An Introduction of

Global Flood Alert System (GFAS)

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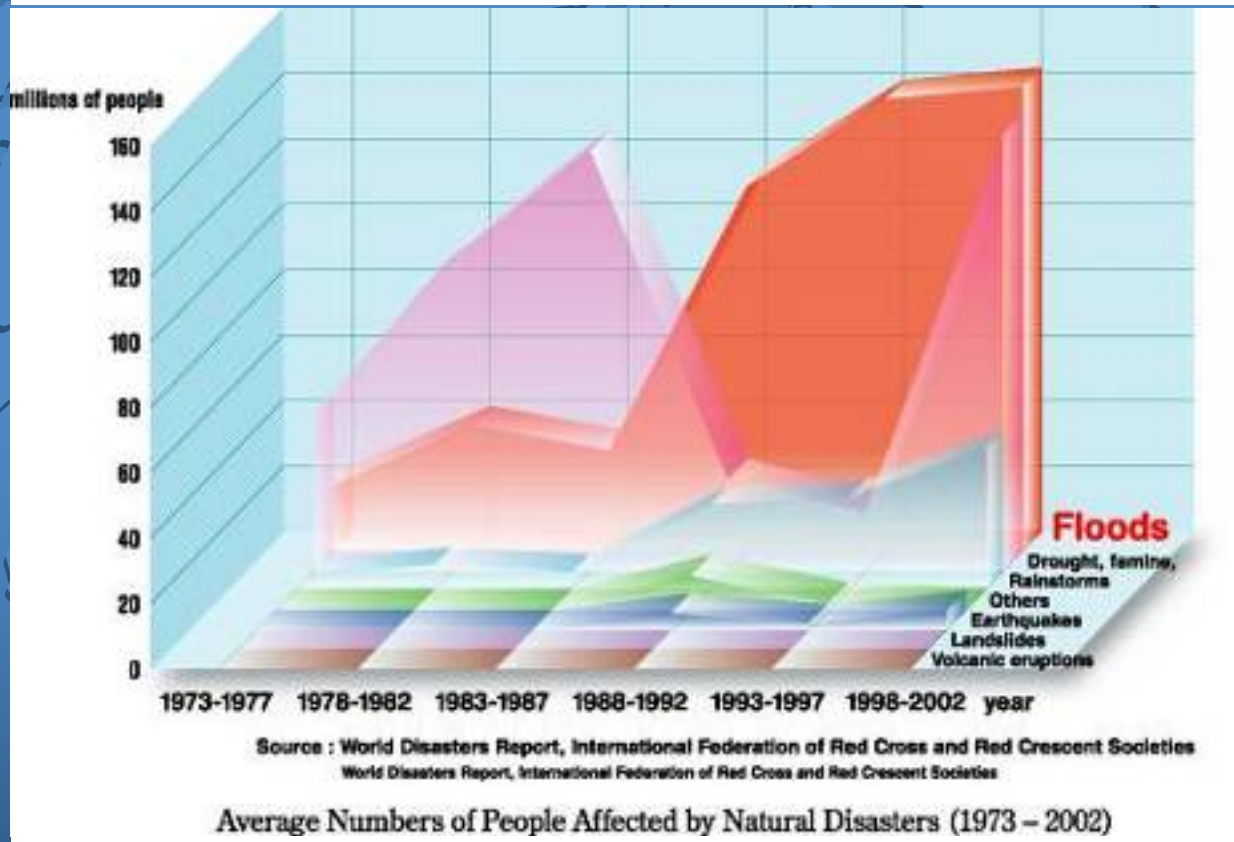
2. System Overview
3. 1st Phase Trial Run

1. Statistics of Flood Disasters (1)

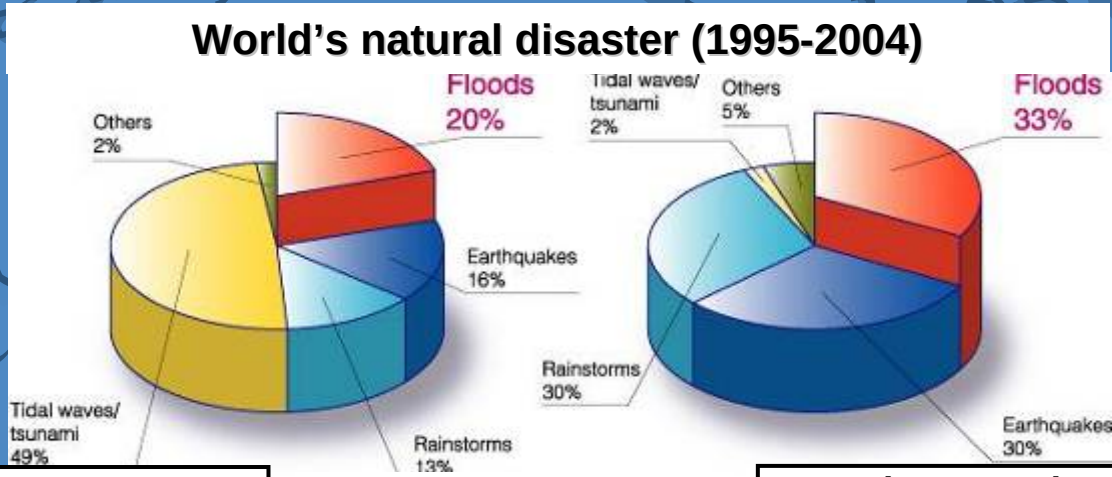
Average numbers of people affected by natural disasters (1973-2002)



Average Numbers of People Affected by Natural Disasters (1973 – 2002)

Source: International Federation of Red Cross and Red Cross Societies

Statistics of Flood Disasters (2)



Total Death Toll:
(about 470,000 people)

Source: EM-DAT, CRED

Total Economic Loss:
(about 49 billion. US$)

Death Toll

- **Tidal waves/Tsunami** **49%**
- **Floods** **20% (Target: to halve)**
- **Earthquakes** **16%**

2. System Outline

1. Objective

- To facilitate the use of Satellite Rainfall in FEW

2. System Concept

collaboration between:

i) Space Agencies as rainfall data provider

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

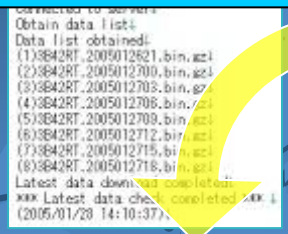
iii) IFNet as transmission network

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

Scheme of GFAS

Space Agencies

NASA Homepage



Observation Satellites

Heavy rainfall around
In the XX river basin

River

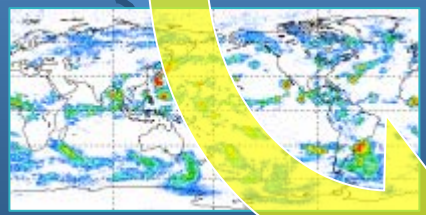
IDI-Japan

Data Download

Data processing

Mapping, Email

System Development



IFNet

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

Hydrological Service

River Authorities

Flood Forecasting and Warning using GFAS Information etc.

Outline of the IFNet

The establishment of IFNet was declared on the flood day at the 3rd World Water Forum in Kyoto, March 2003

1. Objectives

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

2. Membership

- Participation in IFNet is open to all who assent to the objectives.
- A total of **410** from **73** countries has been registered.
  (as of 1 Jan. 2006)

3. Field of Activities

- Policy Promotion, Raising Awareness
- Information Dissemination, Sharing and Exchange
  IFNet Action Report
- Flood Early Warning
  GFAS Project

Global Precipitation Measurement (GPM)

Current Observation System:

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

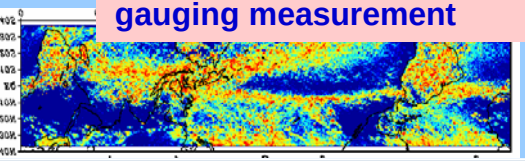
Core Satellite

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

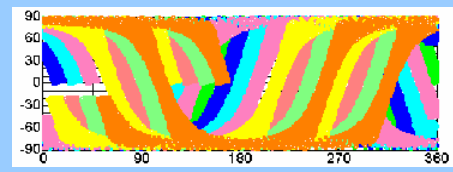


8 Constellation Satellites

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

Characteristics of Satellite Data

(Current observation system has started in 2002.)

1. Features

- 3-dimensional analysis of rainfall structure.
- No influence of the topographic features.

2. Data Delivery

- Observation is made every 3 hours (not hourly) for each grid.
- Observation grid size is about 600km2 (30km by 20km rectangle).
- Data delivery is near-real-time basis (several hours after observation).

Challenges for Flood Forecasting

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

- Telemetry System

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

- 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.

Expectations for Satellite Rainfall

Mozambique 2002

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

Challenges for Flood Forecasting in Small/Medium Urban Rivers

Flood in Fukuoka City (Jun. 1999)

Flood in Tokai Area (Sep. 2000)

Flash flood disasters are aggravated by the absence of accurate flood forecasting in urban middle/ small rivers

- To establish accurate flood forecasting with enhanced accuracy

Expectations for Satellite Rainfall

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 Trial Run in 2006

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

Data source: NASA (3B42RT)

Quasi Real-Time of Every 3 Hours

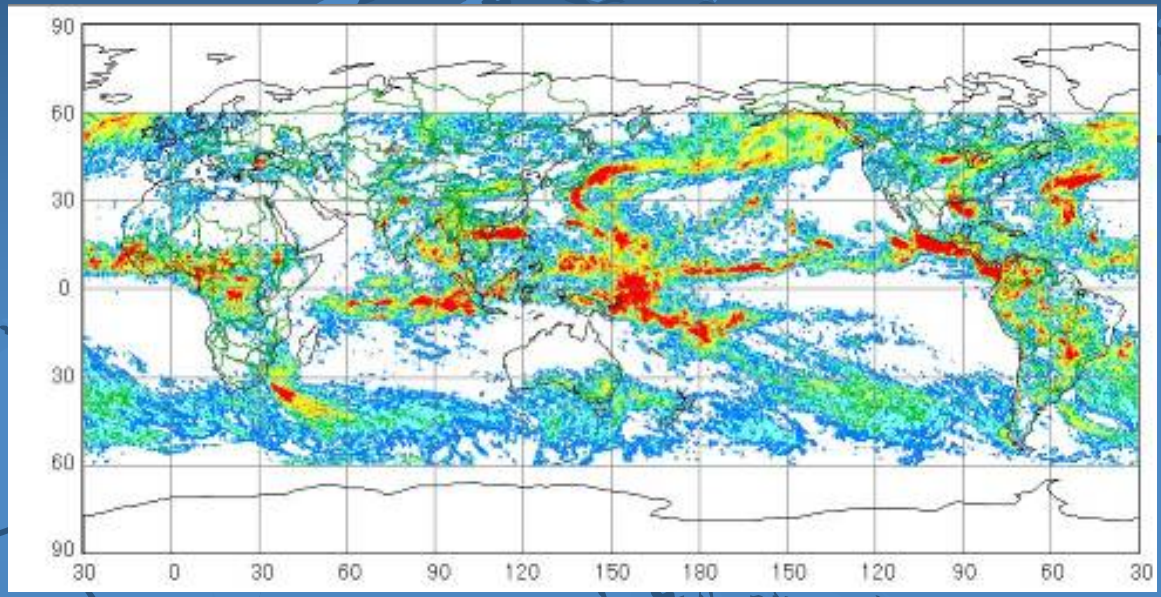
Observed by TRMM and others

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 March 2006 through IFNet Website/e-mail

Daily Rainfall Map and Text Rainfall Data



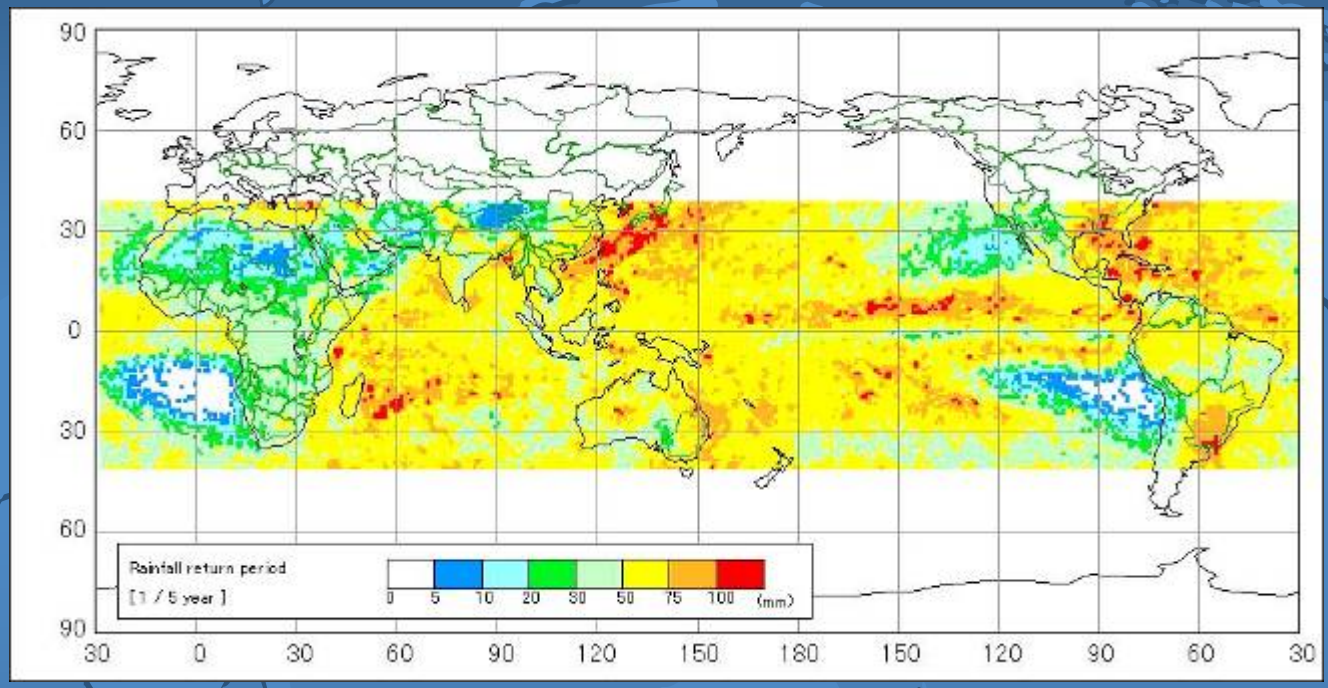
Daily Rainfall Map

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

Text Daily Rainfall Data

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

Probability Rainfall

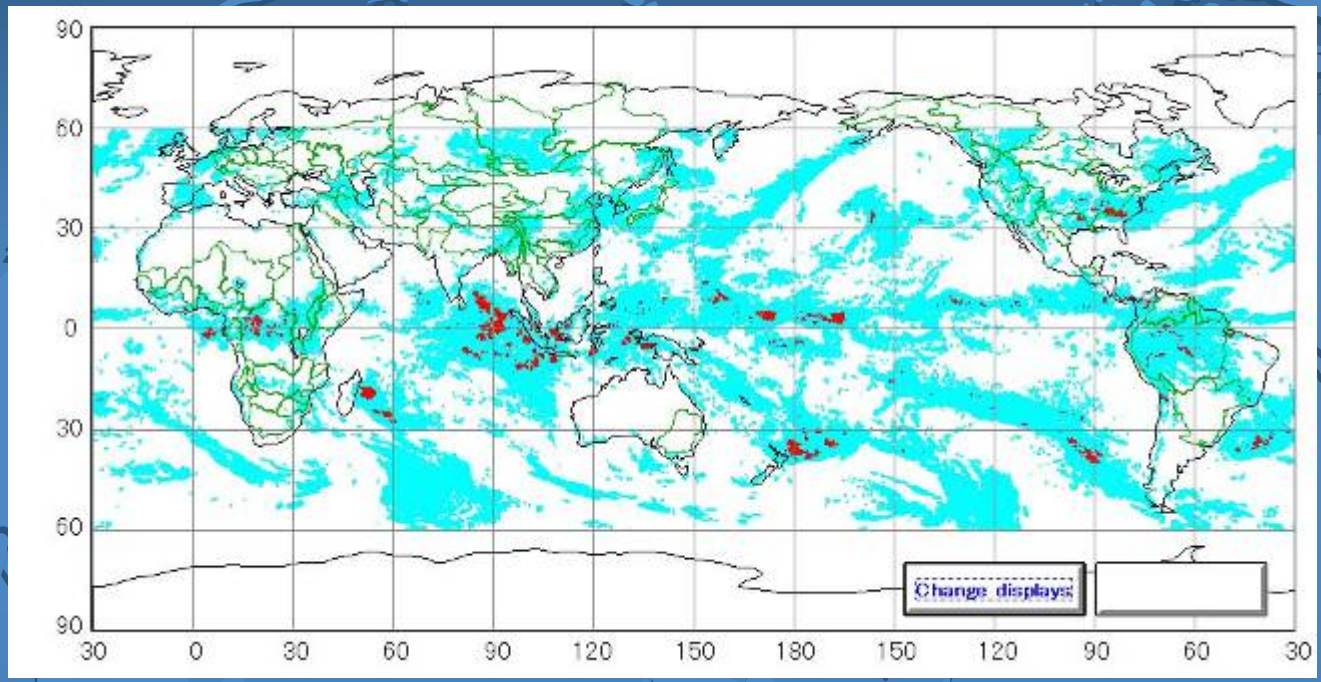


Note:
This is a sample map showing 5 year return period rainfall of 40-40 N-S, but the real map will show in the band of **60-60 N-S**.

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

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

Indication of Heavy Rain Area



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

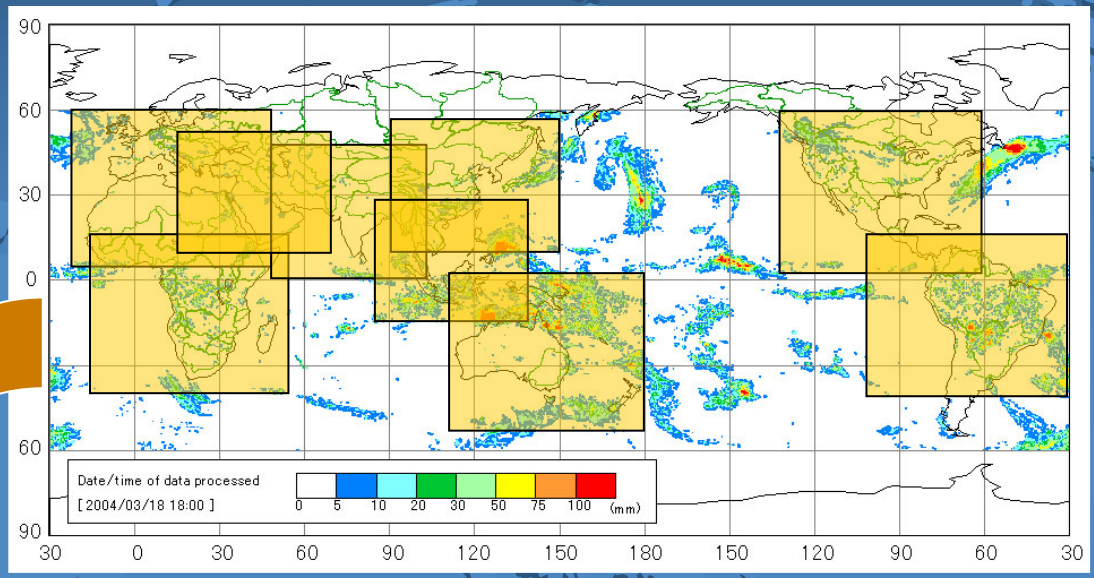
Rainfall Areas

Areas exceeding 1/5 return period Rainfall

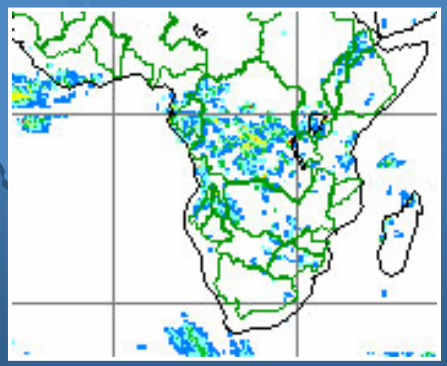
Map showing areas exceeding 5 year and 10 year return period daily precipitation

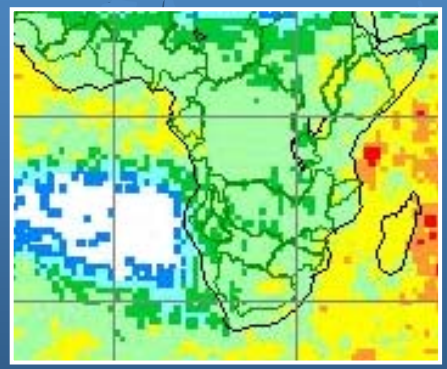
Accumulated data for calculation: TRMM 3B42(1998-2001) , 3B42RT(2002 –2004)

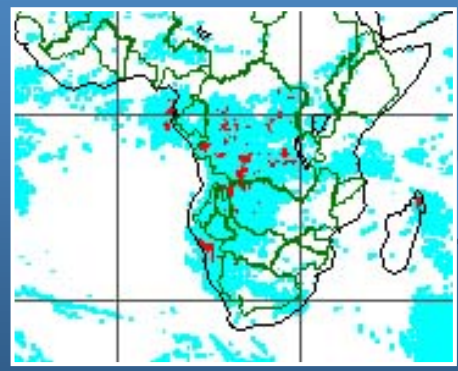
Enlarged maps for 9 Regions



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







Regional Map Sample (South Africa)

E-mail Delivery of Heavy Rainfall Notice on Request

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.**

Optimization of GFAS during Trial Run

1. Verification of 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. Grasp on User's Needs

- More enlarged maps for 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.)

Visions for the Future

1. Run-off Model

Data: satellite and existing rainfall observation, global mapping

Purpose: Flood forecasting, water resources planning/management

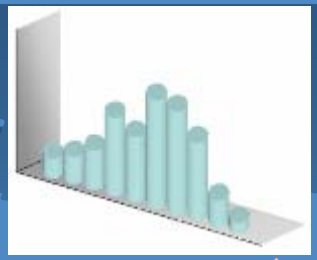
2. Enhanced Applicability of Satellite Rainfall

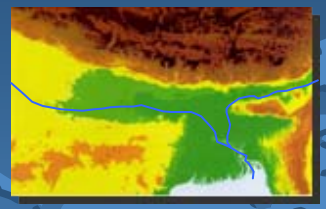
(Expectations for Space Agencies)

Smaller mesh, frequent data renewal for middle/small river basins

Visions for the Future (2)

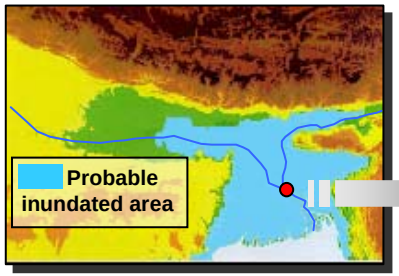
Precipitation

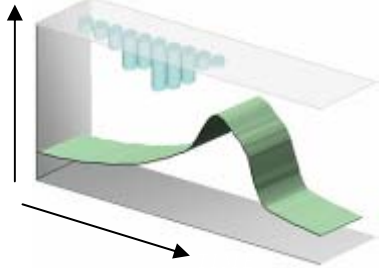




Global Digital Map

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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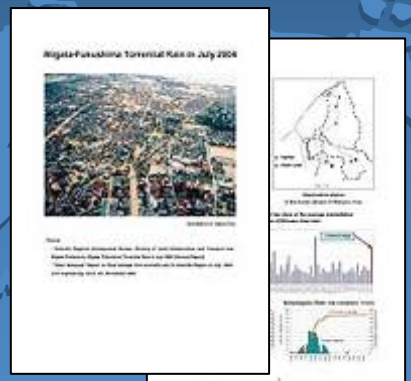
Present Approach to Satellite Rainfall

- Survey on the possibility of the satellite rainfall in river management
- Verification of satellite rainfall in comparison with ground rain-gage data
- Trial run of GFAS (Global Flood Alert System by IDI-Japan) Information

Tools for information dissemination

Websites



Reports

Newsletters (e-mail)

Materials for Distribution

Measures to Reduce Human Loss

- Structural Measures:

  Levee, Flood Control Dam, Flood Way

  Retarding Basin, etc.

- Non-structural Measures:

  1. In Emergency (Early Warning System)

     - Flood Forecasting
     - Flood Warning
     - Evacuation Advice/Order

  2. In Normal Time

     - Flood Hazard Map
     - Flood Fighting Drill,

Flood Hazard Map