Monsoon Crosscut

By Jun Matsumoto

CEOP at Melbourne, Australia

August 19, 2009

Australian central region viewed from the plane between Singapore and Melbourne on August 16, 2009

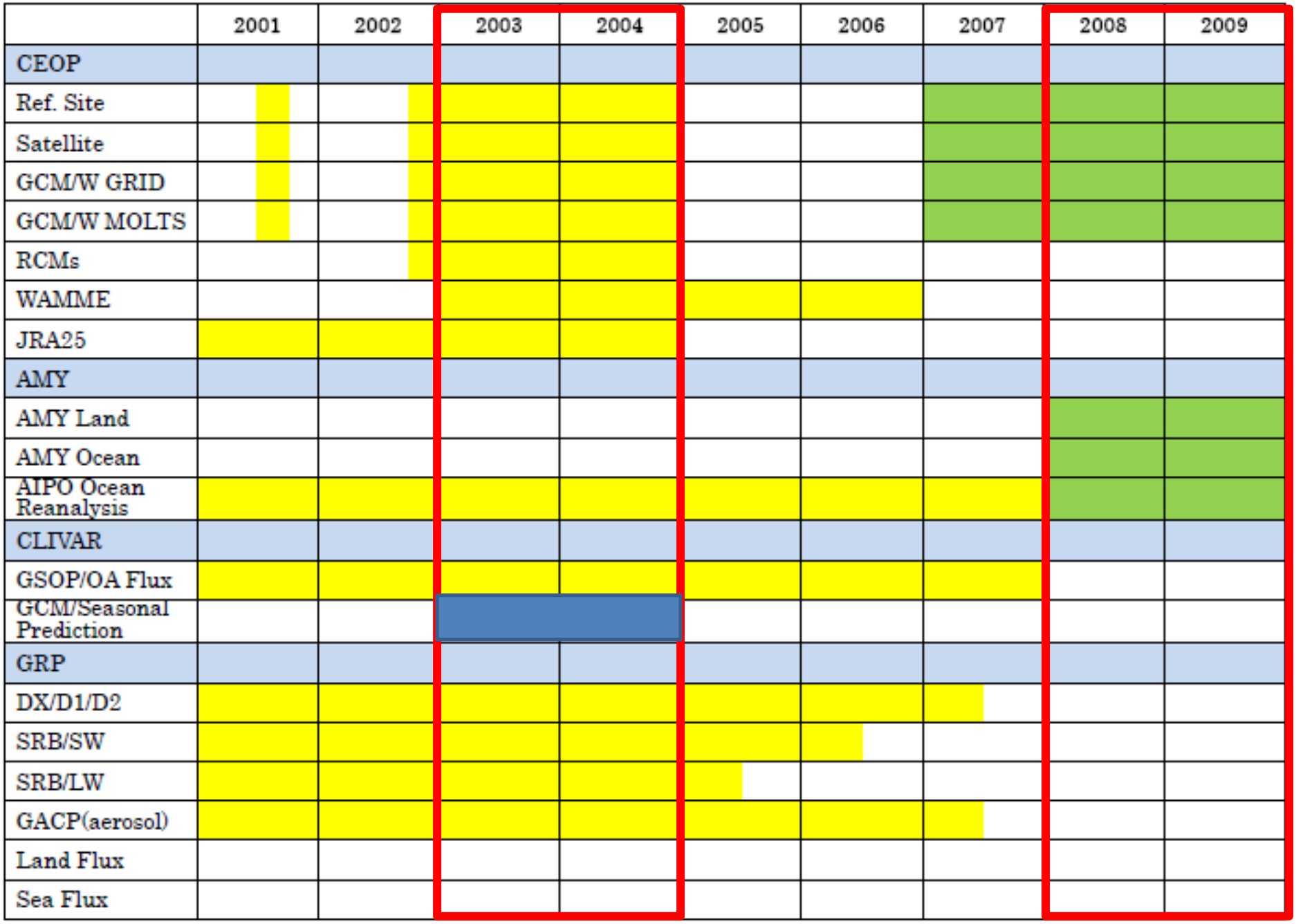
CEOP Monsoon (1)

- The ultimate goal of MONS is to clarify the role of land, ocean and aerosol on monsoon variability in order to help operational centers to improve forecasts of monsoon variability, in particular from intra-seasonal to inter-annual time-scales. To tackle this goal, it is needed to share common recognition of the need to advance knowledge of energy and water cycle processes in various monsoon regions over the major continents in the world.

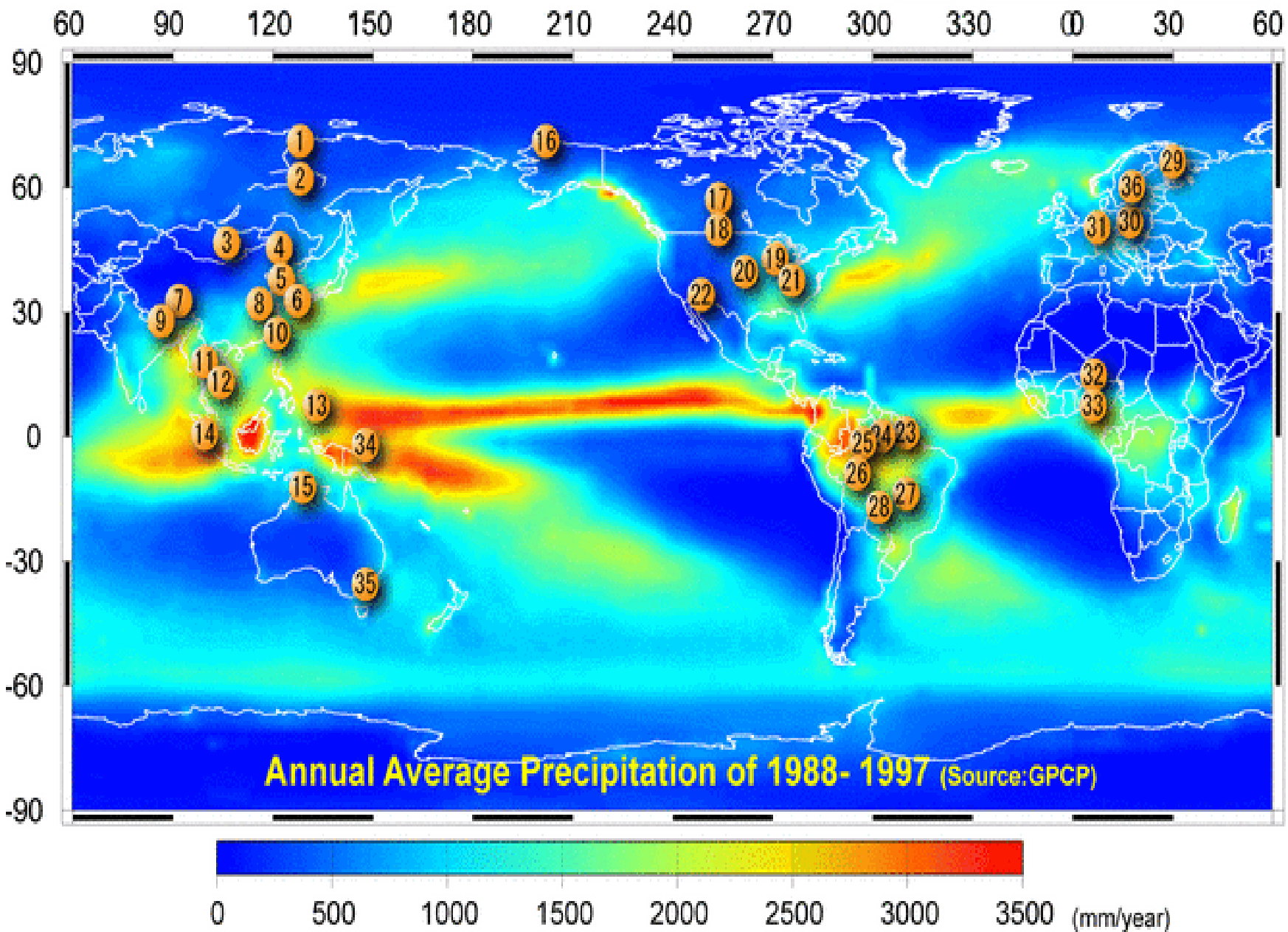
CEOP Monsoon (2)

CEOP MONS will address the following questions by examining the land surface-ocean-atmosphere feedbacks that may affect the different stages of the monsoon precipitation by utilizing CEOP data:

- What are the characteristics of land-ocean-atmosphere interactions in the evolution and variation of monsoon system?
- How do the diurnal, intraseasonal, seasonal and inter-annual variations of monsoon interact with land surface?
- What is the impact of nearby high elevated heating onto the monsoon system?
- What is the role of the monsoons on extremes, such as floods and droughts?
- What is the role of human activity on changing the activity and/or characteristics of monsoons?


2001
2002
2003
2004
2005
2006
2007
2008
2009
CEOP
Ref. Site
Satellite
GCM/W GRID
GCM/W MOLTS
RCMs
WAMME
JRA25
AMY
AMY Land
AMY Ocean
AIPO Ocean Reanalysis
CLIVAR
GSOP/OA Flux
GCM/Seasonal Prediction
GRP
DX/D1/D2
SRB/SW
SRB/LW
GACP(aerosol)
Land Flux
Sea Flux

PHASE-1 REFERENCE SITE LOCATIONS



Recommendations to GEWEX Panels by SSG21 (Jan., 2009)

- It is recommended that the leaders of monsoon studies develop common themes to be studied and that the Coordinated Energy and Water Cycle Observations Project (CEOP) organize a meeting concerning this.

-> Pan-WCRP monsoon meeting was organized in October 2008 during IMW-IV meeting at Beijing. CEOP monsoon activity was introduced, but regional cross-cut activities have not progressed much since then.

-> Cross-cut with YOTC has started since July 2009.

We will have common target period in 2008 and 2009 for understanding interaction of monsoon rainfalls with MJO activities.

Report of the 2nd Pan-WCRP Monsoon Workshop (PWM-2) (draft 09/01/20)

by Prof. Tetsuzo Yasunari (Former JSC, in charge of monsoon-crosscut)

The 2nd Pan-WCRP Monsoon Workshop was held in Beijing, China for 2 and a half days from October 23 to 25, in conjunction with the 4th International WMO Monsoon Workshop (IWM-4). More than 60 scientists participated and discussed the overall issues on monsoons of the world. Particular emphasis was given to near-term scientific issues and strategy to solve these issues.

1) What are issues?

a. Role of multi-time scale interactions from diurnal cycle, synoptic-scale, intraseasonal variability (ISV) and seasonal cycles in monsoon predictions and its importance in extreme events in monsoons

b. Role of fine-structure orographies, land-ocean configuration (including role of coasts) in forcing monsoon cloud systems

c. Role of lands vs oceans in seasonal prediction of monsoons, including local to global scales

d. Role of aerosols -importance of aerosol-monsoon interaction in monsoon heating processes

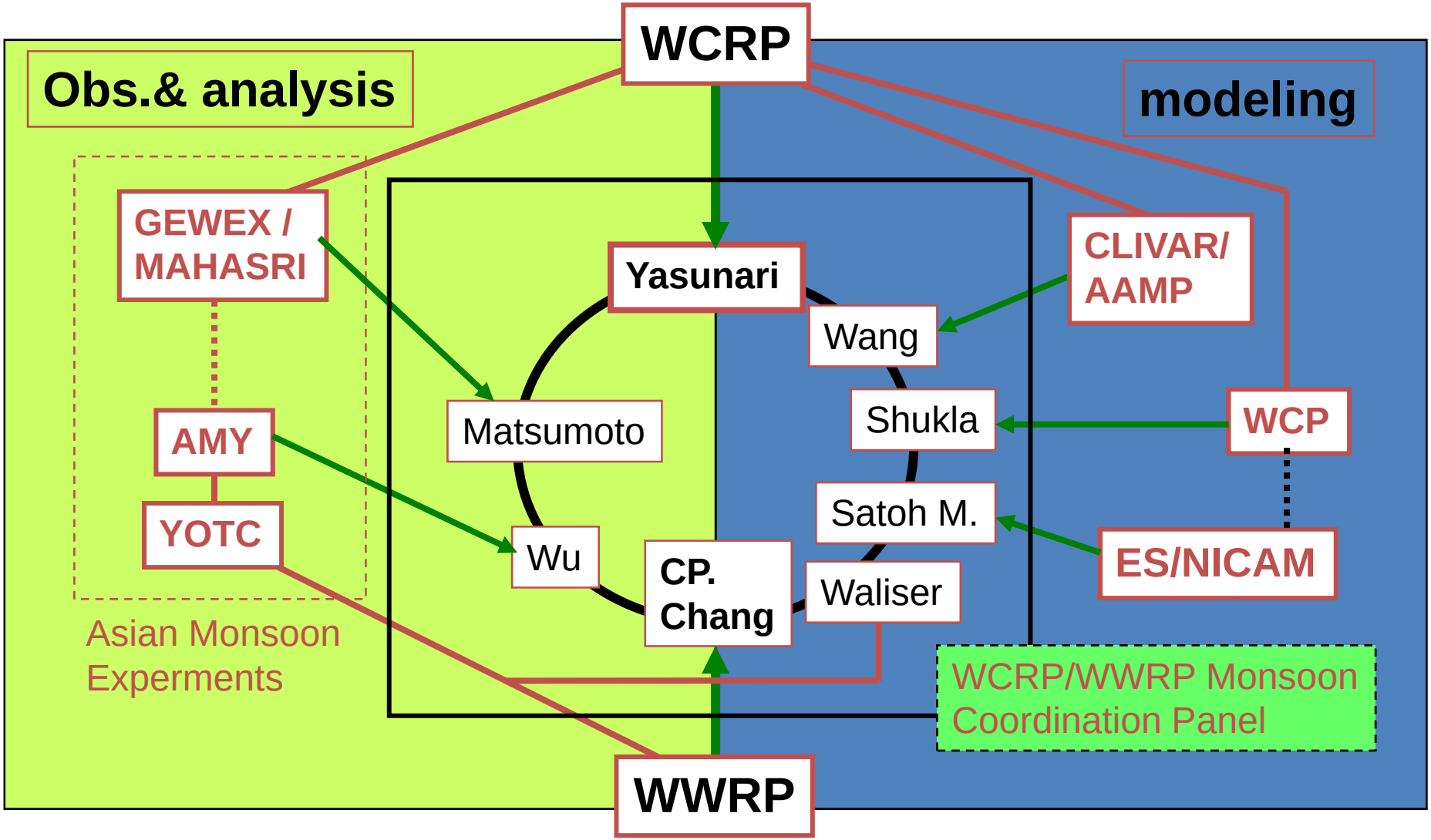
2) What we should do?

a. High-resolution modeling (with spatial scales of 10km or less, and cloud resolving) including optimal utilization of NICAM (Nonhydrostatic / Cosahedral Atmospheric Model) simulation.
b. Observations & modeling for solving ocean-atmosphere (and land-atmosphere) interaction processes for intraseasonal time scale
c. Optimal use of data archived through various projects and campaigns (AMY, YOTC, CEOP etc.) and data assimilation (hopefully, including land and ocean surface processes)

3) What strategy we should take?

To function the WMCP for promoting these strategic plan within the three years or so, core leading group (about 10 scientists) need to be established, who are responsible for the overall activity of WMCP, including planning of the Pan-WCRP monsoon workshops and meetings. IPOs of GEWEX and CLIVAR should support this activity (though the IPOs can support travel only for 4-5 scientists). we also need a group who will coordinate with NICAM group for high-resolution modeling studies for monsoons (particularly, diurnal cycles, ISV etc.)

Monsoon Coordination for observations & modeling on AMY/YOTC (suggested at the 2nd Pan-WCRP Monsoon WS in Beijing, Oct.23-25, 2008)



MJO/MISO Hindcast Experiment Plan

A joint effort by

CLIVAR/AAMP, APCC, YOTC and AMY

Hindcast Experiment for Intraseasonal Prediction

1. Motivation

The Madden-Julian Oscillation (MJO)

interacts with, and influences, a wide range of weather and climate phenomena (e.g., monsoons, ENSO, tropical storms, mid-latitude weather), and represents an important, and as yet unexploited, source of predictability at the subseasonal time scale.

The Monsoon Intraseasonal Oscillation (MISO)

is one of the dominant short-term climate variability in global monsoon system

The wet and dry spells of the MISV strongly influence extreme hydro-meteorological events, which composed of about 80% of natural disaster, thus the socio-economic activities in the World's most populous monsoon region.

2. Need for a Coordinated Multi-Model ISO Hindcast Experiment

There are still **great uncertainties regarding the level of predictability that can be ascribed to the MJO, other subseasonal phenomena and the weather/climate components that they interact with and influence.** The development and analysis of a multi-model hindcast experiment is needed to address the above questions and challenges.

The development of an MME is **the intrinsic need for lead-dependent model climatologies (i.e. multi-decade hindcast datasets) to properly quantify and combine the independent skill of each model as a function of lead-time and season.**

Hindcast Experiment for Intraseasonal Prediction

3. Objectives

- Better understanding of the physical basis for intraseasonal prediction. Determine potential and practical predictability of ISO in a multi-model frame work.

- Developing optimal strategies for multi-model ensemble (MME) ISO prediction system, including effective initialization schemes and quantification of the MME's ISO prediction skills with forecast metrics under operational conditions.

- Revealing new physical mechanisms associated with intraseasonal variability that cannot be obtained from analyses of a single model.

- Identifying model deficiencies in predicting ISO and finding ways to improve models' convective and other physical parameterizations relevant to the ISO through development of model process diagnostics.

- Help to determine ISO's modulation of extreme hydrological events (e.g., midlatitude weather, monsoon depressions, and tropical cyclones) and its contribution to seasonal and interannual climate variation.

Hindcast Experiment for Intraseasonal Prediction

4. Experimental Design

EXP1: Control Simulation

A long simulation allows us to better understand the dependence of the prediction on initial conditions and better define metrics that measure the "drift" of the model toward their intrinsic MJO/MISV modes

Free coupled runs with AOGCMs or AGCM simulation with specified boundary forcing (e.g., observed SST and Sea ice distribution) are requested for at least 20 years. The period for the forced AGCM run should be consistent with the hindcast period

EXP2: ISO Hindcast

Retrospective Forecast Period	**20 years from Jan 1989 to Decembr 2008 MJJAS 2009 (optional)**
Initial Date	**Every 10 days on 1st, 11th, and 21st of each calendar month**
The Length of Integration	**At least 45 days**
Ensemble Member	**At least 6 members**
Initial condition	**Initial conditions may use one day or 12 hours lag**

Hindcast Experiment for Intraseasonal Prediction

5. Current Status

Institution	Participants	Current Status
ABOM	Harry Hendon	26-year integration initiated the first day of every month with 10 ensemble simulations (1980-2006)
COLA and GMU	E. Jin, J. Kinter, J. Shukla	
ECMWF	F. Molteni, Frederic Vitart	1991-2007 integration initiated the 15th of every month with 15 ensemble simulation
GFDL	W. Stern	26-year integration initiated the first day of every month with 10 ensemble simulations
IAP/LASG	T. Zhou, B. Wang	
JAMSTEC/APL	T. Yamagata, J.-J. Luo	
NASA/GMAO	S. Schubert, P. Pegion	20-year integration initiated every day, AGCM only
NCEP/CPC/EMC	A. Kumar, J. E. Schemm, Augustin Vintzileos	26-year integration initiated every month with initial condition of 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 29, 30, 1, 2, 3
SNU	I.-S. Kang	21-year integration initiated every five days during NDJFM season
UH/IPRC	X. Fu, J.-Y. Lee	20-year integration initiated every 5 day during MJJAS
UM	B. Kirtman	
INGV	Annalisa Cherichi	
MRD/EC	Gilbert Brunet, Hai Lin	20-year integration initiated every 10 days (almost finished), AGCM only
CWB	Mong-Ming Lu	20-year integration initiated every 15 days, working on the case with 21st initial condition
BCC/CMA	Zhang Peiqun, Chen Lijuan	

JRA-55 & AMY reanalysis by MRI/JMA

Dr. Kiyotoshi Takahashi
Japan Meteorological Agency
Tokyo, Japan
Dr. Hirotaka Kamahori
Climate Research Divivion
Meteorological Research Institute
Tsukuba, Japan

Outline of JRA-55

- JMA has just started the new reanalysis project, JRA-55.
- Computation will start in 2010.
- The production of the global analysis will be completed in the end of 2012JPFY.
- AMY Reanalysis will be conducted at the first stage of JRA-55.

	JRA-25	JRA-55
Target Period	1979-2004 (26 years)	1958-2012 (55 years)
Model	T106L40 (~110km)	TL319L60 (~60km)
Assimilation scheme	3D-var	4D-Var
Continuation	JCDAS 2005～	Under planning

AMY Re-analysis

- **Input data**

  Surface (Ps, T, RH, U, V)

  Upper level (Z, T, RH, U, V)

  Ship (Ps/Z, T, RH, U, V)

  Airplane (Z, T, RH, U, V)

  Satellite(Direct assimilation, Retrieve quantity assimilation)

- **Products**

  Model surface analysis (640x320 : 0.5625deg) ～ 60Km

  Pressure level analysis (288x145 : 1.25deg) ～ 140Km

  Physical monitor

Global Data Assimilation System

- ✓ **Prediction model**

  Resolution: TL319L60 (model top:0.1 hPa) ～60km

  Cumulus parameterization: Arakawa-Schubert

  SST : COBE

  Boundary layer : Y-M level-2

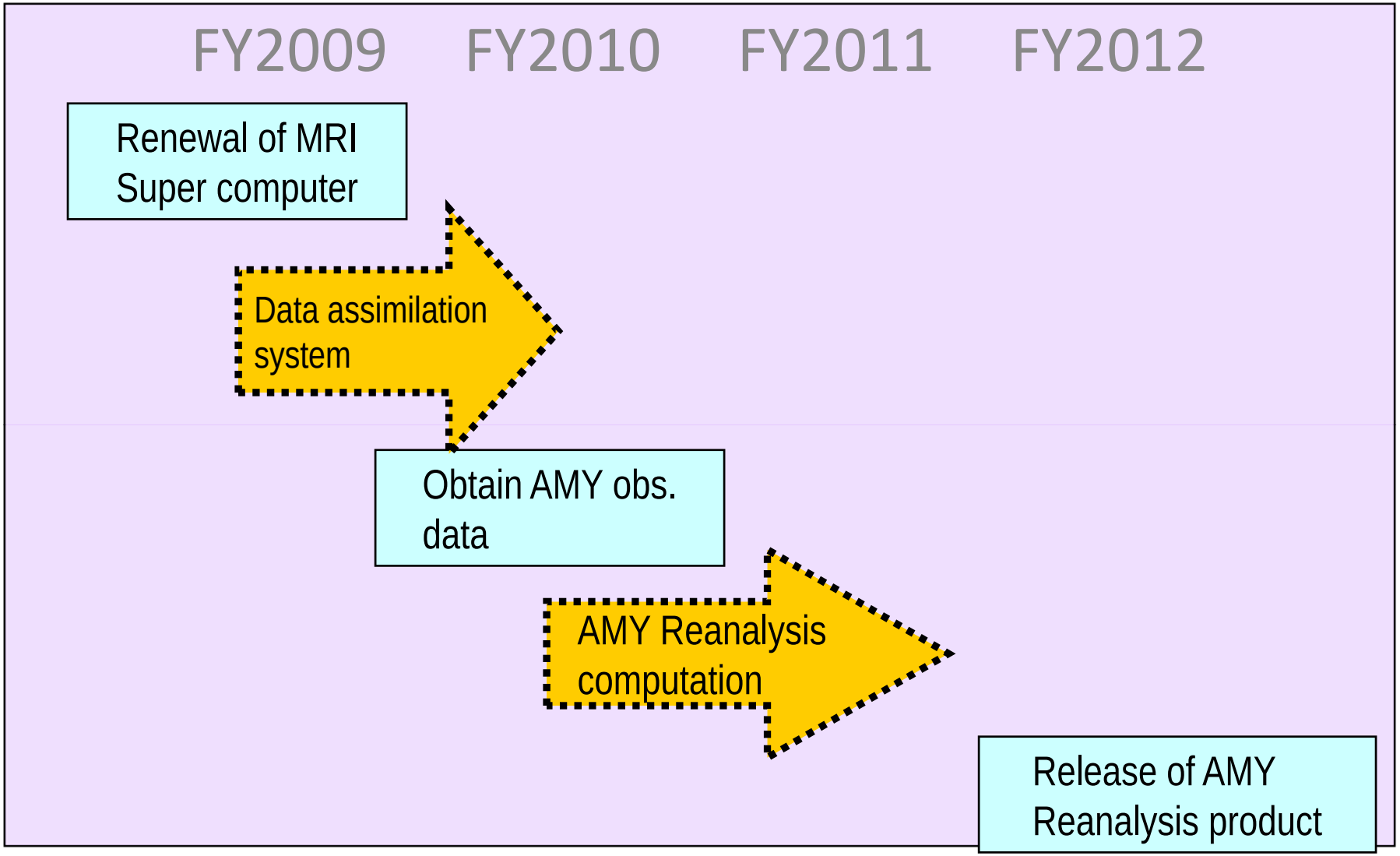
- ✓ **Assimilation scheme**

  Algorism: 4D-VAR

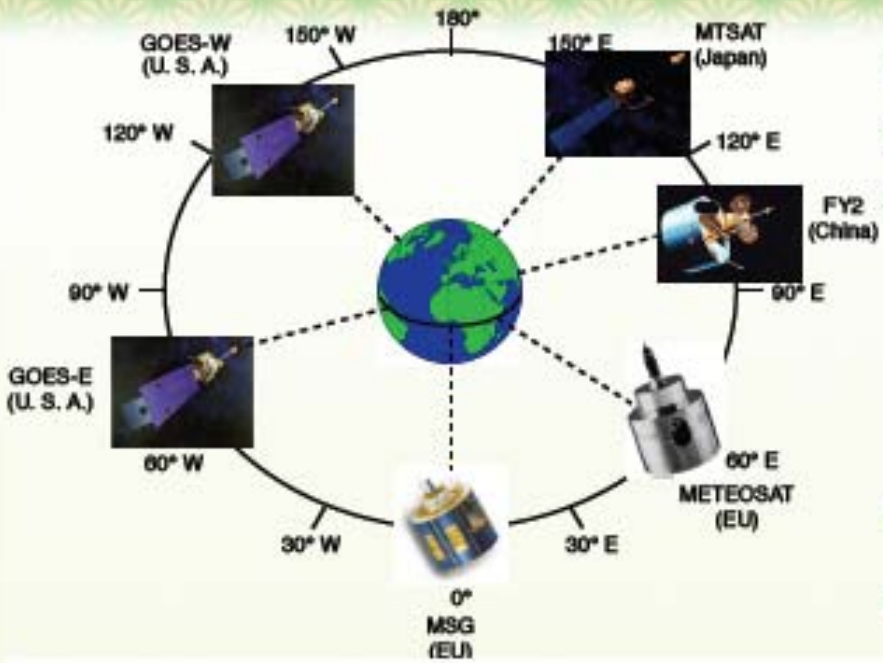
  Resolution: T159L60 Increment method ～80km

  Land surface: Snow cover analysis (Surface obs. and satellite estimation)

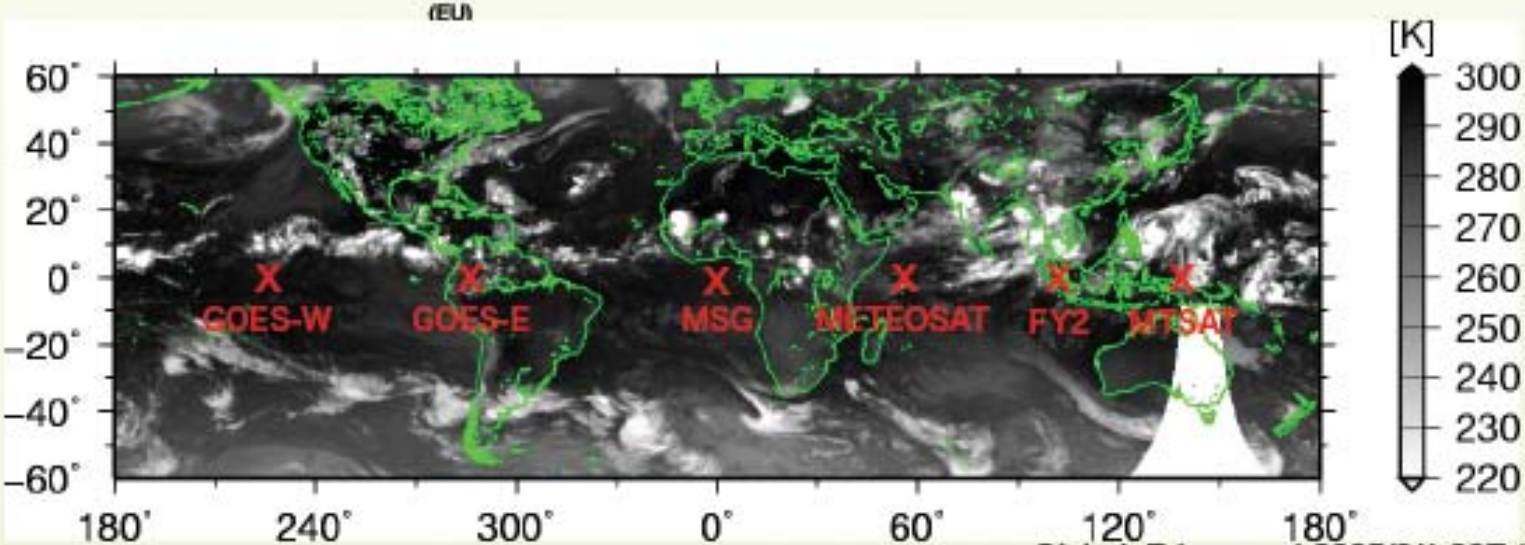
Time Table (Tentative)



Geostationary meteorological satellites

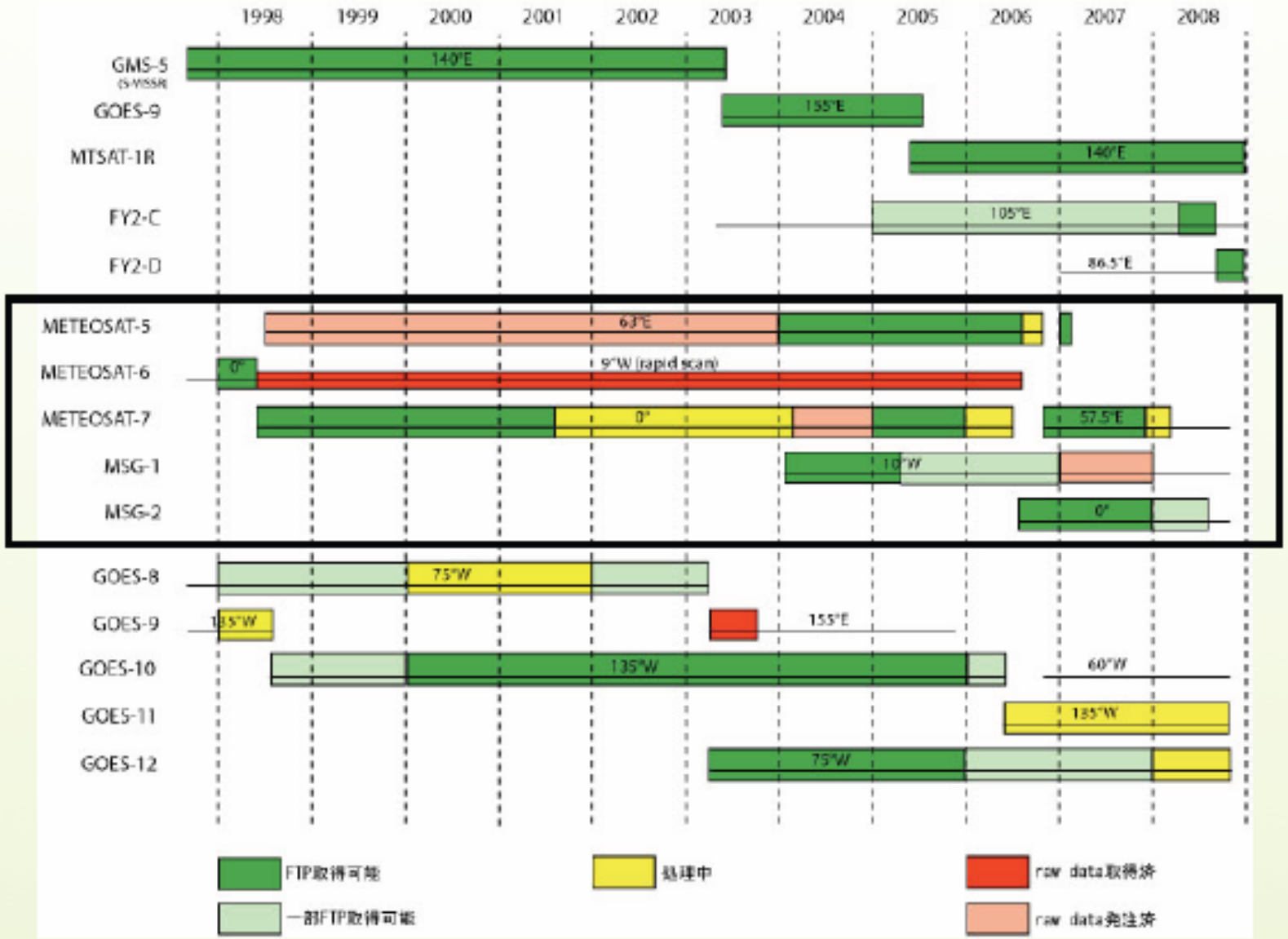


- Data archive for 6 satellites for past 10 years
- Geometric correction (lat.-lon. grid)
- Provide VIS, IR1, IR2, and WV channel
  - 1- or 2-byte binary CN with CN-Tbb conversion ascii table
  - 60°S–60°N, nadir ± 60°
  - 0.01° for VIS, 0.04° for IR1–3
- Develop inter-calibration technique
- Quasi-real time processing



Global IR image at 2005/8/1 00Z (NASA GSFC DAAC)

Data access


1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
GMS-5
(-VISSR)
140°E
GOES-9
135°E
MTSAT-1R
140°E
FY2-C
105°E
FY2-D
86.5°E
METEOSAT-5
63°E
METEOSAT-6
0°
9°W (rapid scan)
METEOSAT-7
0°
57.5°E
MSG-1
10°W
MSG-2
0°
GOES-8
75°W
GOES-9
135°W
135°E
GOES-10
135°W
60°W
GOES-11
135°W
GOES-12
75°W
FTP取得可能
一部FTP取得可能
処理中
raw data取得済
raw data発注済

CEReS 4VL Wiki

http://www.cr.chiba-u.jp/~4vl/

FrontPage

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4大学連携バーチャルラボ支援室 (VL支援室)

ポスター (A4版)

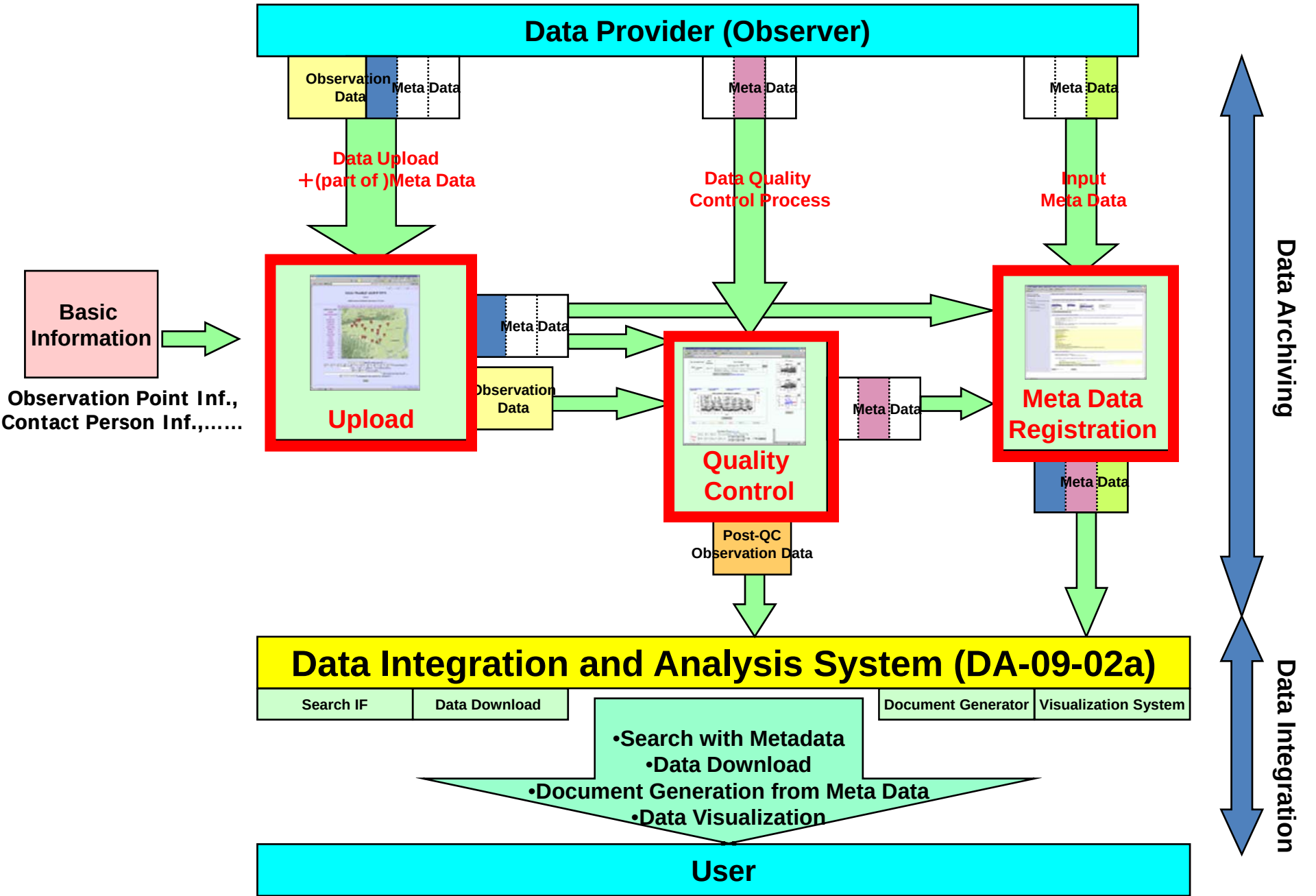
CEReS 4VL Wiki

Quasi-realtime images
静止気象衛星準リアルタイム画像

FY2-D MTSAT-1R GOES-W GOES-E

VIS
IR1
IR2
IR3
(WV)
IR4

Web-based Data Archiving & Integration System



Summary

- Common issues should be targeted by each RHPs.
- Also targeting evaluation of long-term monsoon changes by utilizing good quality regional data-sets.
- AMY modeling activity in collaborating with CLIVAR/AMMP, APCC, YOTC should also contribute to and contributed from other monsoons.
- AMY-reanalysis will also contribute to monsoon-cross cut. Data input from other RHP projects are strongly needed.