Launching Global Flood Alert System (GFAS)

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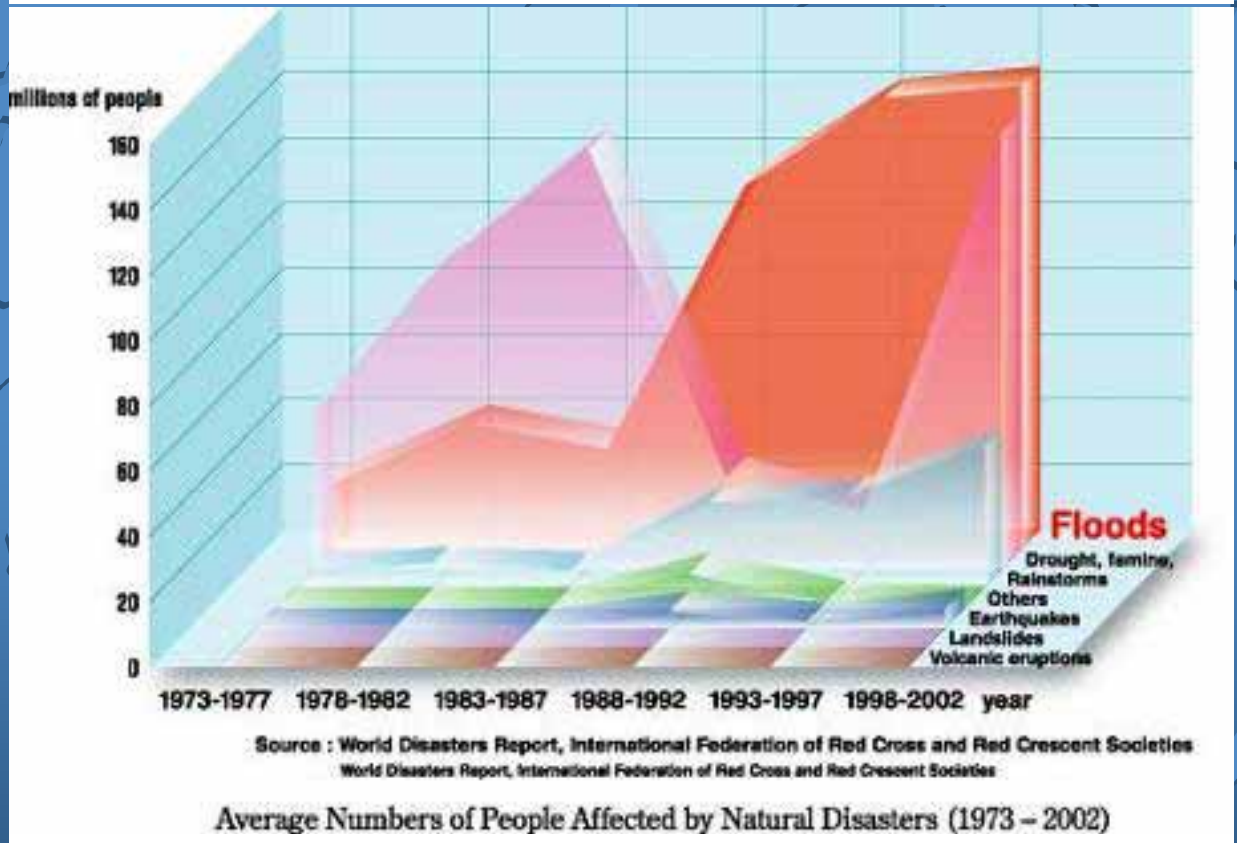
1. Background(1)

Suffer great losses by flood disaster

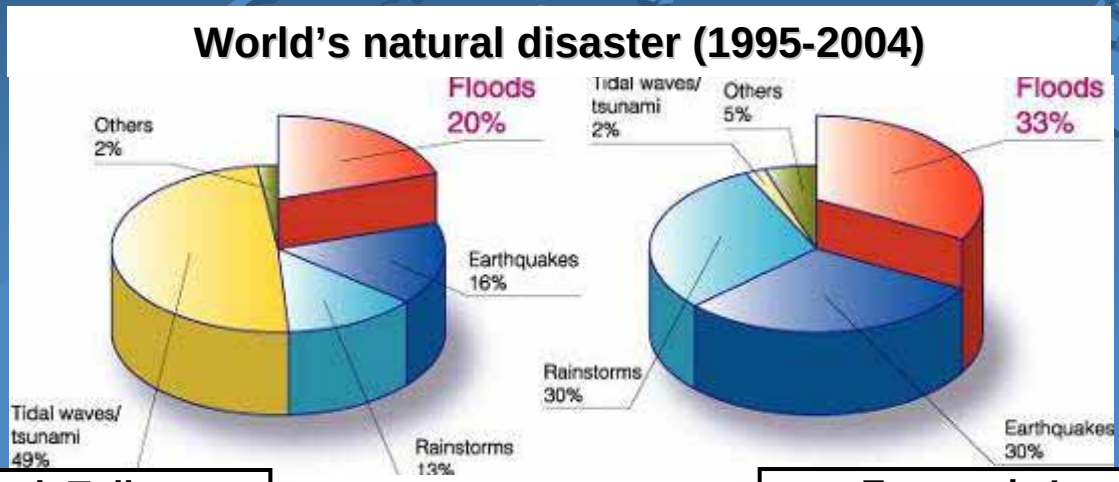
Average numbers of people affected by natural disasters (1973-2002)



Source: International Federation of Red Cross and Red Cross Societies

1. Background(2)

Suffer great losses by flood disaster



Source: EM-DAT, CRED

Death Toll:
about 470,000 people

Economic Loss:
about 49 billion. US$

Death Toll

- **Tidal waves /Tsunami 49%**
- **Floods 20%**
- **Earthquakes 16%**

- Needs for **Effective Early Warning System**
  Support Flood forecasting
  especially in Developing Countries

2. System Outline of GFAS

(1). Objectives

- To facilitate the use of Satellite Rainfall in FEW system

(2). System Concept

collaboration among:

i) Space Agencies as rainfall data provider

ii) IDI as system developer, analyzer of rainfall, information provider

iii) IFNet as transmission tool

iv) Hydrological Services , River Authorities in charge of flood forecasting and warning

(3) Outline of IFNet

Objectives

Flood Disaster Reduction by network activities such as information disseminating and sharing.

Membership

- Open to all who assent to the objectives.
- A total of 410 from 73 countries has been registered.
  (as of 1 Jan.. 2006)

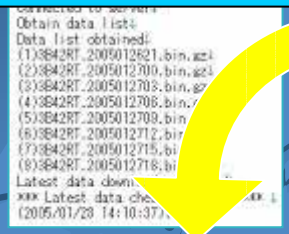
Activities

1. Raising Awareness of flood issues
   - *Flood risks, poverty, uncontrollable urbanization, etc.*
2. Forming a Platform for information sharing
   - *Good practices and lessons learned, etc.*
3. Supporting Flood Early Warning
   - *GFAS*

(4) Scheme of GFAS

Space Agencies

NASA Homepage



Observation Satellites

Heavy rainfall around
In the XX river basin

River

IDI-Japan

Data Download

Data processing

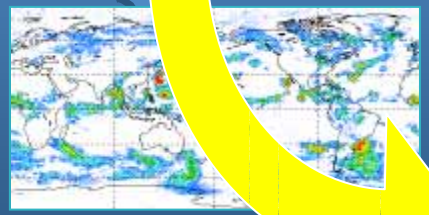
Mapping, Email

System Development

Hydrological Service

River Authorities

Flood Forecasting and Warning using GFAS Information etc.



IFNet

1. IFNet Homepage
2. Email of Heavy Rain
   to IFNet members in charge of Flood Forecasting and Warning

(5) Global Precipitation Measurement (GPM)

Current Observation System:

TRMM and other Satellites orbiting the earth, and 5 Stationary Satellites

Core Satellite

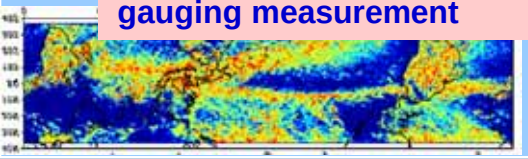
Dual Frequency Radar
Multi Frequency Radiometer

✧Observation of rainfall with more accurate and higher resolution

✧Adjustment of data from constellation satellites

JAXA (Japan)
Dual frequency Radar, Rocket

NASA(US)
Satellite Bus, Micro-wave gauging measurement

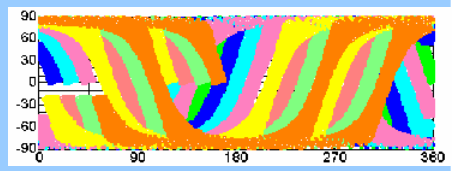


8 Constellation Satellites

Satellites with Micro-wave Radiometers

✧More frequent Observation

Cooperation :
NOAA(US),NASA(US),ESA(EU), China, Korea and others



–Earth heating Phenomena

–Study of Climate Change

–Improvement of forecasting system

Global Observation every 3 hours

•IWRM

•Flood Forecasting

•Forecasting of crop productivity

(6)Characteristics of Satellite Data

(Current observation system has started in 2002.)

A. Features

- 3-dimensional analysis of rainfall structure.
- Not influenced by topographic condition.

B. Data Delivery

- Observation is made every 3 hours for each grid.
- Observation grid size is about 600km2 (30km by 20km rectangle).
- Data delivery is para-real-time basis (several hours after observation).

(7) Issues of Flood Forecasting

Flood forecasting requires real-time accurate hydrological data transmission and run-off analysis.
Issues are:

- Maintenance of Telemetry System

  Budget constraint for maintenance, spare parts, other social factors etc.

- Data transmission in Trans-boundary Rivers

  Difficulty in data transmission across borders.

- Accurate Forecasting for Flash Flood in Small/Medium Rivers

  Detection of localized rainfall, short-term rainfall prediction, etc.

(8)Expectation for Flood Forecasting using Satellite Rainfall

Mozambique 2002

- Early warning has much possibility to reduce human loss in large rivers.

(9) Issues of Flood Forecasting in Small/Medium Urban Rivers

Flood in Fukuoka City (Jun. 1999)

Flood in Tokai Area (Sep. 2000)

Even in Japan, disasters were aggravated by flash flood and absence of accurate flood forecasting in urban, middle/ small rivers

- Accurate flood forecasting is pressing matters

(10) Expectations for application of Satellite Rainfall Observation to GFAS

Preferable Conditions:

- Large river basins where even daily and less dense data could be informative
- **Without any telemetry systems**
- **Trans-boundary Rivers** where prompt data transmission between countries is difficult.

Other Possibilities:

- To improve accuracy of the current flood forecasting system using ground station and radar rain-gauge

3. 1st Phase Launching of GFAS in 2006

Objective: Satellite Data Verification for Flood Forecasting
(comparison with ground rain-gage data)

Data source: NASA (3B42RT)
Quasi Real-Time of Every 3 Hours
Observed by TRMM and others

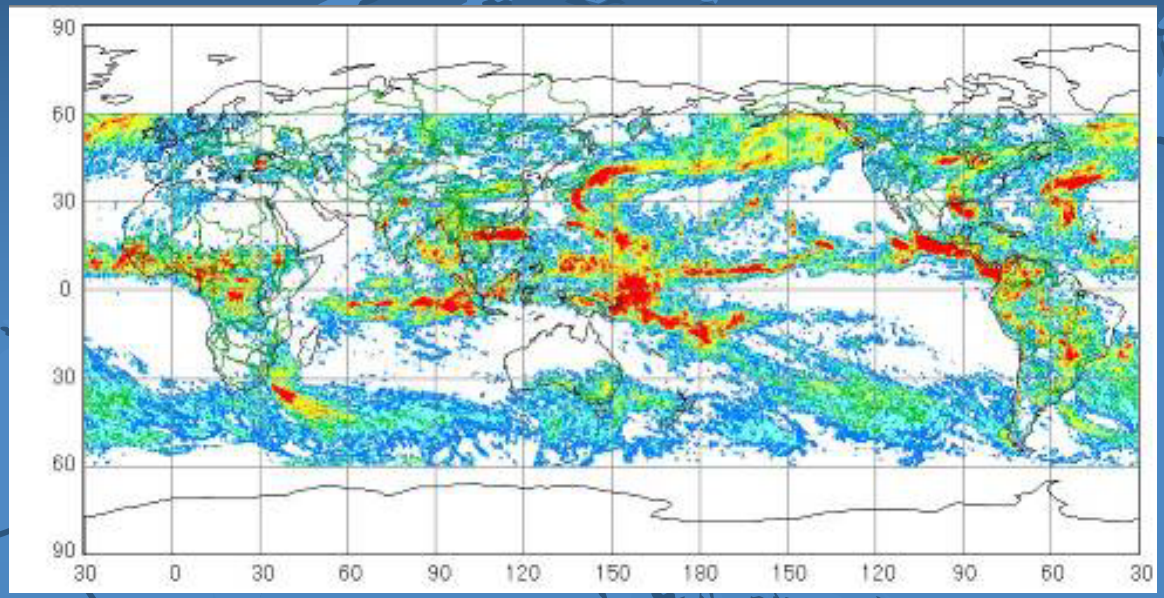
Outputs:
1. Daily Rainfall Map and Rainfall Data in text
(0.25 deg. grid in the band 0-360 deg. longitude, 60-60 N-S latitude)
2. Probability Daily Rainfall
(1/5, 1/10 return periods)
3. Indication of Heavy Rain Area
(area of over a certain probability)
4. E-mail Delivery of Heavy Rainfall Notice on Request

Delivery: Early 2006 by IFNet Website/e-mail

(1) Present Approach to Satellite Rainfall

- **Survey** on the possibility of the satellite rainfall in river management
- Verify accuracy of satellite rainfall in comparison with ground rain- gage data
- Trial run of GFAS Information by IDI Japan

(2) Daily Rainfall Map and Text Rainfall Data



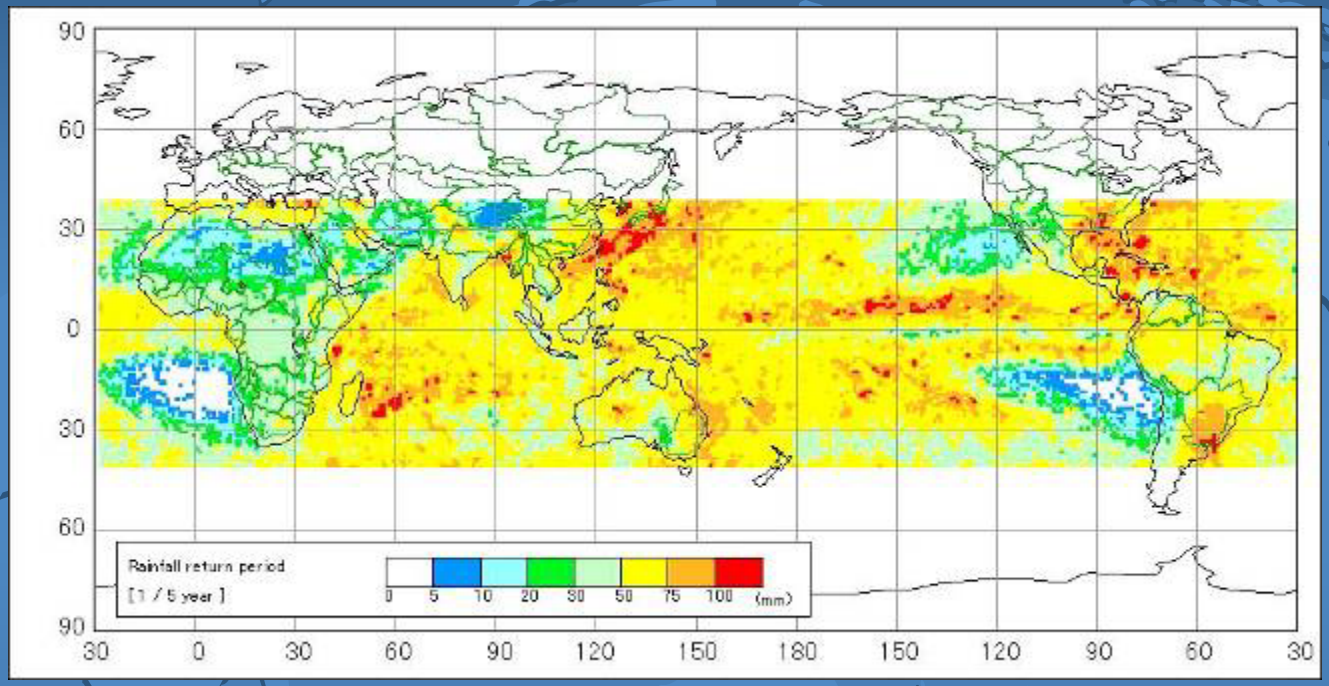
Daily Rainfall Map

0.25 deg. grid in the band 0-360 deg. longitude, 60-60 N-S latitude, with global and regional enlarged view

Daily Rainfall Data in text

0.25 deg. grid in the band 0-360 deg. longitude, 60-60 N-S latitude

(3) Probable Rainfall

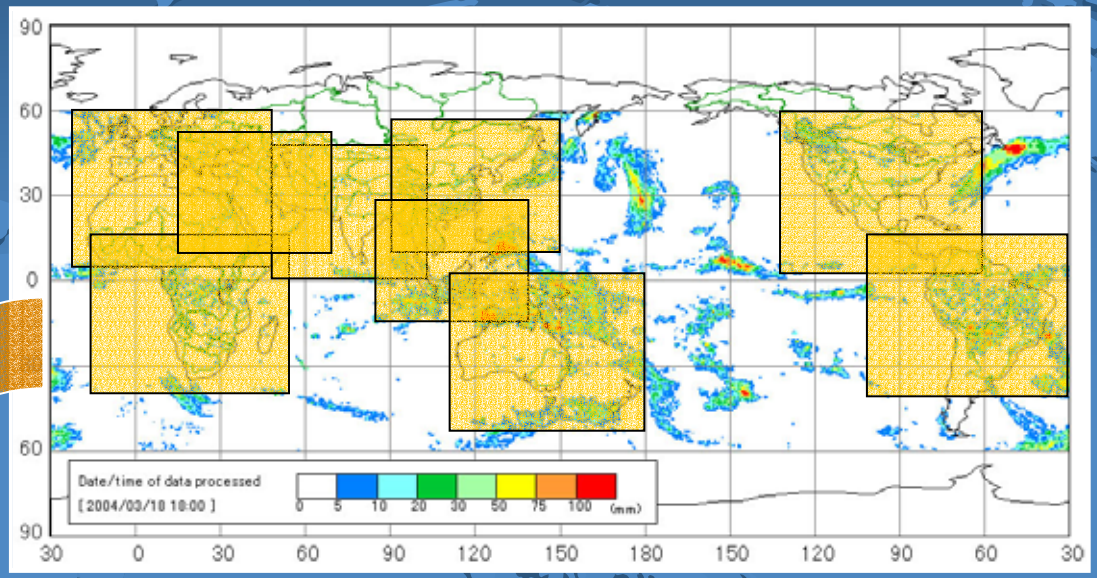


Note:
This is a sample map showing 5 year return period rainfall of 40-40 N-S, but the real map will show in the band of **60-60 N-S**.

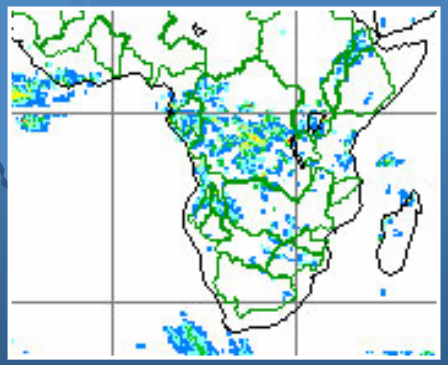
Map showing 5 year and 10 year return period of daily Rainfall

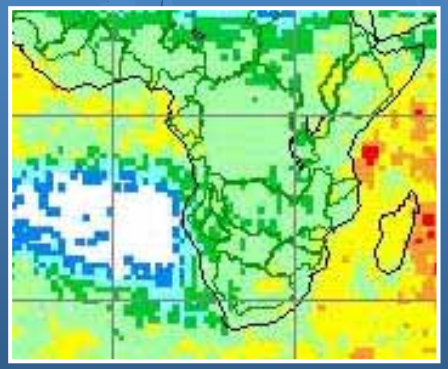
Accumulated data for calculation: TRMM 3B42(1998-2001) , 3B42RT(2002 –2004)

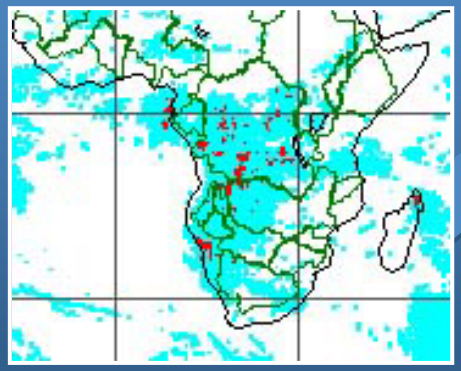
(4) Enlarged maps for 9 Regions



Europe& North Africa
Middle East
South Africa
South Asia
Southeast Asia
East Asia
North America
South America
Oceania

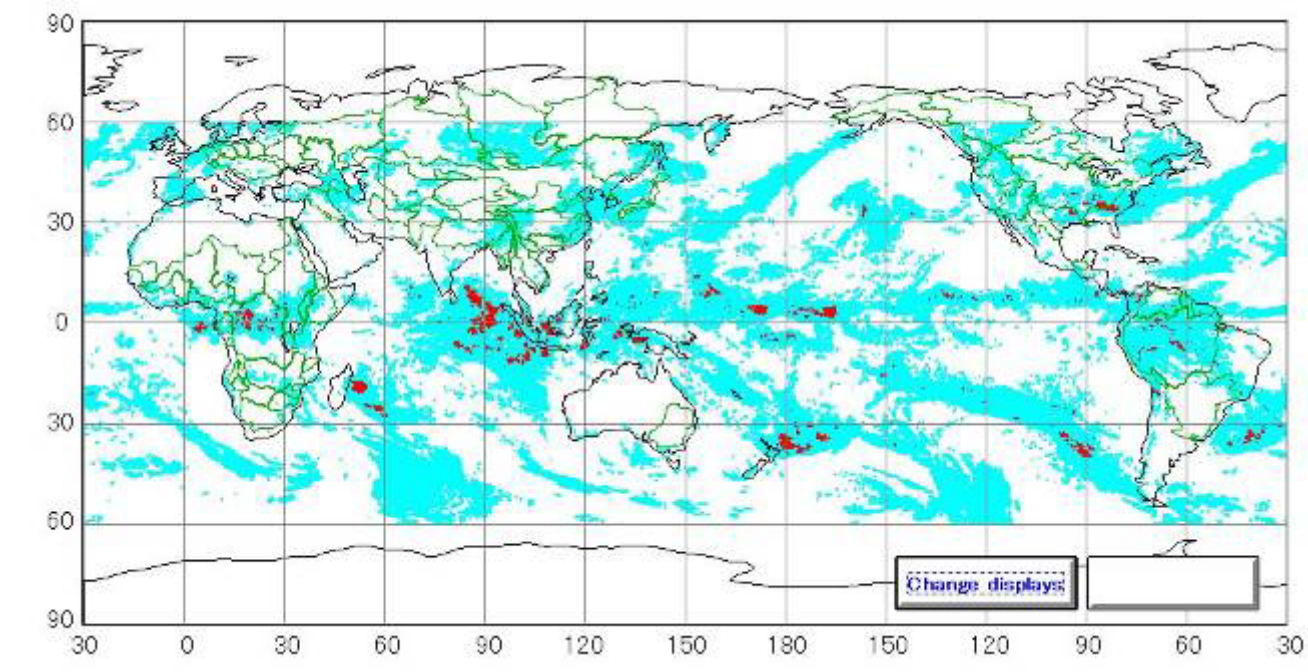






Regional Map Sample (South Africa)

(5) Heavy Rainfall Area



Note:
This is a sample map showing areas exceeding 5 year return period rainfall Was observed.

Rainfall Areas

Areas exceeding 1/5 return period Rainfall

Map showing areas exceeding 5 year and 10 year return period daily precipitation

Accumulated data for calculation: TRMM 3B42(1998-2001) , 3B42RT(2002 –2004)

(6) E-mail Delivery of Heavy Rainfall Notice the Request from IFNet members

Sending notice e-mails to registered agencies
when a rainfall over certain threshold is observed.

E-mail SAMPLE:

Heavy rain information to ZZ basin.
Mean basin precipitation* of YY mm/day, which exceeds 5 year return period rain, was observed.
Please check it on IFNet website !
http://xxxxxxxxxxxxxxxxxxxxx

Agencies hoping to receive Email:

- RID, Thailand
- Department of Hydrology and River Works, Cambodia
- MCTPC, MAF, Lao PDR

*** Currently, we can calculate the "mean basin precipitation" in typical 60 basins.**

(7) Optimization of GFAS after delivery

1. Verify Satellite Rainfall

Verification of

- Satellite Rainfall by comparing with ground rain-gage
- Rainfall Return Period of 1/5, 1/10 by adding more data

2. Response to User's Needs

- More enlarged maps for a single river basin
- Other rainfall period than daily
  (half day, 2 days, 3 days etc.)
- Other return period than 1/5, 1/10
  (2 years, 30 years etc.)
- Other criteria for sending e-mail
  (number and place of grid exceeding certain probability, etc.)

4. Visions for the Future

1. Establishment of an Operation Center

Multipurpose utilization of GFAS information for training, research and so on

2. Run-off Analysis

Prediction of when and how much of peak flood discharge will be

(transformation into water lever, inundation area by flooding analysis)

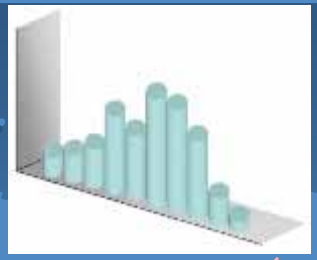
3. Improved Applicability for Middle/Small Rivers

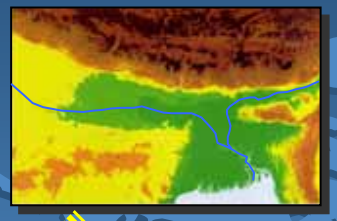
Smaller mesh, frequent data less than every 3 hours

(Expectations for Space Agencies)

4. Visions for the Future (2)

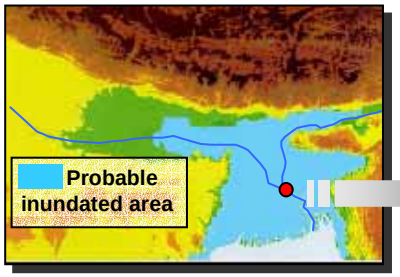
Rainfall

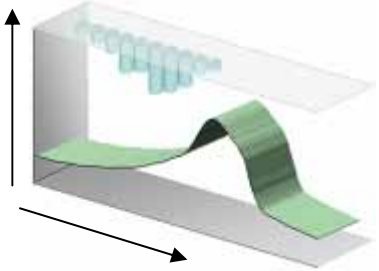




Global Digital Map

Runoff calculation





A runoff calculation is performed using data through GPM after runoff model based on global mapping data is developed. This calculation will make it possible to forecast not only discharge and water level but also inundating state of flood at representative spots.

The forecasting result obtained through runoff calculation will be use to flood alert system as well as various water managements such as flood control and water resources management.

Water Resources Management

Flood Forecasting and Warning

Thank You

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