Overlap, Needs and Contribution

http://www.wcrp-amy.org/

Jun Matsumoto  (Tokyo Metropolitan U., JAMSTEC/RIGC)
YOTC IPM at Honolulu, Hi USA,  July 13, 2009
AMY coordinated observation projects
Observation Network of JICA-Tibet Project

- AWS(E)
- AWS(N)
- PBL Tower(E)
- PBL Tower(N)
- Windprofiler(E)
- Windprofiler(N)
- GPS(E)
- GPS(N)
- Sonde(N)
- CAMP/GAME
Implementation Scheme for Intensive Observation in 2008

Phase I
- Feb 25-Mar 19
- Mar 7-Mar 16
  - 理塘
  - 温江
  - 大理
  - 林芝

Phase II
- Apr 20-May 19
- May 7-May 16
  - 理塘
  - 温江
  - 大理
  - 林芝

Phase III
- Jul 7-Jul 16
- Jun 20-Jul 19
  - 四川 (达县 (电子)、温江 (L)、甘孜 (L)、宜宾 (59)、西昌 (L)、红原 (L))
  - 云南 (昆明、腾冲 (L)、蒙自 (59)、丽江 (电子)、思茅 (59))
  - 西藏 (拉萨 (L)、定日 (59)、昌都 (59))
Experiment design (PHONE 06-08)

Taiwan
- 2008/5/15 ~ 6/30

Chujado
- 2007/6/21 ~ 7/10

Jejudo
- 2006/6/22 ~ 7/12

Ieodo
- 2007/6/8 ~ 6/14
- 2008/6/22-7/9

Miyako
- 2007/6/2 ~ 6/17

Okinawa
- 2008/5/27 ~ 6/21

Video Sonde

MP Radar Observation in Nagoya
SoWMEX/TiMREX

CHINA

SOUTH CHINA SEA

May 15-June 30, 2008, SCS and SW Taiwan

Sounding component: ground-based, airborne dropsondes, shipboard, GPS-RO
<table>
<thead>
<tr>
<th>IOP#</th>
<th>Date</th>
<th>Scientific objectives</th>
<th>Dropsonde mission/comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>06Z May 19 to 00Z May 22</td>
<td>Frontal circulation, Upstream environment for orographic convection, Model verification and data assimilation</td>
<td>mission #1 at 21Z May 20, C, 3:20/12-4. SOP was scheduled to start on 00Z May 15 and was delayed to 00Z May 19</td>
</tr>
<tr>
<td>2</td>
<td>06Z May 27 to 21Z May 29</td>
<td>Southwest flow interacting with the terrain, Upstream condition for mountain convection, Lee side vortex/shear zone</td>
<td>mission #2 at 21Z May 28, D, 2:35/13-6</td>
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<tr>
<td>3</td>
<td>21Z May 29 to 12Z May 31</td>
<td>Island effects on SW (LLJ) and the Mei-Yu front Upstream condition for heavy precipitation</td>
<td>mission #3 at 21Z May 29, Cn, 2:43/15-10, mission #4 at 21Z May 30, Cn, 2:55/13-0, EOP started on 21Z May 29 and scheduled to end on 21Z, June 4</td>
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<tr>
<td>4</td>
<td>21Z June 1 to 15Z June 3</td>
<td>Mesoscale convective systems, Shallow surface front, Mesoscale convective vortex</td>
<td>Mission #5 at 09Z June 3, Cn, 2:29/13-0 Astra nose radar malfunction, the flight was delayed (was scheduled on 21Z, June 1)</td>
</tr>
<tr>
<td>5</td>
<td>18Z June 3 to 12Z June 4</td>
<td>Mesoscale convective systems, Quasi-stationary front, Mesoscale convective vortex</td>
<td>mission #6, 21Z June 3, C, 3:47/14-2 mission #7, 05Z June 4, E, 2:08/12-0</td>
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<tr>
<td>6</td>
<td>18Z June 4 to 12Z June 6</td>
<td>Mesoscale convective systems; Quasi-stationary front; Mesoscale convective vortex</td>
<td>mission #8, 21Z June 4, C, 3:25/15-1; mission #9, 05Z June 5, E, 2:23/10-0; mission #10, 21Z June 5, D, 2:35/12-1; MCV landed and brought heavy rainfall to Kaohsiung; EOP ended at 18Z June 6 and SOP resumed.</td>
</tr>
<tr>
<td>7</td>
<td>00Z June 12 to 12Z June 13</td>
<td>Convection initiation, Orographic convection</td>
<td>UAV mission #1, 04Z and 06Z June 12, Astra engine oil leakage and grounded for a few days</td>
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<tr>
<td>8</td>
<td>00Z June 14 to 12Z June 17</td>
<td>Southwesterly flow interacting with the terrain, Upstream condition for mountain convection, low level jet, Mesoscale convective systems, Mesoscale convective vortex</td>
<td>mission #11, 09Z June 16, E, 2:15/10-1, mission #12, 21Z June 16, E, 2:25/12-0, mission #13, 04Z June 17, E, 2:29/14-1, Astra available after examining by Singapore engineer</td>
</tr>
<tr>
<td>9</td>
<td>06Z June 23 to 12Z June 26</td>
<td>Typhoon Fengseng track uncertainty, Typhoon induced southwesterly flow and related heavy rain systems</td>
<td>Dotstar flight at 08Z June 23, 2:30, A, mission #14 at 09Z June 25, E, 2:30/15 SOP ends on 12Z June 26</td>
</tr>
<tr>
<td>Non-IOP</td>
<td>Afternoon thunderstorm systems and microphysics study</td>
<td>22-26 May; June 7-11; June 18-22</td>
<td></td>
</tr>
</tbody>
</table>
### Operation Summary (May 15 to June 25, 2008)

- Daily Planning Meeting 46 times
- Science Meeting 38 times
- Evening update 4 times
- Pre-flight briefing 15 times
- SOP: 42 days
- IOP: 24 days (9 IOPs)
- EOP: 9 days (May 29-June 6)

### Operation and Man-day Counts

<table>
<thead>
<tr>
<th>Operation</th>
<th>Man-day</th>
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<tbody>
<tr>
<td>OCC-CWB</td>
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<tr>
<td>NPUST-Pingtung</td>
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<tr>
<td>SPOL</td>
<td>520</td>
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<tr>
<td>XPOL (mobile)</td>
<td>337</td>
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<tr>
<td>Super-Site</td>
<td>432</td>
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<tr>
<td>Dropsonde</td>
<td>~100</td>
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<tr>
<td>Sounding System</td>
<td>~2800</td>
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<td>Shipboard Sounding</td>
<td>507</td>
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<tr>
<td>Total</td>
<td>~6000</td>
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### # of sondes

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<tr>
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<td>Dongsha</td>
<td>146</td>
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<td>Magong</td>
<td>243</td>
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<td>Pingtung</td>
<td>247</td>
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<td>Lyudao</td>
<td>218</td>
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<tr>
<td>Taichung</td>
<td>165</td>
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<tr>
<td>Liouguei</td>
<td>219</td>
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<tr>
<td>Hengchun</td>
<td>193</td>
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<tr>
<td>SW ship</td>
<td>146</td>
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<td>North ship</td>
<td>60</td>
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<tr>
<td>Tainan</td>
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<tr>
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<td>Flight</td>
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### Re-leaf

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<td>Taichung</td>
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<td>Liouguei</td>
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<td>Hengchun</td>
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<td>SW ship</td>
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<td>North ship</td>
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<td>Tainan</td>
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<tr>
<td>SW ship</td>
<td></td>
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<tr>
<td>North ship</td>
<td></td>
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<tr>
<td>Tainan</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
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</tbody>
</table>
SoWMEX/TiMREX Project in 2009

• In 2009, we conducted dropsonde and intensive sounding observations in early June. **Two weeks (from June 3 to June 16) period is chosen to have intensive sounding observations, i.e., 4 sondes per day.** The stations include Banciao, Makung, and Dongsha. Additional site near central part of mountain (Dou-Lieou) is also established to conduct two week sounding launch. **China Meteorological Administration agreed to launch 4 sondes per day at Fujian area (cross the Taiwan strait).** In the Taiwan strait and central Taiwan, there are two new C-band polarimetric radars (from Gematronics) and also participate the field experiment. There are three major frontal systems passing through the field. Two of them brought heavy rainfall to the coastal and mountain areas in the west side of the island. More details can be found in the website [http://sowmex.cwb.gov.tw](http://sowmex.cwb.gov.tw) under sowmex-2009 icon.
China-Japan Co-operative Project on Weather Disaster Reduction

Summer Rainstorm Experiment

May-June, 2008
R/V Mirai Cruise for PALAU2008

26 May ~ 30 June
MR08-02
(for PALAU2008)
IOP 4 ~ 28 June
sonde 8 times/day

3 July ~ 6 August
MR08-03
(for buoy replacement)
sonde 2 or 4 times/day
PALAU2008 observation

- **Doppler radar**
  Palau (continuous) and R/V Mirai (135°E, 12°N, 4-28 June 2008)

- **Dropsonde**
  G-II (about one week at Palau in late June 2008, 2 ferry and 3 local flights)

- **Radiosonde** <June-early July 2008> (operational / special)
  R/V Mirai [JNSR]  (00, 03, 06, 09, 12, 15, 18, 21 UTC)
  Woleai [no ID]  (00, 06, 12, 18 UTC)
  Koror [91408]  (00, 06, 12, 18 UTC) by Weather service office
  Yap [91413]  (00, 06, 12, 18 UTC) by Weather service office
  Guam [91212]  (00, 12 UTC)

- **Argo float**
  Deploy along 130E (2 Argos and 3 Illigium) from R/V Mirai

- **Forecast experiment**
  MRI-NHM, CReSS

- **Surface weather observations** (ceilometer, disdrometer, AWS etc)
  Palau

- **SST, CTD, and oceanographic observations**
  R/V Mirai (4-28 June 2008)
Upper air soundings during PALAU2008

[Map and timeline showing the soundings from various locations and dates]
hydrometeorological Array for ISV-Monsoon Automonitoring (HARIMAU)

Japan EOS Promotion Program (JEPP) + Indonesian Research/Technology Grant

Kototabang EAR, BLR, XDR
KU + LAPAN

MIA XDR
Serpong CDR
Mirai CDR

JAMSTEC

Pontianak WPR
Manado WPR
Biak WPR

2008

Palau XDR+WPR
JAMSTEC

Aceh
Lampung
Padang
Surabaya
Biak
Pontianak
Manado

BMG CDRs

Mirai CDR
JAMSTEC

KU + LAPAN

5°N
10°N
15°N
20°N
25°N
30°N

90°E
95°E
100°E
105°E
110°E
115°E
120°E
125°E
130°E
135°E
140°E
145°E

Operational Rawinsonde
Operational Radar
JAMSTEC GPS
JAMSTEC Isotope
JAMSTEC/JEPP Profile
JAMSTEC/JEPP Radar

XDR+WPR
MIA XDR

Japan EOS Promotion Program (JEPP) + Indonesian Research/Technology Grant

hydrometeorological Array for ISV-Monsoon Automonitoring (HARIMAU)
ISVs by WPR network

<table>
<thead>
<tr>
<th>Day</th>
<th>Dec 1</th>
<th>Oct 11</th>
<th>Dec 1</th>
<th>Dec 21</th>
<th>Dec 31</th>
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</thead>
<tbody>
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<td>Kototabang</td>
<td>Pontianak</td>
<td>Biak</td>
<td>Kototabang</td>
<td>Pontianak</td>
<td>Biak</td>
</tr>
<tr>
<td>Zonal wind (m/s)</td>
<td>-15</td>
<td>0</td>
<td>15</td>
<td>-15</td>
<td>0</td>
</tr>
</tbody>
</table>

Average over 2-3 km

Onset of Monsoon & Rainy Season

MTSAT TBB Hovmoeller

Manado (installed last week! / Sep 2008)

(Malay flood)

(Yamanaka et al., 2008, *J. Disaster Res.*)

- GPS, AWS (2002-) with BMG/BPPT
- WPR (2007-) with LAPAN/BPPT
- BMG-CDR (2008-) with LAPAN/BPPT
- RS (LAPAN/BPPT) (Jan 13-29)

Map showing locations in Malaysia, Singapore, and Kalimantan with red markers indicating points of interest.
Fig. 1 Time-height cross section of zonal winds (upper panel) and meridional winds (bottom panel) observed at LAPAN office site in Pontianak, western Kalimantan Island during 20 January to 7 February 2009.
Implementation of AMY-associated South China Sea observation in 2008

Dongxiao Wang

South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou 510301, China
The observation network in the South China Sea

三亚

大亚湾
The coastal cruise in June-July, 2008
The open cruise in August, 2008
The third cruise in September, 2008
Continental Tropical Convergence Zone (CTCZ) Programme under the Indian Climate Research Programme (ICRP)

- IOP from July 1 to August 31, 2009
- The observational campaigns include airborne measurements for aerosol-cloud interactions over the Indo-Gangetic plain region, ship (two ships) based measurements for ocean-atmosphere interactions in the Bay of Bengal, boundary layer and land surface processes at selected watersheds.
Observations include

- **Over land**
  - AWSs (~200), Flux towers (~10), DW Radar network (IMD+IAF) ~5-10
  - Aerosol measurements (~10)
  - High resolution GPS radiosondes (5-10)
  - CCN & Cloud Microphysics

- **hydrology**
  - 2 Water sheds (Eastern India, Himalayan foothill)

- **Ocean**
  - 2 ships
  - buoy network (~90E line, 10S to 20N)
STORM Program
Severe Thunderstorms – Observations & Regional Modeling

March – May (Pre-monsoon)
Severe Thunderstorms & Tornadoes
NW-SE traveling systems
India: STORM - Field Experiment

**Proposed Instrumentation BY 2008:**

- **AWS** - meso-network of 100 AWS
- **RS/RW** - 4 stations (Additional)
- **Dropsondes** - 1 (instrumented IAF aircraft)
- **Wind Profilers** - 3
- **Mobile Doppler Radar** - 1
- **Research Ship at the Head Bay** - 1
- **Micro-towers** - 4; with 6 levels of instruments
- **Disdrometers** - 3
- **Atmospheric Electric Sensor** - 1
- **Aerosol Sampler** - 1
- **Aerosol particle sensors** - 2
- **Electric Mill** - 3
More than 600 million people (~10% global population) from Lahore, Pakistan to Calcutta, India depend critically on 2-3 months’ monsoon rain water;

Melt-water from the Himalayas sustain the regional agriculture throughout the dry season;

Glaciers are rapidly shrinking, jeopardizing the long-term water supply over the region;

Aerosol loading is extremely high throughout the year and is increasing with the growth of the Indian economy (~8%/year); and

The impact of aerosols on human health, agricultural productivity and the monsoon is poorly understood.

**RAJO-MEGHA** *(Sanskrit: Dust-Cloud)*:

*Radiation, Aerosol Joint Observations - Monsoon Experiment in Gangetic-Himalayan Area*
Coordinated Enhanced Observing Period
Three Unique Capabilities

Interoperability Arrangement
A well organized collecting, processing, storing, and disseminating shared data, metadata and products

- In-Situ Data Archiving Center at NCAR (National Center for Atmospheric Research) of USA
- Data Integrating/Archiving Center at University of Tokyo and JAXA of Japan
- Model Output Data Archiving Center at the World Data Center for Climate, Max-Planck Institute for Meteorology of Germany
The colors represent the CEOP Data Quality Flags (see definitions) as follows: green=0, yellow=1, red=2, black=3, gray=4. Note that the time period covered varies from station to station. If a station does not measure any FLX parameters it is not included in this table.

For the Soil Temperature and Moisture Data Status and Quality summary click here.
For the Meteorological Tower Data Status and Quality summary click here.
For the Flux Data Status and Quality summary click here.
CEOP Phase II at ceop.wdc-climate.de

CEOP Phase II

The structure of the model output
For CEOP Phase II WDC-Climate proposes a more homogeneous data structure for gridded data and MOLTS. The WMO-GRIB format is used for the gridded data. MOLTS can be stored in NetCDF-CF format as an example header of JMA data shows. Find a set of example NetCDF files (also JMA) here; (bar) example. The barbell contains 4 NetCDF files for one day with the 12:00 file containing 72 forecast steps. The Stationlist list of the station names with proposals for changes.

MOLTS
The information of the MOLTS (Model Output Location TimeSeries) is available as a map and as a list as well.

Data Sets included into the CERA Database

<table>
<thead>
<tr>
<th>Center</th>
<th>MOLTS Data</th>
<th>GRID DATA</th>
</tr>
</thead>
</table>

Data size
Currently the data base contains 618.6 GByte of data.
• **Modeling:**
  – Global re-analysis (by MRI/JMA)
  – Regional re-analysis (TBD)
  – NICAM and other high resolution models for case study (TBD)
  – Coordinated intra-seasonal hindcast to access predictability & prediction skill for MISO
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.
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.
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**

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<th>Retrospective Forecast Period</th>
<th>20 years from Jan 1989 to December 2008 MJJAS 2009 (optional)</th>
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<tbody>
<tr>
<td>Initial Date</td>
<td>Every 10 days on 1st, 11th, and 21st of each calendar month</td>
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<tr>
<td>The Length of Integration</td>
<td>At least 45 days</td>
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<tr>
<td>Ensemble Member</td>
<td>At least 6 members</td>
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<td>Initial condition</td>
<td>Initial conditions may use one day or 12 hours lag</td>
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### 5. Current Status

<table>
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<th>Institution</th>
<th>Participants</th>
<th>Current Status</th>
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<td>Harry Hendon</td>
<td>26-year integration initiated the first day of every month with 10 ensemble simulations (1980-2006)</td>
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<tr>
<td>COLA and GMU</td>
<td>E. Jin, J. Kinter, J. Shukla</td>
<td>1991-2007 integration initiated the 15th of every month with 15 ensemble simulation</td>
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<tr>
<td>ECMWF</td>
<td>F. Molteni, Frederic Vitart</td>
<td>26-year integration initiated the first day of every month with 10 ensemble simulations</td>
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<tr>
<td>GFDL</td>
<td>W. Stern</td>
<td>20-year integration initiated every day, AGCM only</td>
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<tr>
<td>IAP/LASG</td>
<td>T. Zhou, B. Wang</td>
<td>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</td>
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<td>JAMSTEC/APL</td>
<td>T. Yamagata, J.-J. Luo</td>
<td>21-year integration initiated every five days during NDJFM season</td>
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<td>NASA/GMAO</td>
<td>S. Schubert, P. Pegion</td>
<td>20-year integration initiated every 5 day during MJJAS</td>
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<tr>
<td>NCEP/CPC</td>
<td>A. Kumar, J. E. Schemm</td>
<td>20-year integration initiated every 10 days (almost finished), AGCM only</td>
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<tr>
<td>SNU</td>
<td>I.-S. Kang</td>
<td>20-year integration initiated every 15 days, working on the case with 21st initial condition</td>
</tr>
<tr>
<td>UH/IPRC</td>
<td>X. Fu, J.-Y. Lee</td>
<td>20-year integration initiated every 10 day during MJJAS</td>
</tr>
<tr>
<td>UM</td>
<td>B. Kirtman</td>
<td></td>
</tr>
<tr>
<td>INGV</td>
<td>Annalisa Cherichhi</td>
<td></td>
</tr>
<tr>
<td>MRD/EC</td>
<td>Gilbert Brunet, Hai Lin</td>
<td>20-year integration initiated every 10 days (almost finished), AGCM only</td>
</tr>
<tr>
<td>CWB</td>
<td>Mong-Ming Lu</td>
<td>20-year integration initiated every 15 days, working on the case with 21st initial condition</td>
</tr>
<tr>
<td>BCC/CMA</td>
<td>Zhang Peiquin, Chen Lijuan</td>
<td></td>
</tr>
</tbody>
</table>
JRA-55 & AMY reanalysis by MRI/JMA

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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.

<table>
<thead>
<tr>
<th></th>
<th>JRA-25</th>
<th>JRA-55</th>
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<tbody>
<tr>
<td><strong>Target Period</strong></td>
<td>1979-2004 (26 years)</td>
<td>1958-2012 (55 years)</td>
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<tr>
<td><strong>Model</strong></td>
<td>T106L40 (~110km)</td>
<td>TL319L60 (~60km)</td>
</tr>
<tr>
<td><strong>Assimilation scheme</strong></td>
<td>3D-var</td>
<td>4D-Var</td>
</tr>
<tr>
<td><strong>Continuation</strong></td>
<td>JCDAS 2005 ~</td>
<td>Under planning</td>
</tr>
</tbody>
</table>
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: T319L60 (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)

FY2009  FY2010  FY2011  FY2012

Renewal of MRI
Super computer

Data assimilation
system

Obtain AMY obs.
data

AMY Reanalysis
computation

Release of AMY
Reanalysis product
Summary

- Intensive observation data during the AMY-IOP (2008-2009) will contribute to YOTC.
- The relationship between heavy rainfall in monsoon region and MJO activity, the MJO modification processes in the maritime continent, are some of the examples of scientific targets.
- CEOP data-set will also contribute to YOTC.
- AMY modeling also target MJO and MISO so can strongly collaborate with YOTC.
- AMY-reanalysis will also contribute to YOTC. Data input from AMY and other projects are needed.