## Radar-Raingauge Data Integration in Southeast Asia

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- 1. <u>Backgrounds and Our Goal</u>
- 2. Radar-raingauge data integration in West Sumatra, Indonesia
- 3. An example of utilizing integrated data
- 4. A similar work in Central Vietnam



Special thanks to providers of radar information of each country.

# Our Goal in DIAS & MAHASRI

- **Development of transferable** (or universal) **techniques** of radar-raingauge data integration in SEA
- Sharing the techniques for hydrometeorological purposes in each country of SEA
- Exchange/merging of the data integrated in each country for monitoring rainfall fields with larger scale in SEA

## **OPERA** (Operational Program on the **Exchange of Weather Radar Information**)

within the framework of EUMETNET

**A Network of National Weather** Radar **Networks** in EU.

The clear objective is "to harmonize and improve the operational exchange of weather radar information between National Meteorological Services".

Phase 1: 1999-2003 Phase 2: 2004-2006 Now in the phase 3 (2007-2011)

> An example of composite

http://www.knmi.nl/opera/

> 100 weather radars > 20 countries



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## West Sumatra



#### WeSRI (West Sumarta Radar-Raingauge Integrated Data) ver.1.1



Weather radar (MIA) Reflectivity factor Z (X-band Doppler) JEPP-HARIMAU



(Tipping-bucket) 5 raingauges JAMSTEC/IORGC Rainfall rate *R* 

- 28 Oct.-27 Nov. 2006
- Time interval: 30 min
- Space interval: 0.025 deg.
  (2.8 km)
- Reflectivity of 2 km ASL (CAPPI)
- Empirical calibration with 5 raingauges
- Mountain shadow evaluated with SRTM topography data

WeSRI 1.1 is available at http://www.jamstec.go.jp/e/medid/dias/

### **Future Works**



- Extend target period: one month to one year
- Evaluate echo attenuation due to heavy rainfall
  - use the intensive observations by multi weather radars
  - correct the data or put a quality flag to each data value
- Update the Z-R relationship
  - check seasonality of the Z-R
  - check relation with topography, wind system, position of shore line, types of rainfall, ...

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There are many points which can not be explained from only diurnal cycle component.

#### **Distance-Time Slice of Monthly Mean Rainfall**



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## **Central Vietnam**



#### NHMS AND MAHASRI STATIONS NETWORK IN MID-CENTRAL VIET NAM

#### Things We Do

## (1) Radar-raingauge integration

with the group of Dr. Tan Thanh Nguyen-Thi (NHMS)

- 1 radar (NHMS)
- 32 raingauges (CREST, JEPP & NHMS)

#### (2) River flow simulation

with Dr. Thanh Ngo-Duc (NHMS)

- catchment above Nong Son
- all of the ThuBon-VuGia





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Sources: GDBD ver. 1, Global Map V.1.0, GSHHS ver. 1.3, HydroSHEDS ver. 1.0 and VMAP0.

### **Preparing Data and Preliminary Analysis**

- Radar data ... investigating details of radar measurement, training of data handling
- <u>Meteorological & hydrological data</u> ... reading guidelines of measurements (but in Vietnamese), preliminary analysis of rainfall data
- Geological data ... river network, topography, land use, land cover, ...





## Vietnam NHMS Radar Network

- 6 operated; 2 planned
- Two kinds of system: Thomson (France) & EEC (USA)
- Range is mainly 256 or 240 km
- Visibility from some radars is not so clear due to beam blocking
- We have to choose heights carefully for more effective data use