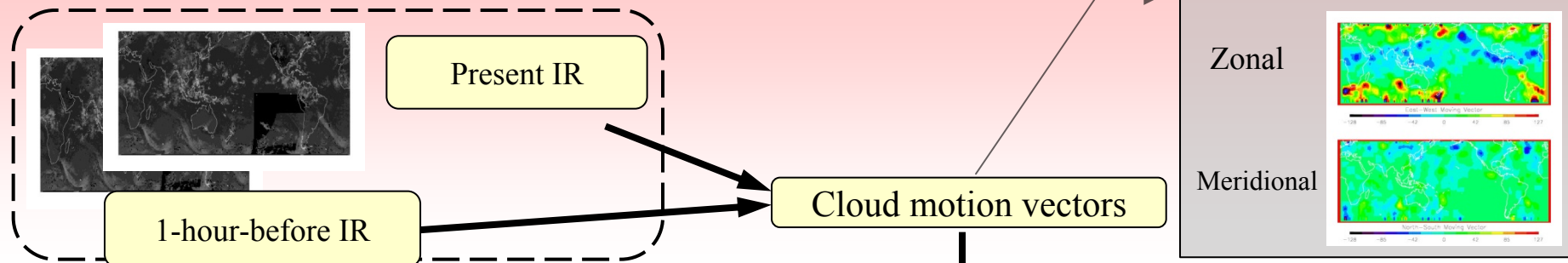
(by Prof. Takayabu, with Dr. Hirose)

## Atmospheric information: Objective analysis (JMA GANAL)

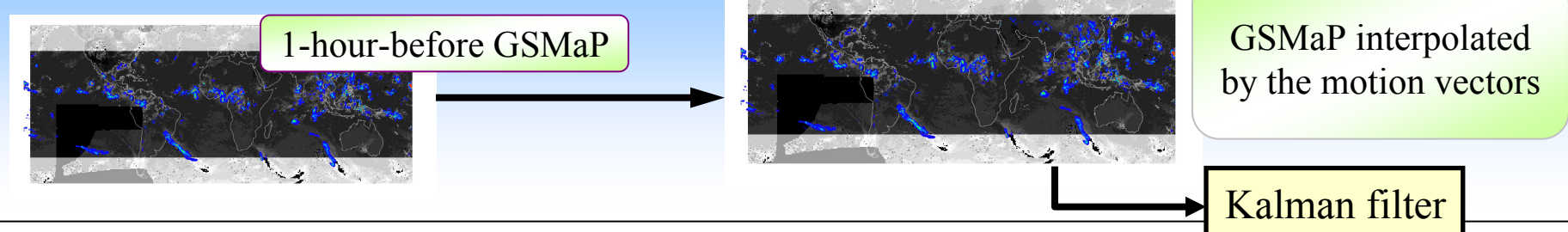


# Flowchart of Blended MWR-IR algorithm (GSMaP\_MVK algorithm)

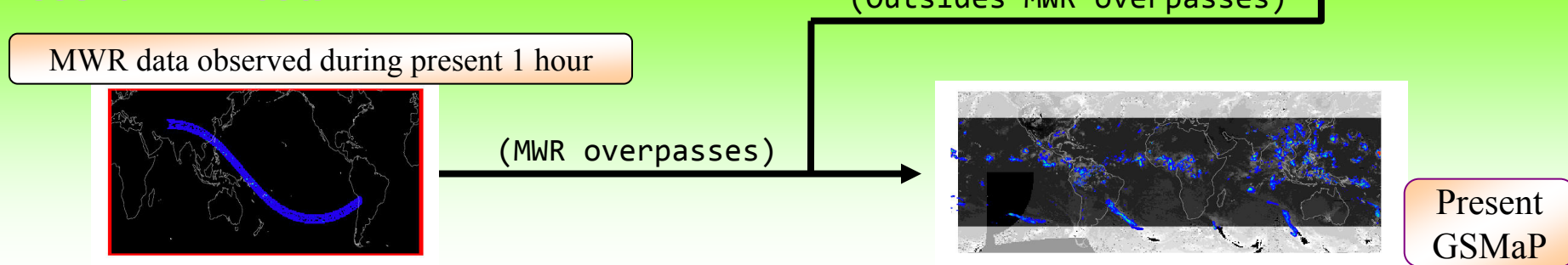
## GEO IR data



## Past GSMaP data



## Present MWR data

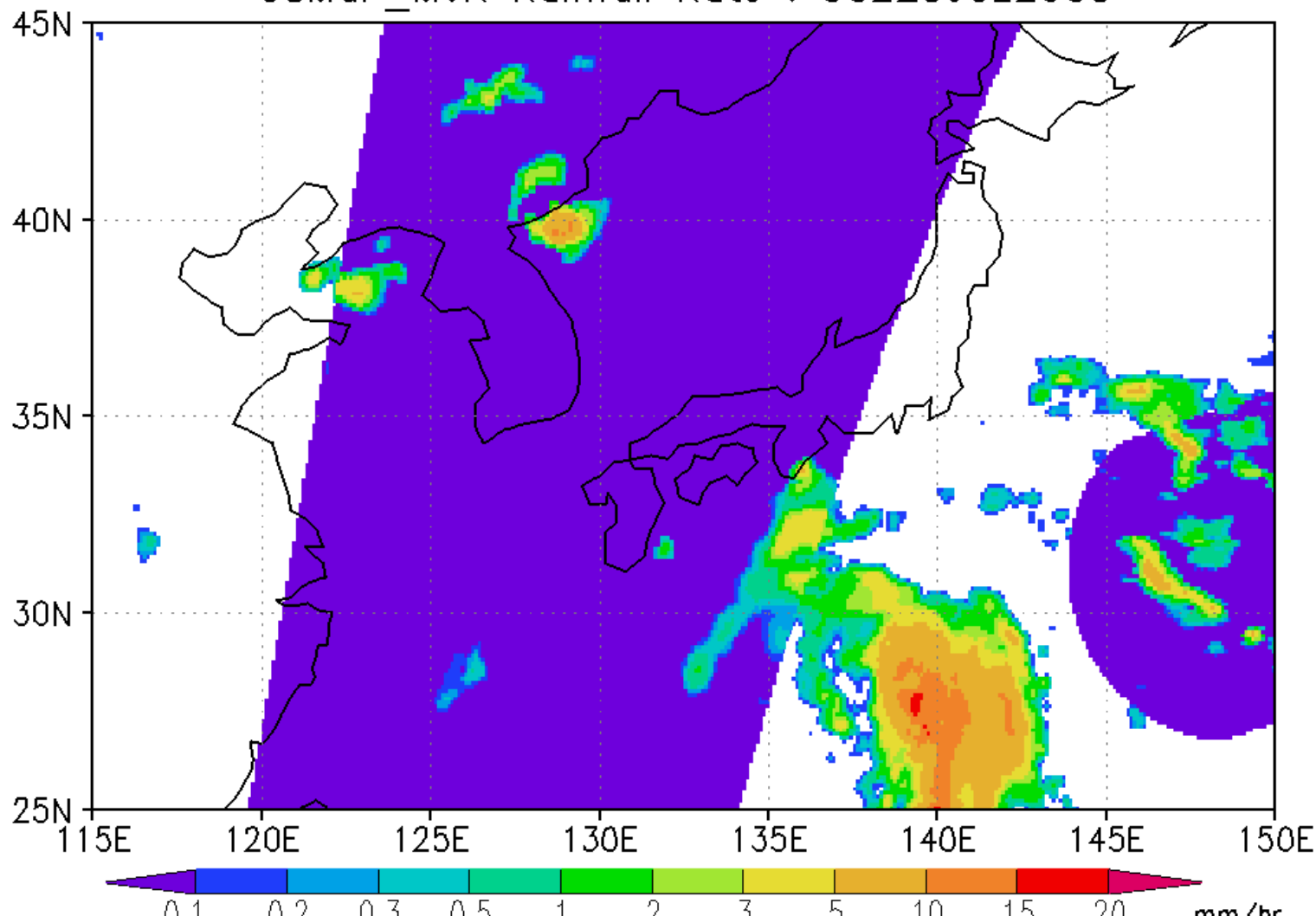




# GSMaP\_MVK by the blended MWR-IR algorithm (hourly, Typhoon 200507/BANYAN)

(Blue violet areas show MWR overpasses.)

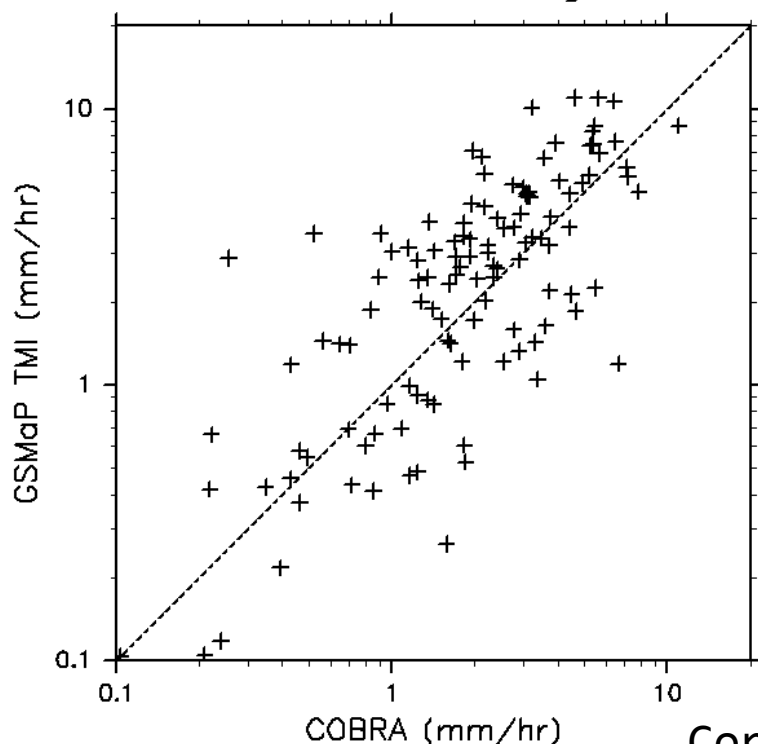
GSMaP\_MVK Rainfall Rate : 00Z25JUL2005



# Comparison with the ground-radar (COBRA)

Comparison of TMI retrievals (GSMaP\_TMI) with COBRA data for four selected overpasses during June 2004 (0.25 x 0.25 deg.)

Rain rate (0.25x0.25 deg.) : GSMaP



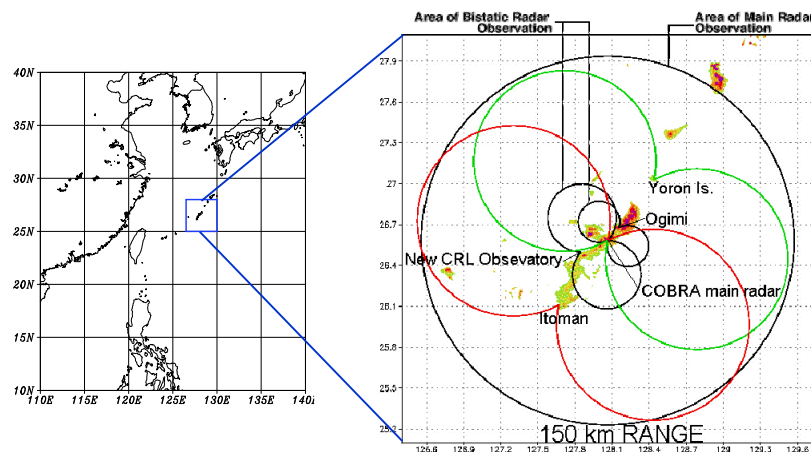
Correlation : 0.82

RMSE(mm/hr) : 1.37

NICT Okinawa Bistatic  
Polarimetric Radar  
(COBRA)  
C-band(5340 MHz)  
10 minute cycle



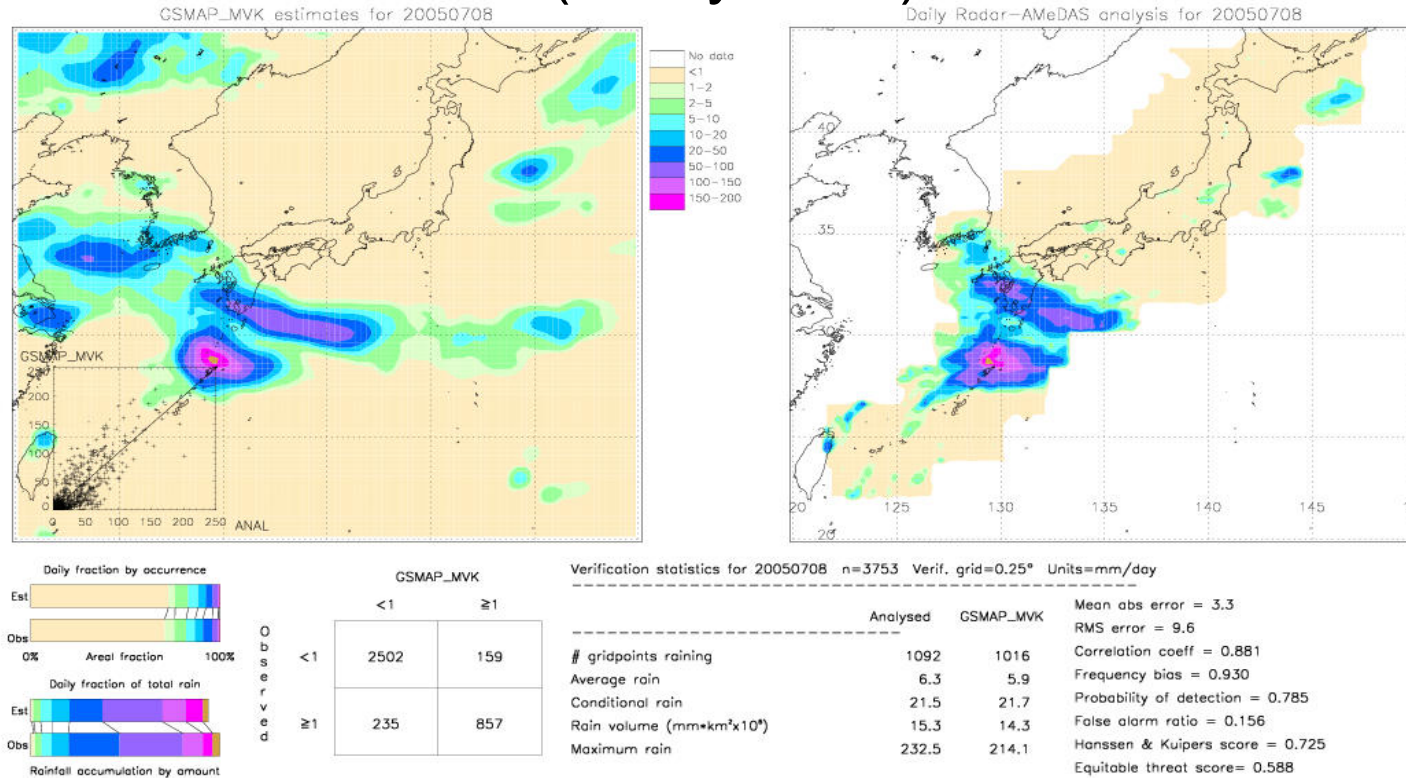
A field campaign of observing precipitation in Okinawa, Japan during rainy season of 2004 (okn-baiu04)





# Validation using JMA Radar-AMeDAS Analysis

## GSMaP\_MVK (8 July 2005) Radar-AMeDAS

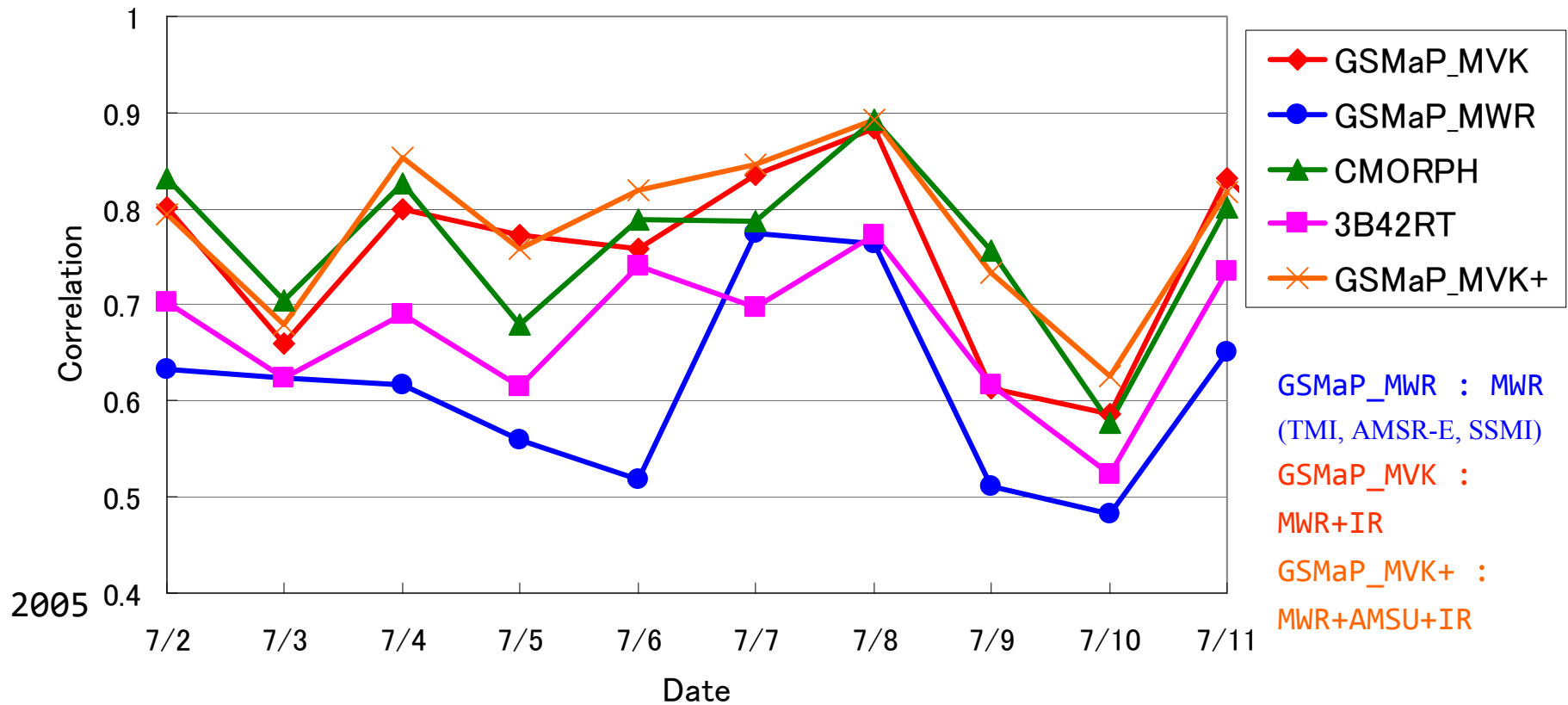


The GSMaP joins the IPWG/PEHRPP activities and validates various satellite estimates around Japan using JMA Radar-AMeDAS analysis.

Comparisons in daily averaged rainfall estimates with 0.25 x 0.25 deg. resolution are shown in <http://www.radar.aero.osakafu-u.ac.jp/~gsmmap/IPWG/dailyval.html>

# Comparison between products of GSMP and others

Correlation for daily mean Radar-AMeDAS data



Daily series of correlation coefficients between the satellite estimates and the RA. The data are daily averaged with 0.25 deg. lat/lon.



# Summary

- ❑ Web site in near-real time using GSMaP algorithms
  - ❑ <http://sharaku.eorc.jaxa.jp/GSMaP/>
- ❑ Microwave radiometer algorithm (GSMaP\_MWR algorithm)
  - ❑ Algorithm developments using various attributes of TRMM PR observations
    - ❑ ex. Precipitation profile, DSD model, Scattering algorithm, Rain/no-rain Classification method
  - ❑ Developments based on the common physical model between MWR and PR algorithms
    - ❑ Melting layer model
- ❑ Blended MWR-IR algorithm (GSMaP\_MVK algorithm)
  - ❑ Cloud motion vector and kalman filter
- ❑ Validation