Measures towards the Water Disaster Risk Reduction of ICHARM

- Research, Development & Capacity Building -

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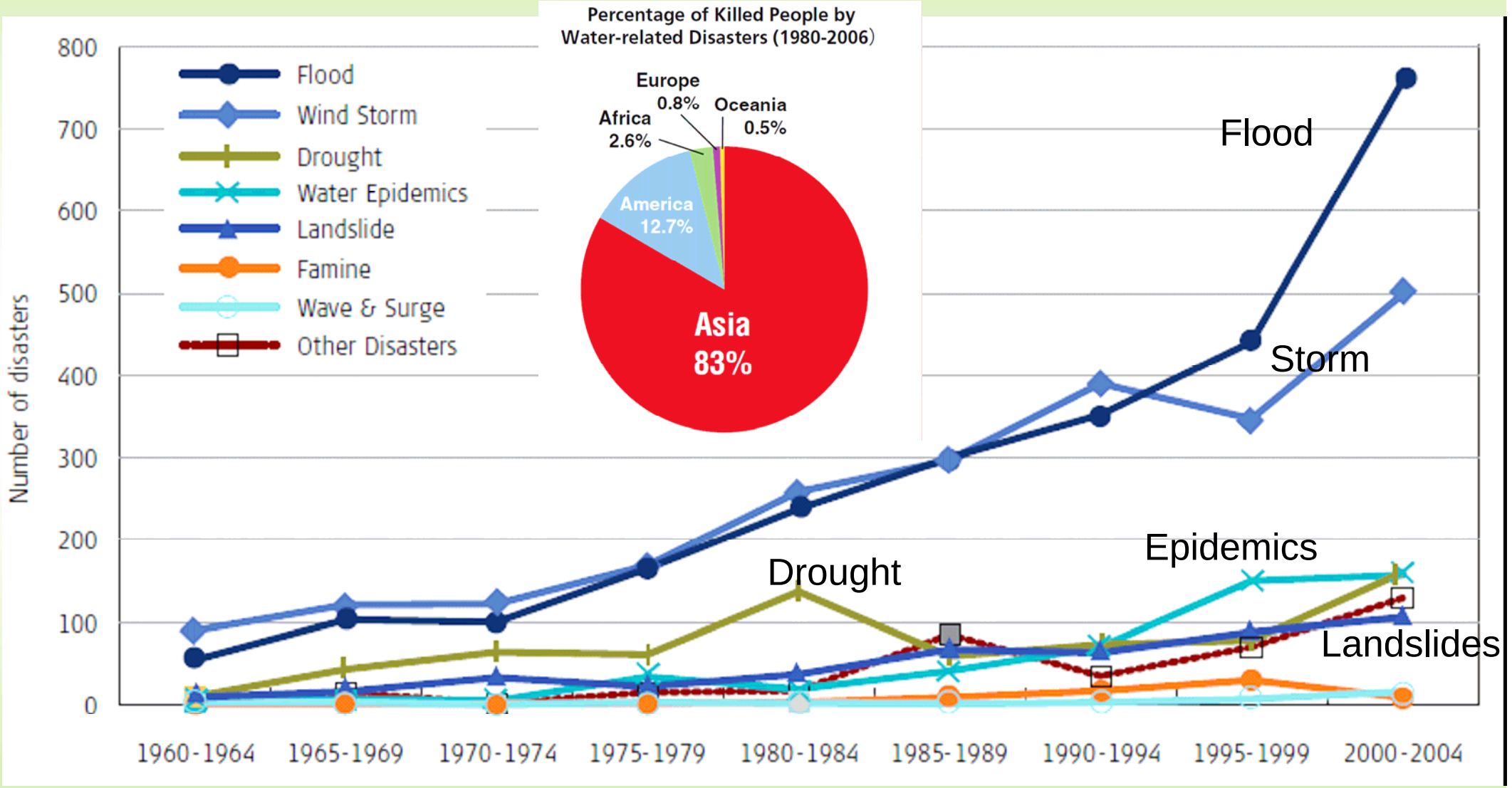
Public Works Research Institute (PWRI), Japan

Disasters are increasing regardless of CC

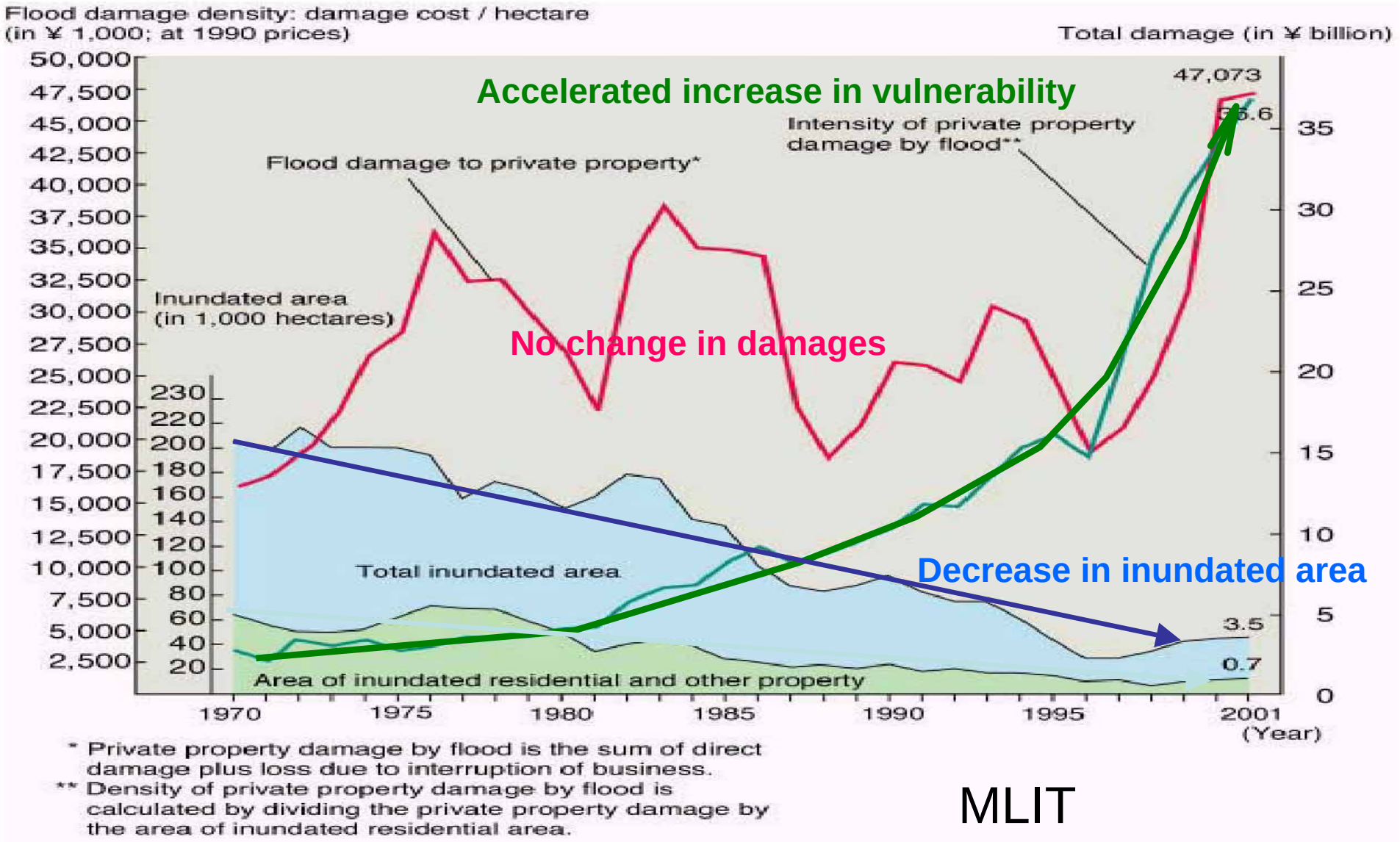
Global trend of water-related disasters by type of hazard, 1960–2004



Source: Data from the Center for Epidemiology of Disasters (OFDA-CRED) in Louvain (Belgium). Analysis by PWRI (ICHARM) in Tsukuba (Japan), 2005.4

Increase of flood damage potential

The main agenda are economic losses and infrastructure costs.



MLIT

ICHARM Objective

International Centre for Water Hazard and Risk Management

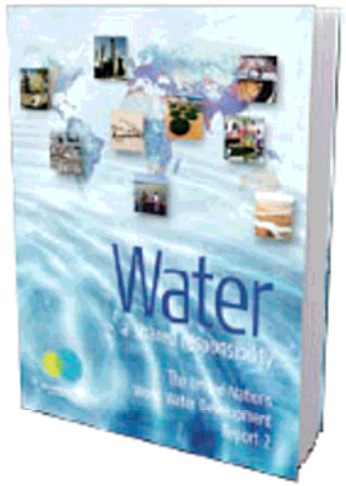
- **To be the global Center of Excellence to provide and assist implementation of the best practicable strategies to localities, nations, regions and the world to manage the risk of water related hazards including floods, droughts, land slides, debris flows and water contamination.**
  - **At the first stage, the priority is flood-related disasters**

ICHARM

International Centre for Water Hazard and Risk Management

under the auspices of UNESCO

hosted by PWRI, Tsukuba



UN WWDR II (2006)

- Flood risk analyses in diverse localities in developing countries
- Development of flood warning systems that use satellite observations and other advanced technology
- Development of flood hazard mapping procedures able to meet various environmental and social conditions
- Development of community water hazards risk aversion systems with advanced flood warning and flood hazard maps as available means
- Promotion of basic research on hydrological measurement, analysis, and forecast to support ICHARM activities
- Participation in international research programs such as World Water Assessment Programme, International Flood Initiative, Group of Earth Observations and Predictions in Ungaged Basins

Research

Data

Curriculum

Results

Participation

Flood Hazard Mapping Training

Information networking

Knowledge

Network

Training

- Creation of a worldwide and inter-disciplinary network of practitioners, researchers and course graduates in the field of integrated water risk management
- Collection, analysis and dissemination of information and experiences regarding water-related disasters worldwide
- Timely organization of investigation teams when catastrophic water hazards occur
- Organizing and sponsoring workshops and symposia

- Training courses on practical risk reduction systems incorporating existing social diversities, for public officers and decision makers
- Human resources development for integrated flood risk management in cooperation with universities and related institutes worldwide
- Training courses of flood hazard mapping and river and dam engineering for researchers and engineers
- Providing follow-up activities for course graduates in their home countries

Research (examples)

- **Local studies** (Identification of the real needs of the people in diverse localities) → Diagnosis & Prescription
  - **Disaster (Flood) Preparedness Indices & ISO**
- **Satellite & High-tech-based Flood Alert System** (with JAXA, IFNet/GFAS/IFAS etc.)
- **Floods & global warming: risk estimates and counter measures** (MEXT fund for 2007-2012)
  - JMA/MRI GCM (20km mesh) →
    - Development of risk indices,
    - Drawing a Global flood risk map,
    - Estimating Adaptation cost (structural & non-structural)
- **Flood Hazard Mapping**:
  - methodologies to map in remote localities with poor data
  - effective and beneficial use of HMs in real local situation

Flood disaster mitigation

with flood forecasting and warning systems (Typical situations in developing countries)

1.Monitoring of meteorological & hydrological conditions

- ✕Low density of gauging stations, low sustainability of maintenance of observatories, etc.

2.Flood forecasting

- ✕Lack of real-time hydrologic data, therefore difficult to construct and run forecasting & warning system

3.Analysis of forecasts and judging risks

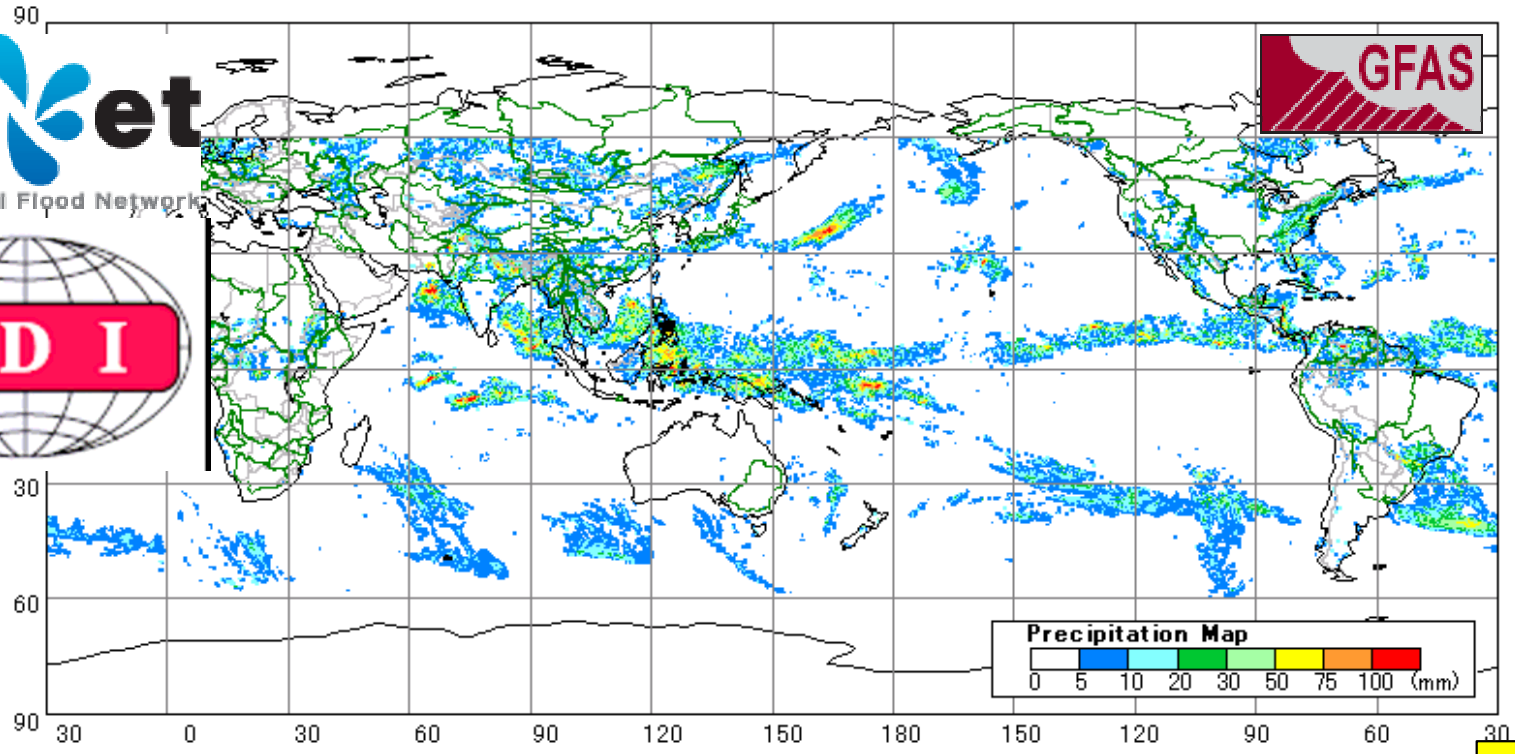
- ✕Lack of historical hydrologic & statistical data on flood events and damage, therefore difficult to judge risks compared with real-time information and/or simulations.

4.Dissemination of warning

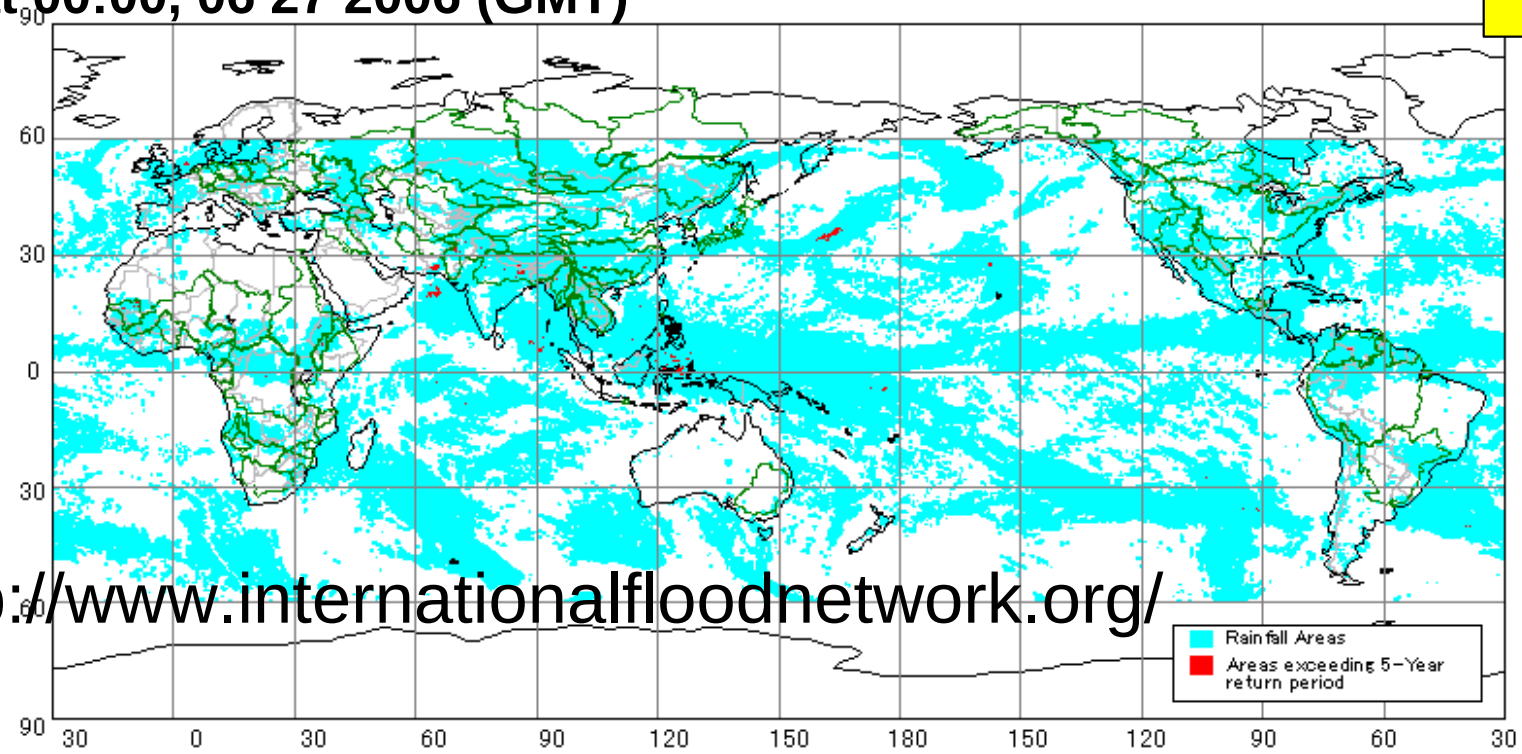
- ✕Lack of disaster-management community and communication network, incompatibility of flood information with local society and needs, etc.

5.Crisis management (flood fighting, evacuation, etc.)

- ✕Improper governance, insufficient institutional cooperation, etc.



As at 00:00, 06 27 2006 (GMT)



From rainfall to local flood forecasts.

http://www.internationalfloodnetwork.org/

NASA and Infrastructure Development Institute

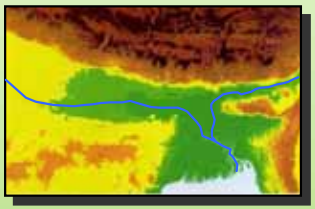
Development of Integrated Flood Analysis System (IFAS)

A computer software package specifically for flood runoff analyses with GUI using ground-based and satellite-based rainfall data

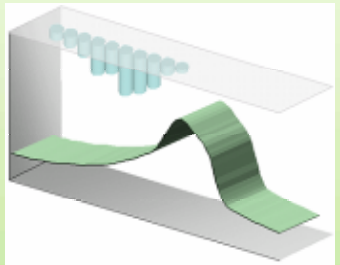
Being developed by *a* joint research (FY2005-2007)

at ICHARM/PWRI,
Infrastructure Development Institute (IDI/IF-Net),
and nine major civil-engineering companies

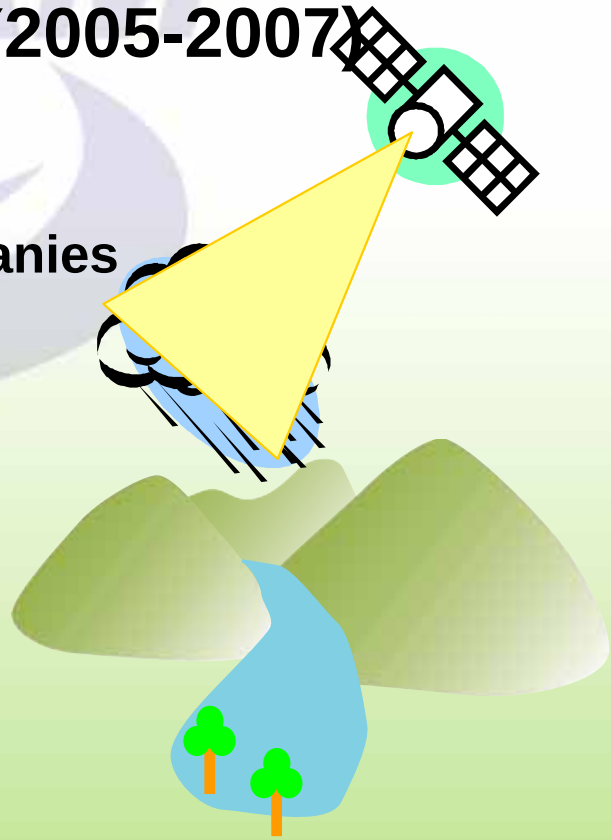
Satellite rainfall



Global GIS data

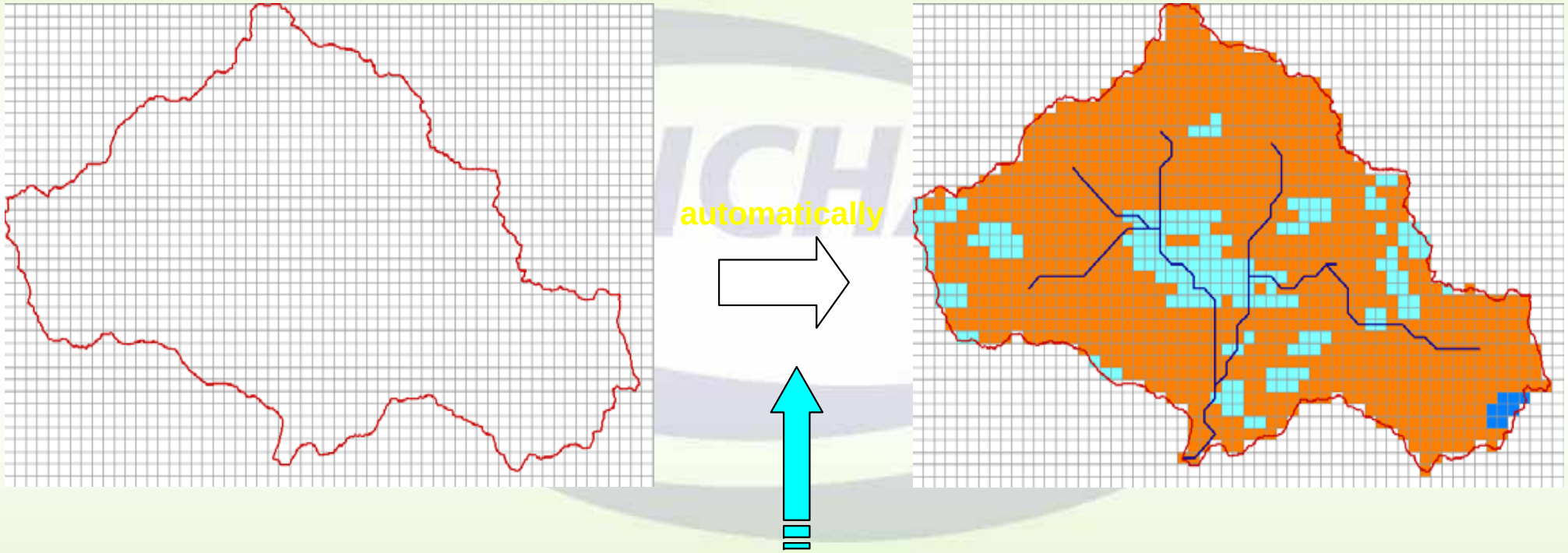


Runoff analysis

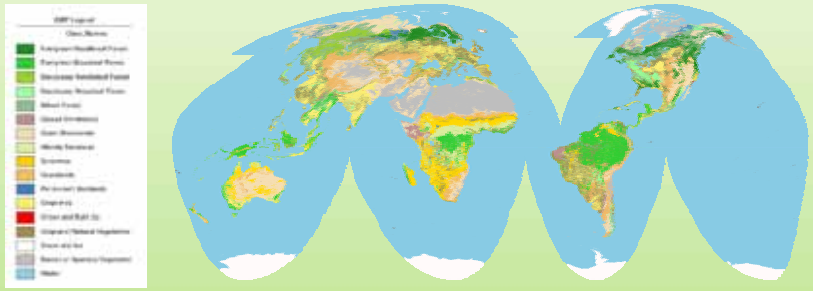


Automatic Estimate of Parameters as a first approximation

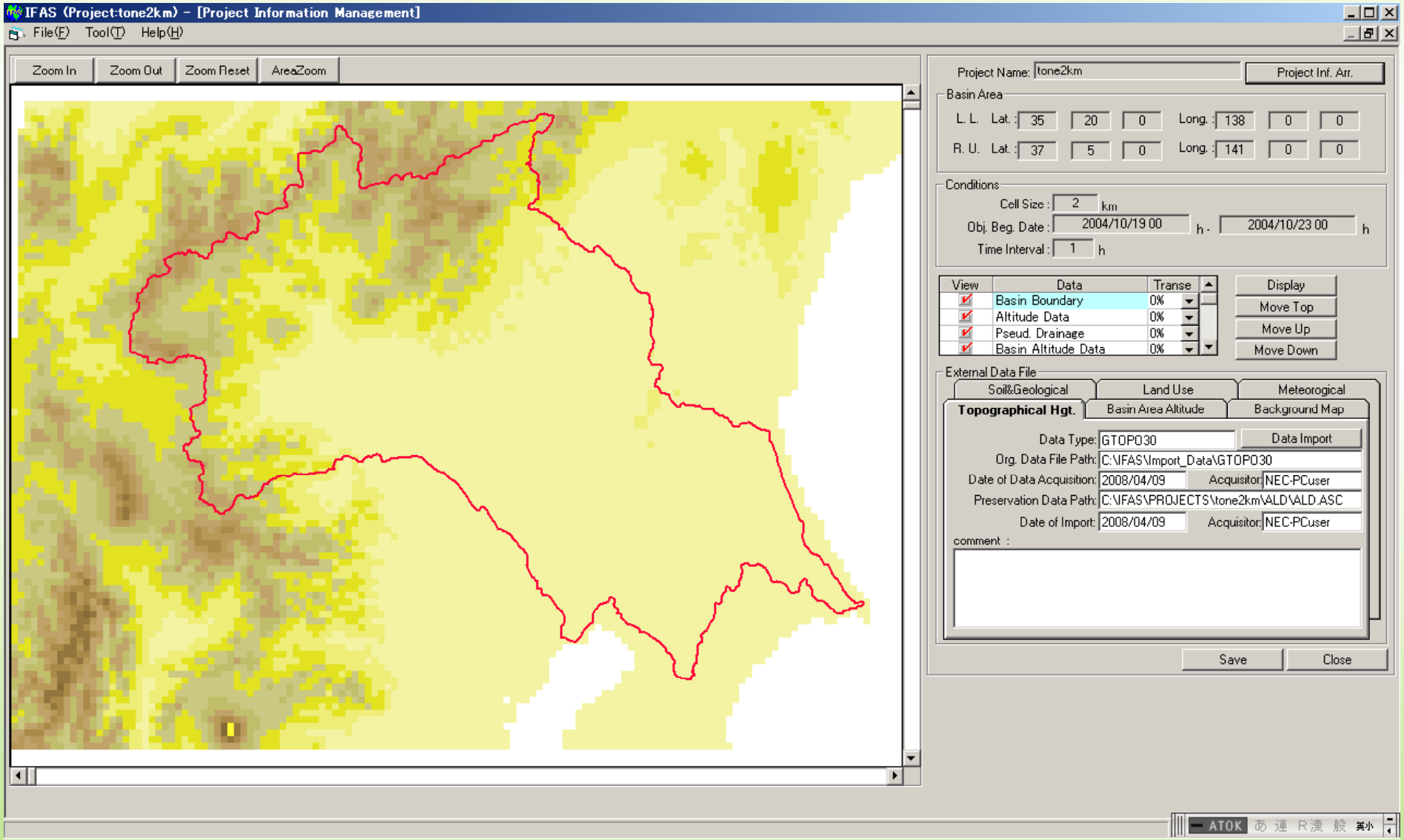
by use of globally available GIS datasets



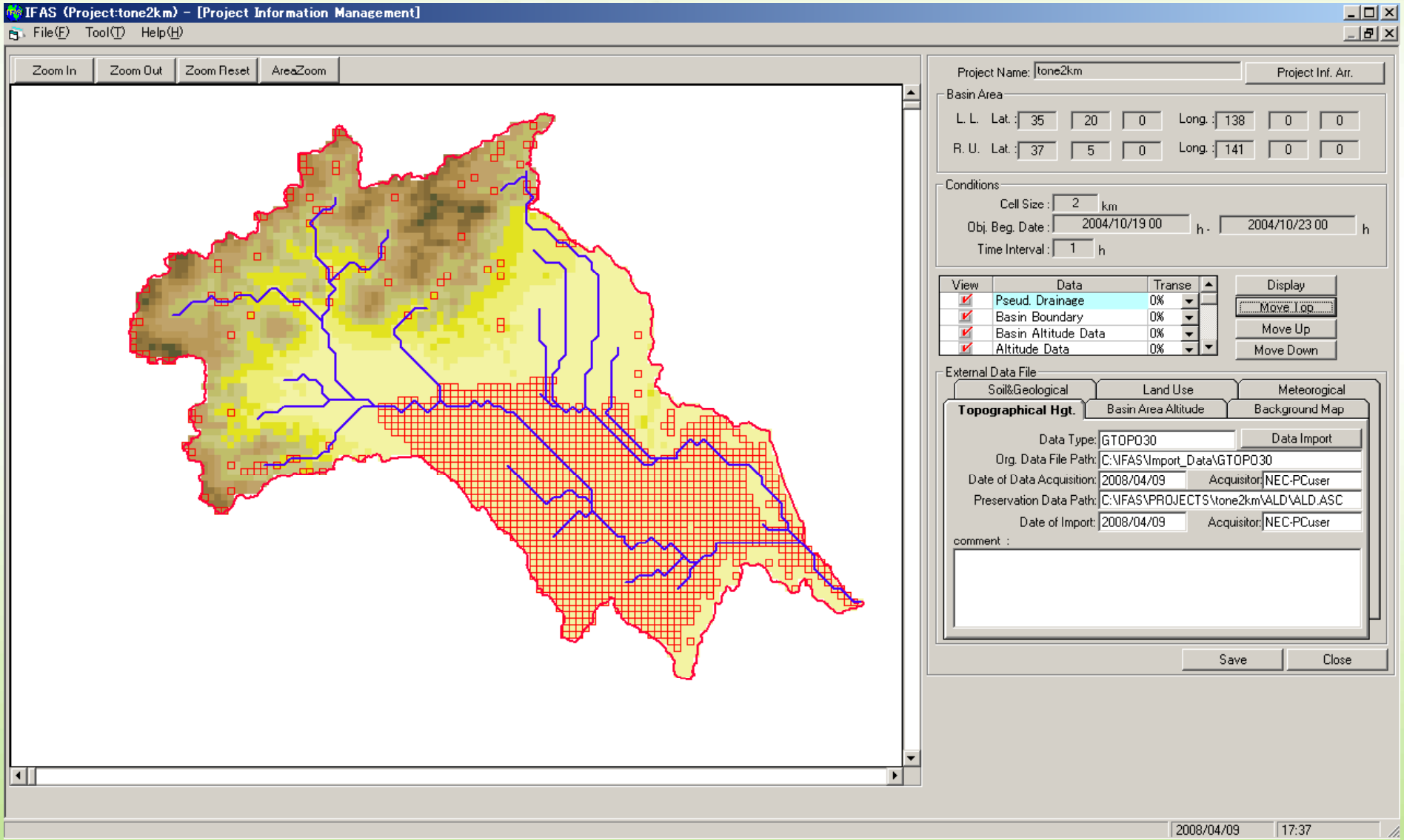
Use global GIS data such as USGS-GTOPO30, GLCC, etc.



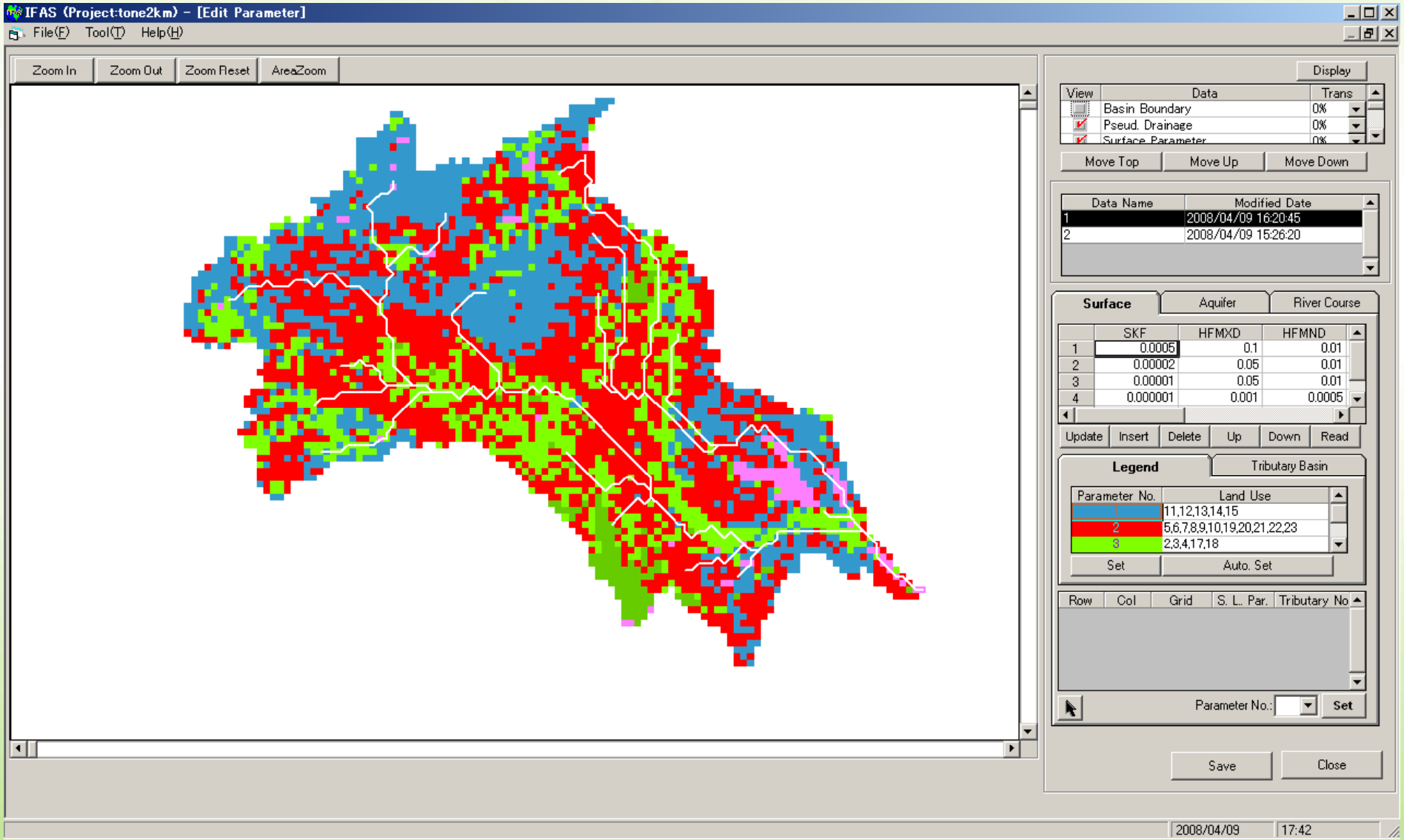
Modeling (altitude display screen in a traget area)



Modeling (river channel display screen)

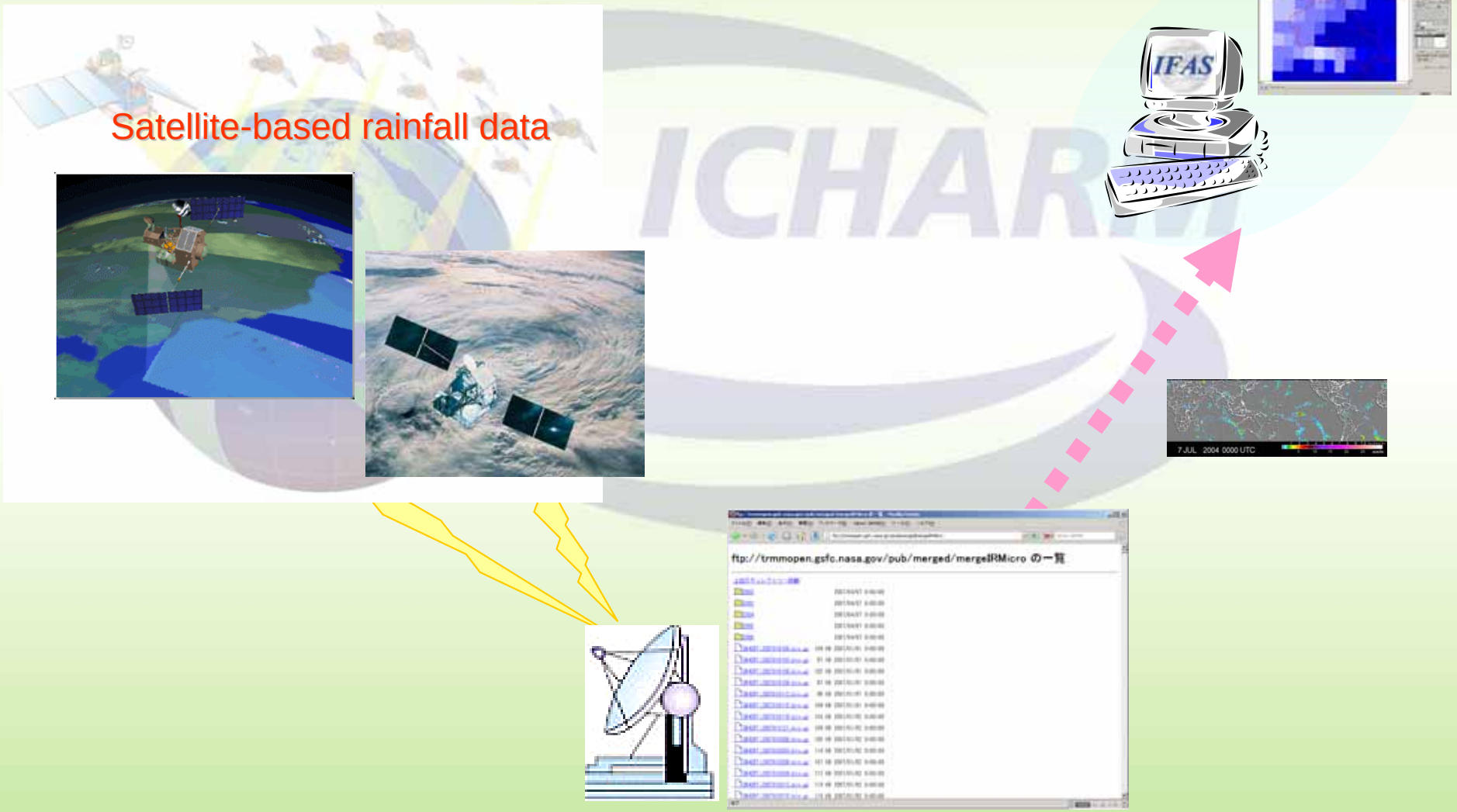


Modeling (surface parameter display screen)



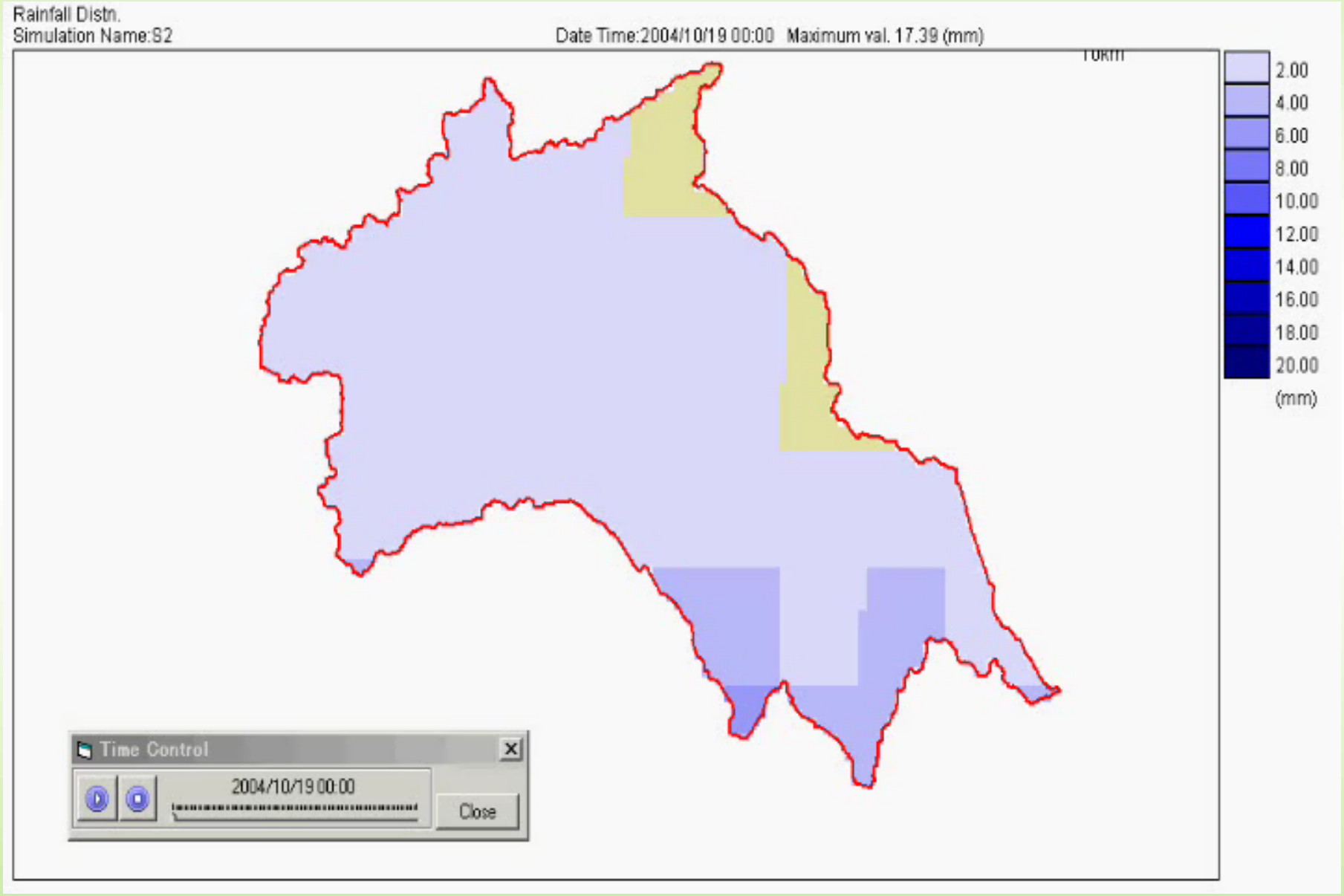
Satellite-based rainfall data

- The rain observed with an artificial satellite comes to hand via the Internet.

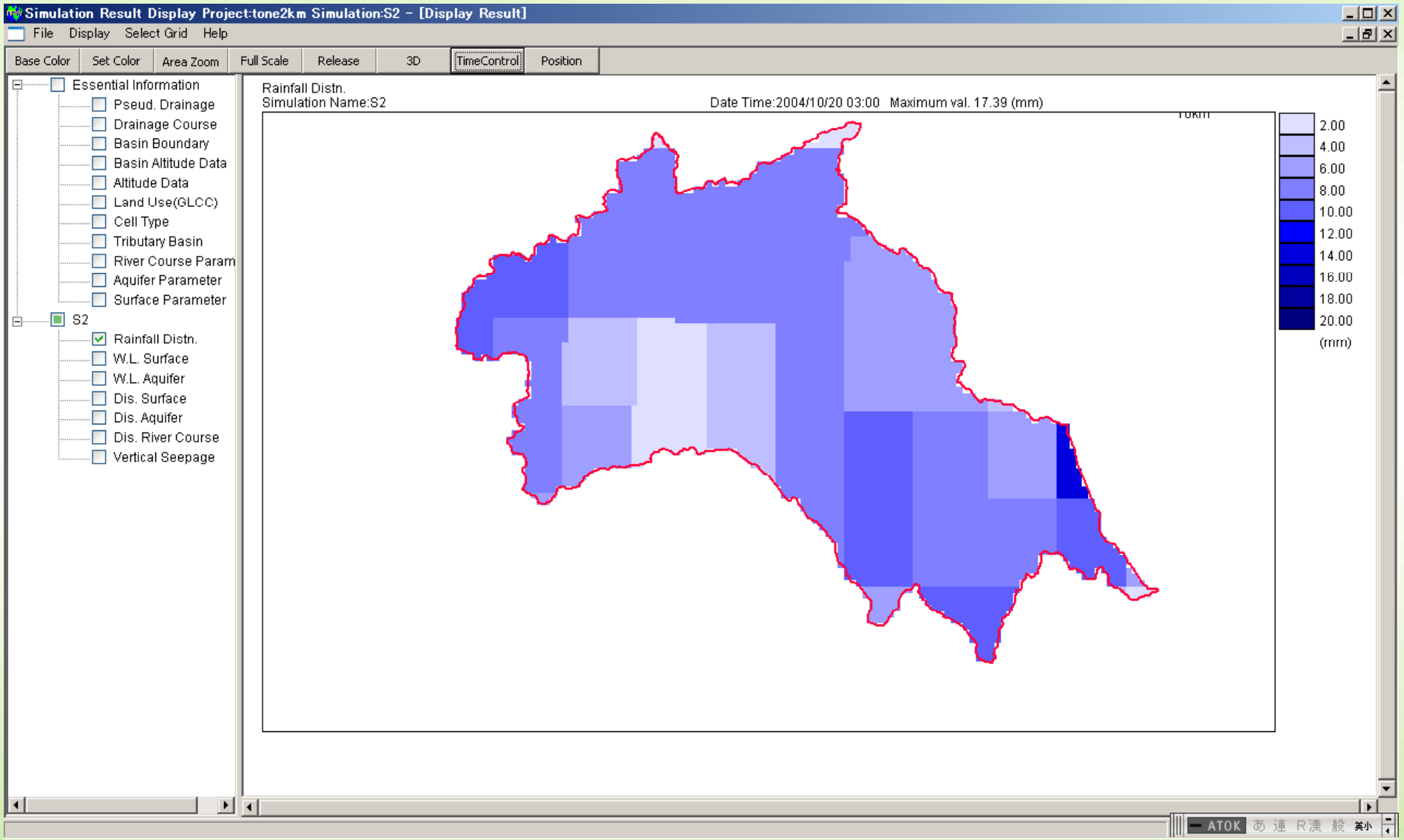


Ground stations, It opens to the public on HP.

ftp://trmmopen.gsfc.nasa.gov/pub/merged/mergeIRMicro/


Rainfall Distn.
Simulation Name:S2
Date Time:2004/10/19 00:00 Maximum val. 17.39 (mm)
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
(mm)
Time Control
2004/10/19 00:00
Close

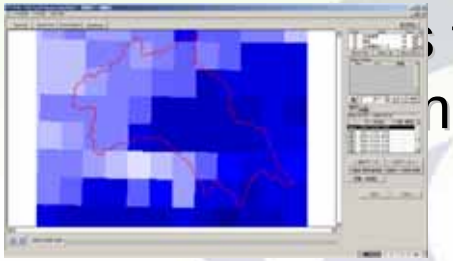
Display of results (rainfall data)



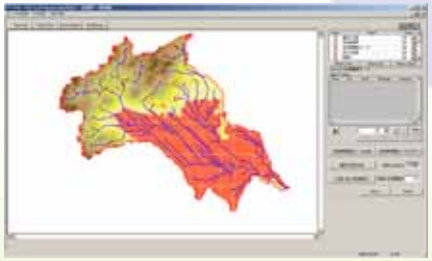
Run off analysis

- s the model, parameter, and rainfall data which
  nd perform run off calculation implementation.

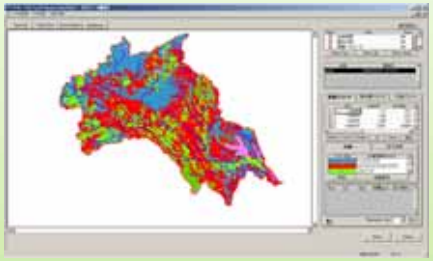
rainfall

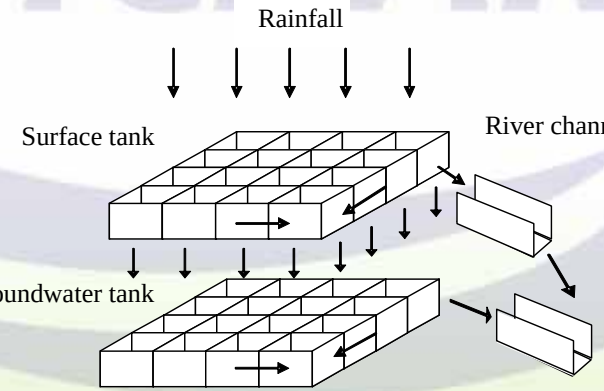


river channel



parameter

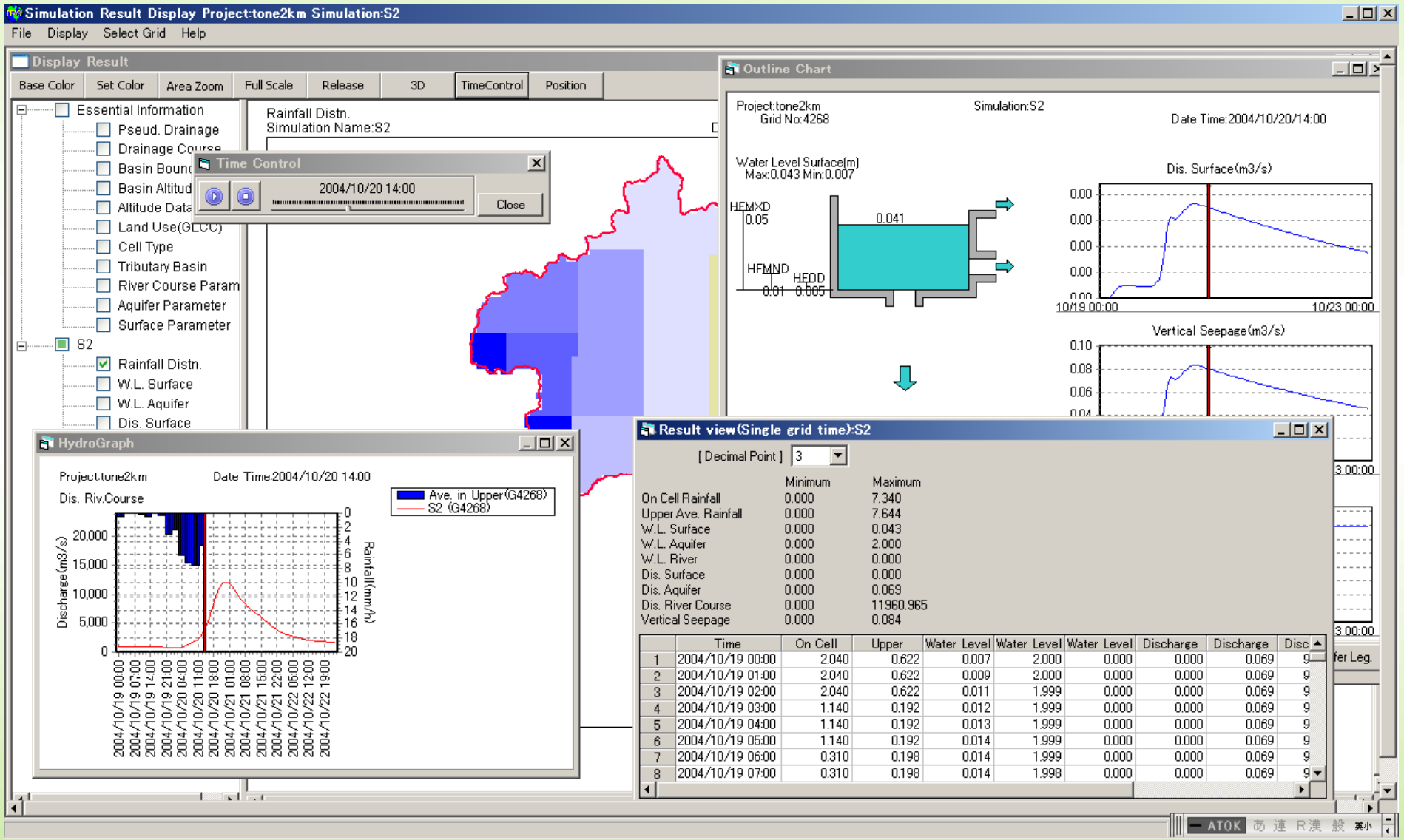




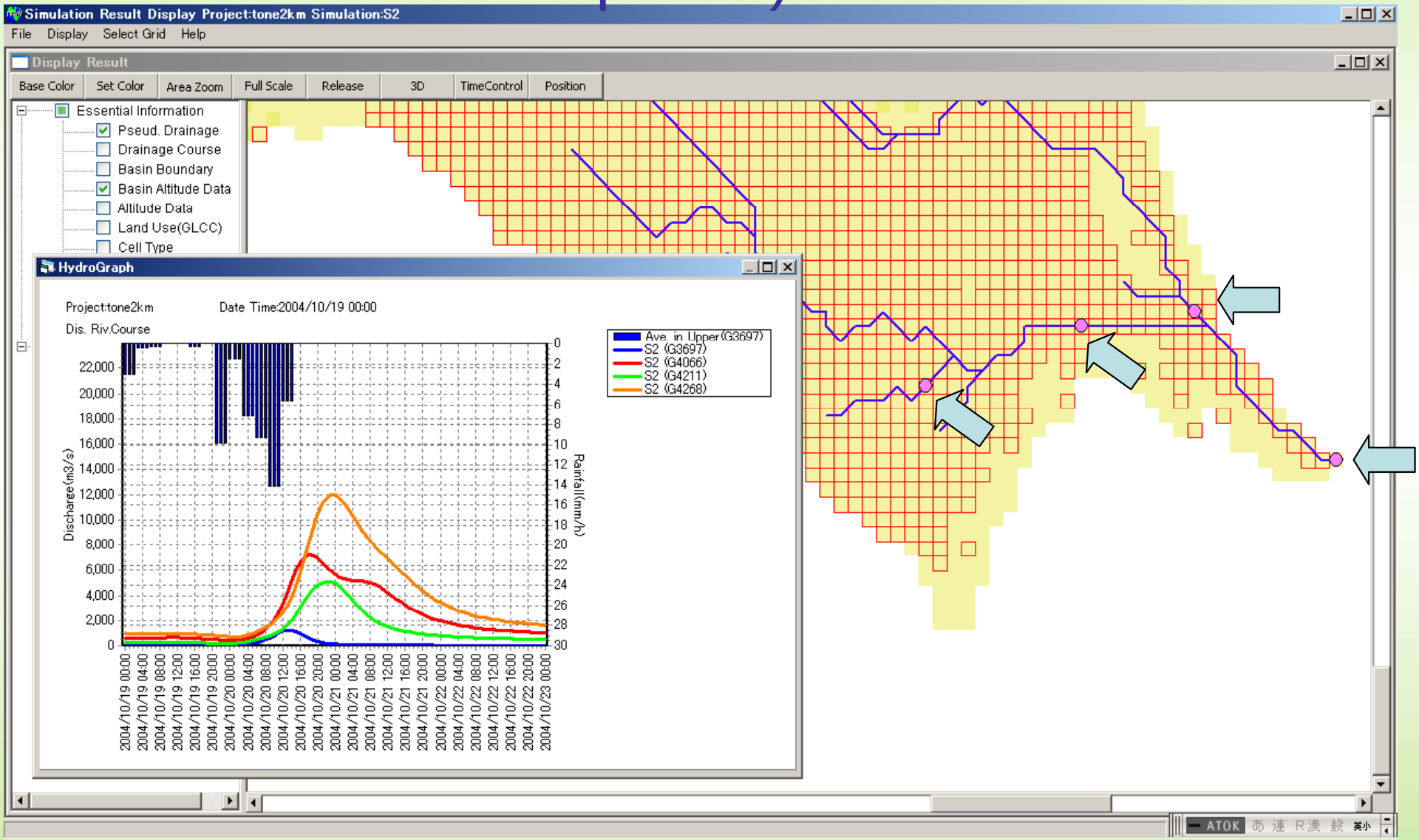
Display

PWRI distributed model

Display of results (two or more item display)



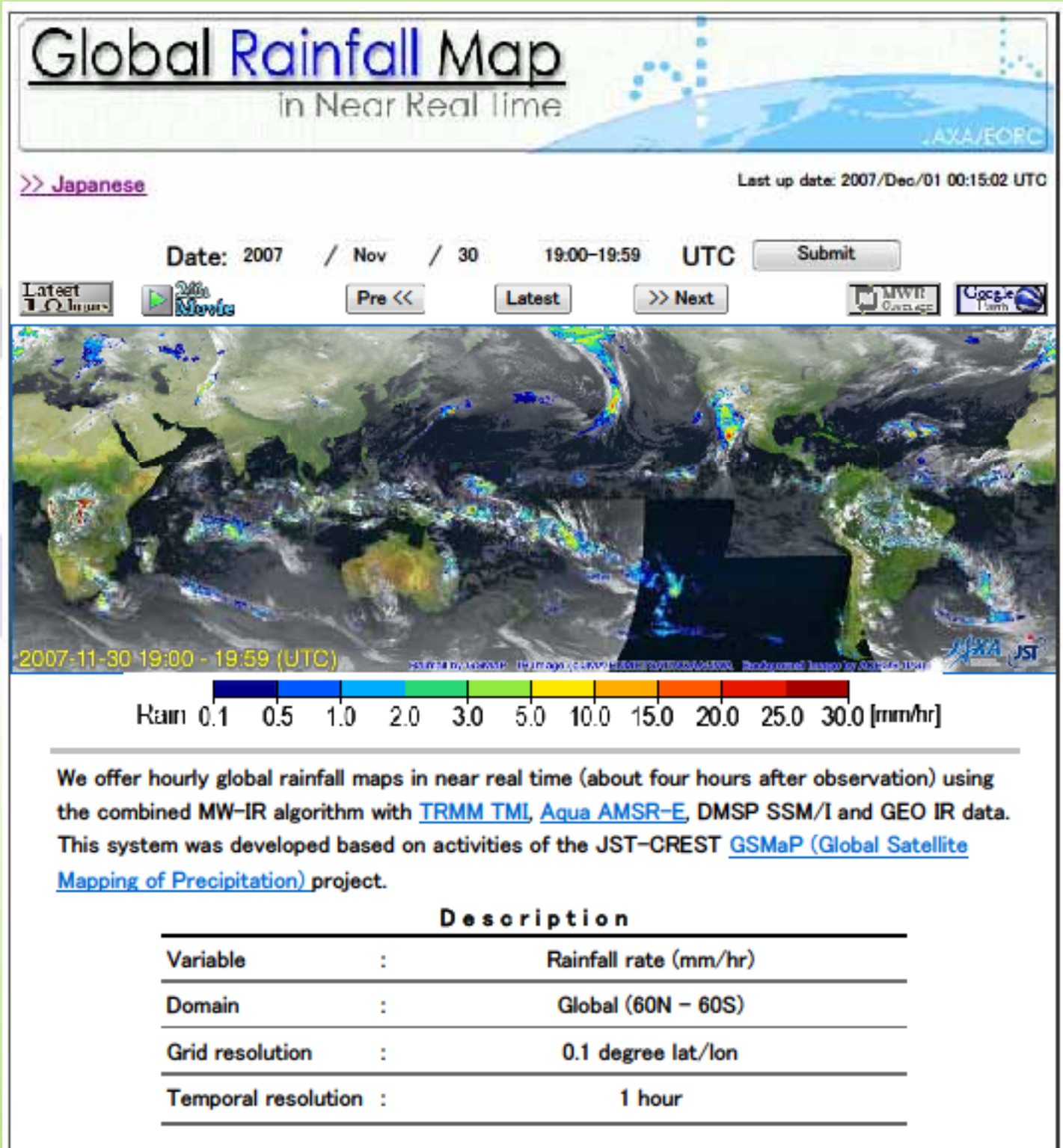
Display of results (figure of two or more points)

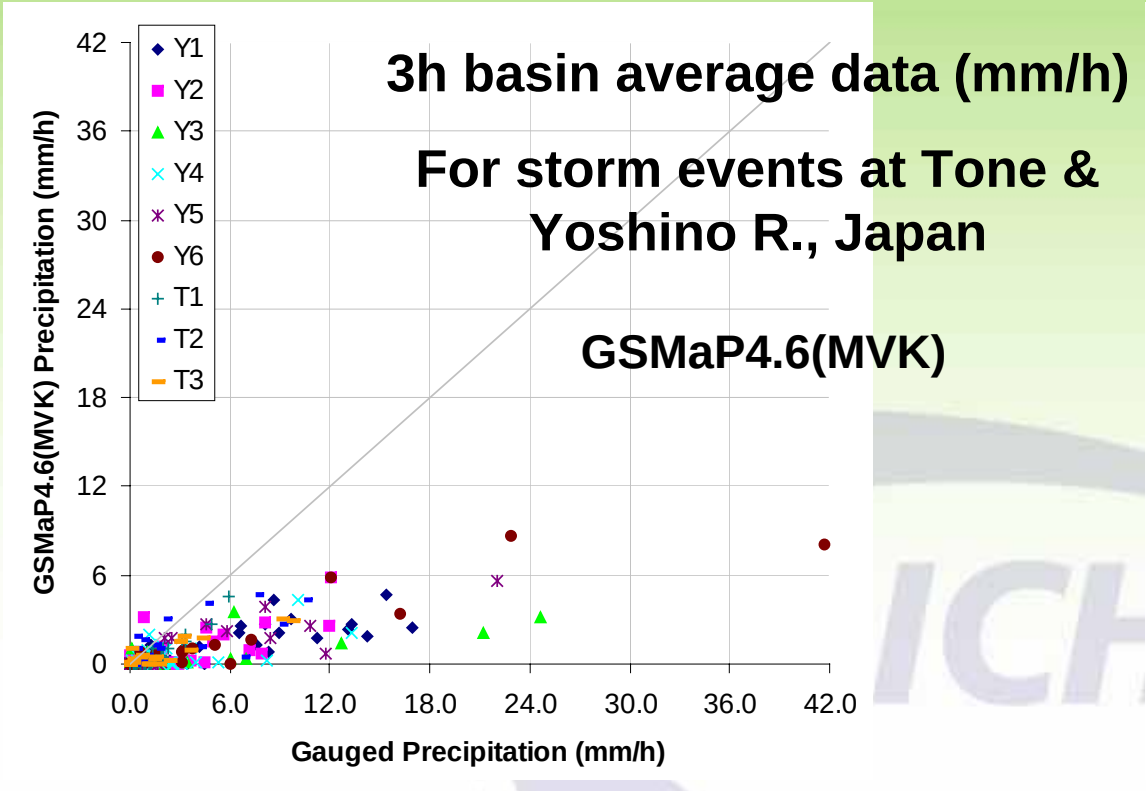


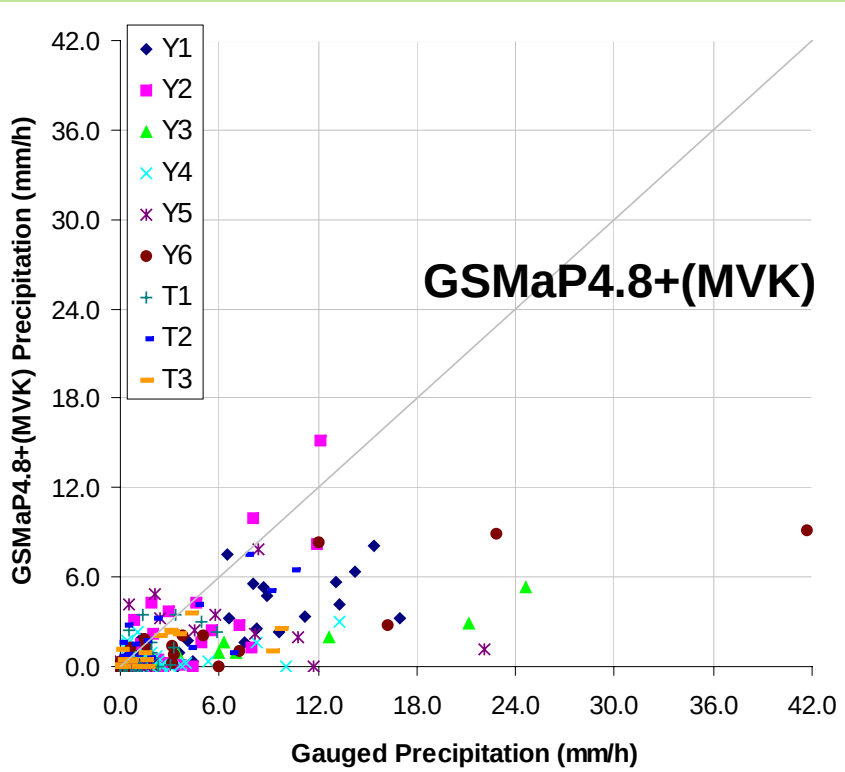
Real-Time GSMaP

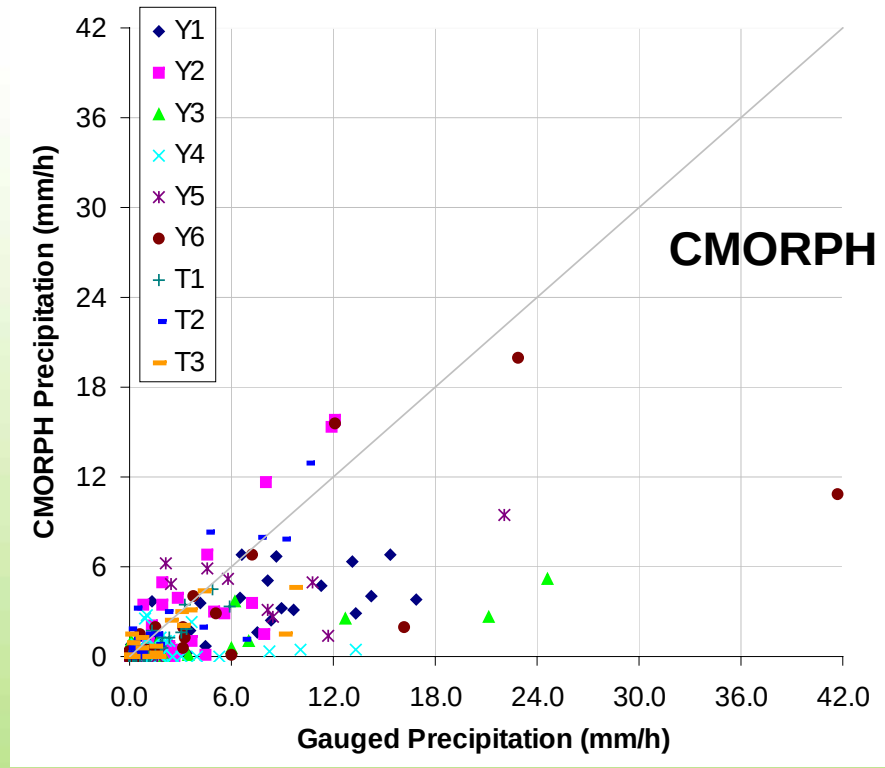
JAXA,
JST-CREST
(Prof. Ken'ichi OKAMOTO,
Osaka Pref. Univ. et al.)

ICHARM/PWRI




3h basin average data (mm/h)
For storm events at Tone & Yoshino R., Japan
GSMaP4.6(MVK)
GSMaP4.6(MVK) Precipitation (mm/h)
Gauged Precipitation (mm/h)
Y1
Y2
Y3
Y4
Y5
Y6
T1
T2
T3
0
6
12
18
24
30
36
42
0.0
6.0
12.0
18.0
24.0
30.0
36.0
42.0


GSMaP4.8+(MVK)
GSMaP4.8+(MVK) Precipitation (mm/h)
Gauged Precipitation (mm/h)
Y1
Y2
Y3
Y4
Y5
Y6
T1
T2
T3
0.0
6.0
12.0
18.0
24.0
30.0
36.0
42.0


CMORPH
CMORPH Precipitation (mm/h)
Gauged Precipitation (mm/h)
Y1
Y2
Y3
Y4
Y5
Y6
T1
T2
T3
0
6
12
18
24
30
36
42
0.0
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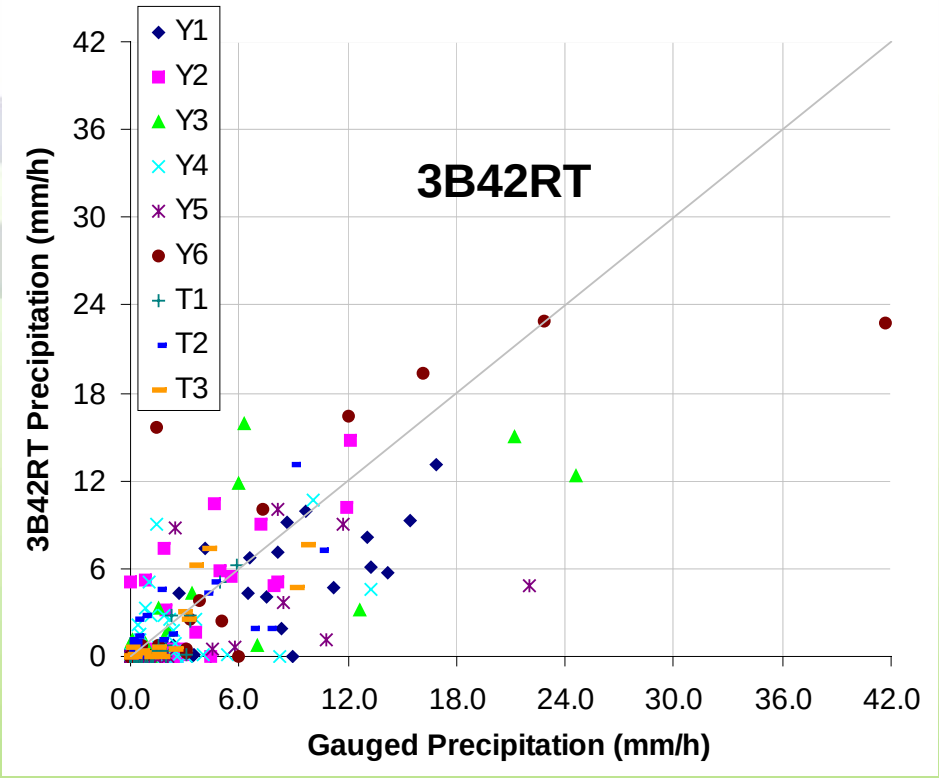
42.0

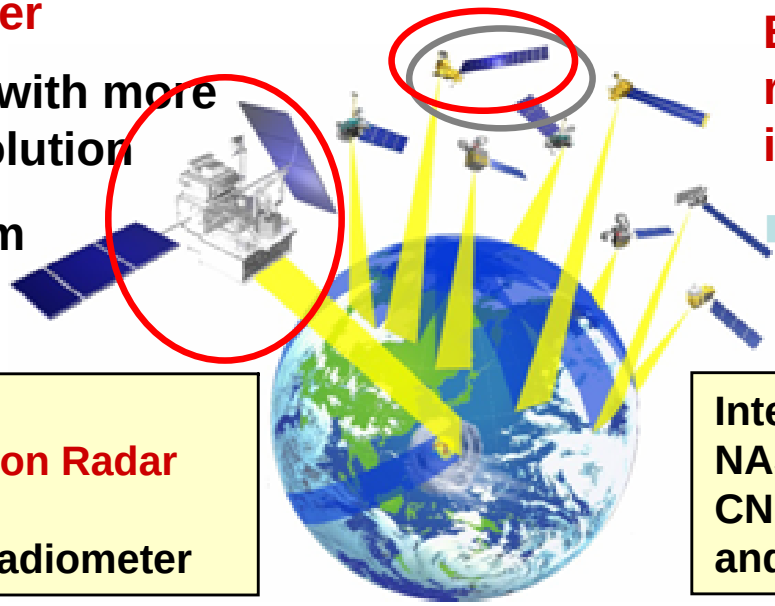

3B42RT
3B42RT Precipitation (mm/h)
Gauged Precipitation (mm/h)
Y1
Y2
Y3
Y4
Y5
Y6
T1
T2
T3
0
6
12
18
24
30
36
42
0.0
6.0
12.0
18.0
24.0
30.0
36.0
42.0

Future mission: Global Precipitation Measurement (GPM)

Core Satellite

Dual-frequency Precipitation Radar and microwave radiometer

- **Observation of rainfall with more accurate and higher resolution**
- **Adjustment of data from constellation satellites**



JAXA (Japan)
Dual-frequency Precipitation Radar
NASA(US)
Satellite bus, microwave radiometer

(launch in 2013)

Constellation Satellites

Each carrying microwave radiometers, provided by international partners

- **More frequent Observation**

International Partners：NOAA(US), NASA(US), JAXA (Japan), CNES/ISRO(France/India) and others

(launch around 2013)

Global Observation every 3 hours

- **Improve the accuracy of both long-term and short-term weather forecasts**
- **Improve water resource management in river control and irrigation systems for agriculture**

Miyagawa River Flood Hazard Map

[Ise City Flood Evacuation Map]

How to read the map

Anticipated inundation depth (demarcation according to rank)

- Inundation depth 5 m or more
- Inundation depth less than 5 m
- Inundation depth less than 2 m
- Inundation depth less than 1 m
- Inundation depth less than 0.5 m

About the Miyagawa River Flood Hazard Map

This map shows anticipated inundation depths and areas, based on the result of a flood simulation in the Miyagawa River Basin conducted by the Ministry of Land, Infrastructure and Transport. The simulation adopted the conditions of the highest recorded flood in the basin (which occurred in August 1938). The inundation depths and areas were calculated, supposing that the levees broke every kilometer. However, the inundation depths and areas in the map are slightly inaccurate since factors, such as storm surges and topographical effects caused by roads and other artificial structures, are not taken into account in the simulation.

The evacuation centers shown on this map are specifically selected from the facilities designated by Ise City as evacuation shelters in case of wind and flood disasters, considering the number of stories of the facilities and the anticipated inundation depths in their areas.

ダム放流

●三重県企業庁二瀬谷貯水池管理事務所

大雨などで宮川の流域ダムが放流をする場合、サイレンを鳴らして宮川の水位を知らせます。

1分 休み 10秒 1分 サイレン 休み 10秒 1分 サイレン 休み 10秒

●伊勢市

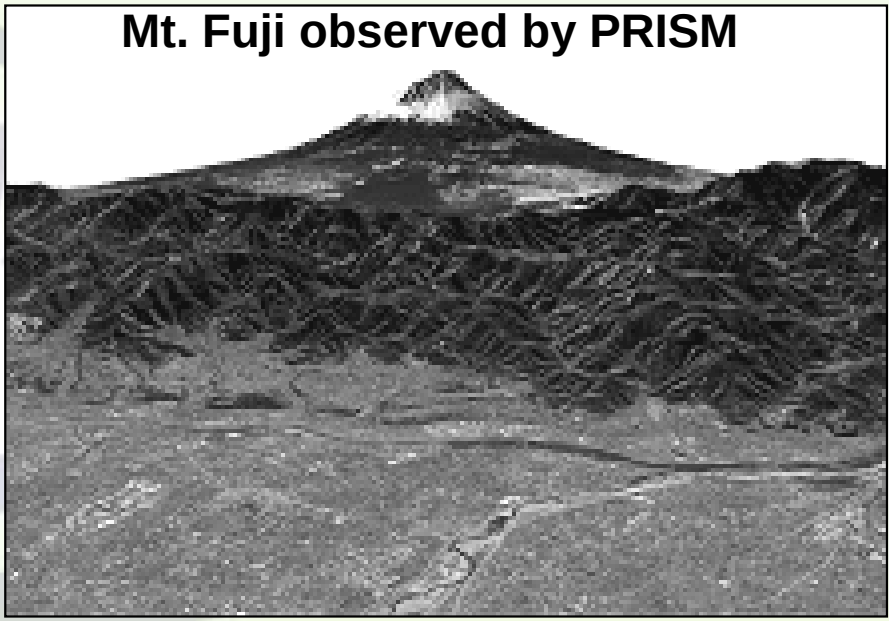
ダム放流の連絡を受けると、災害対策に関係した職員が各地区のスピーカーで宮川の増水を知らせます。

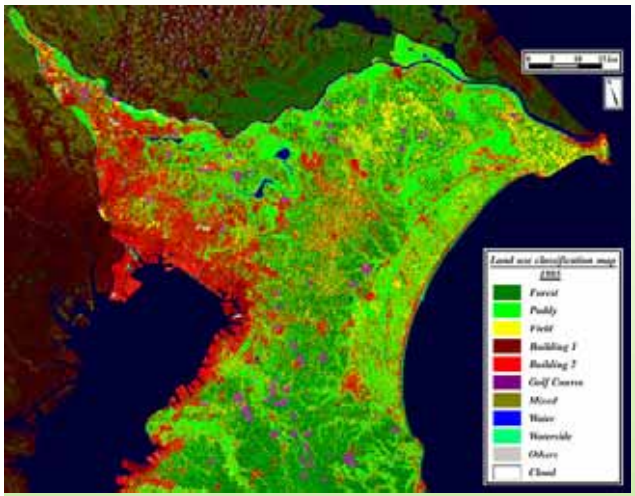
サイレンや地域放送を聞いたら川には近づかないようにしましょう。

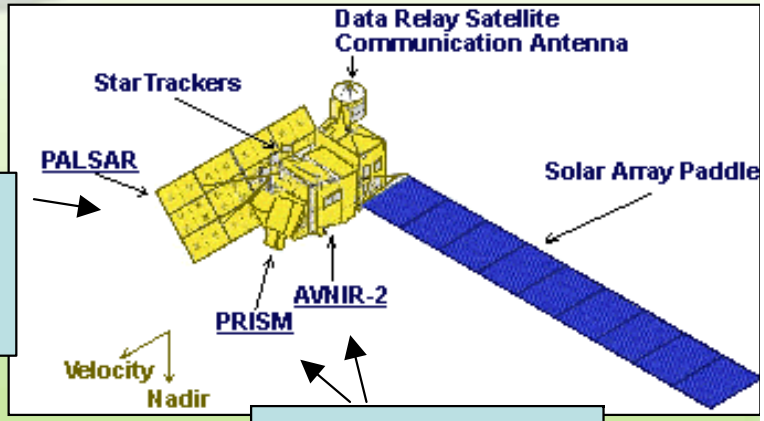
Aftercare programs in trainees' localities

Advanced Land Observing Satellite (ALOS)

- Launch: 24 January, 2006.
- Objectives:
  - Cartography
  - Regional observation
  - **Disaster monitoring**
  - Resource surveying







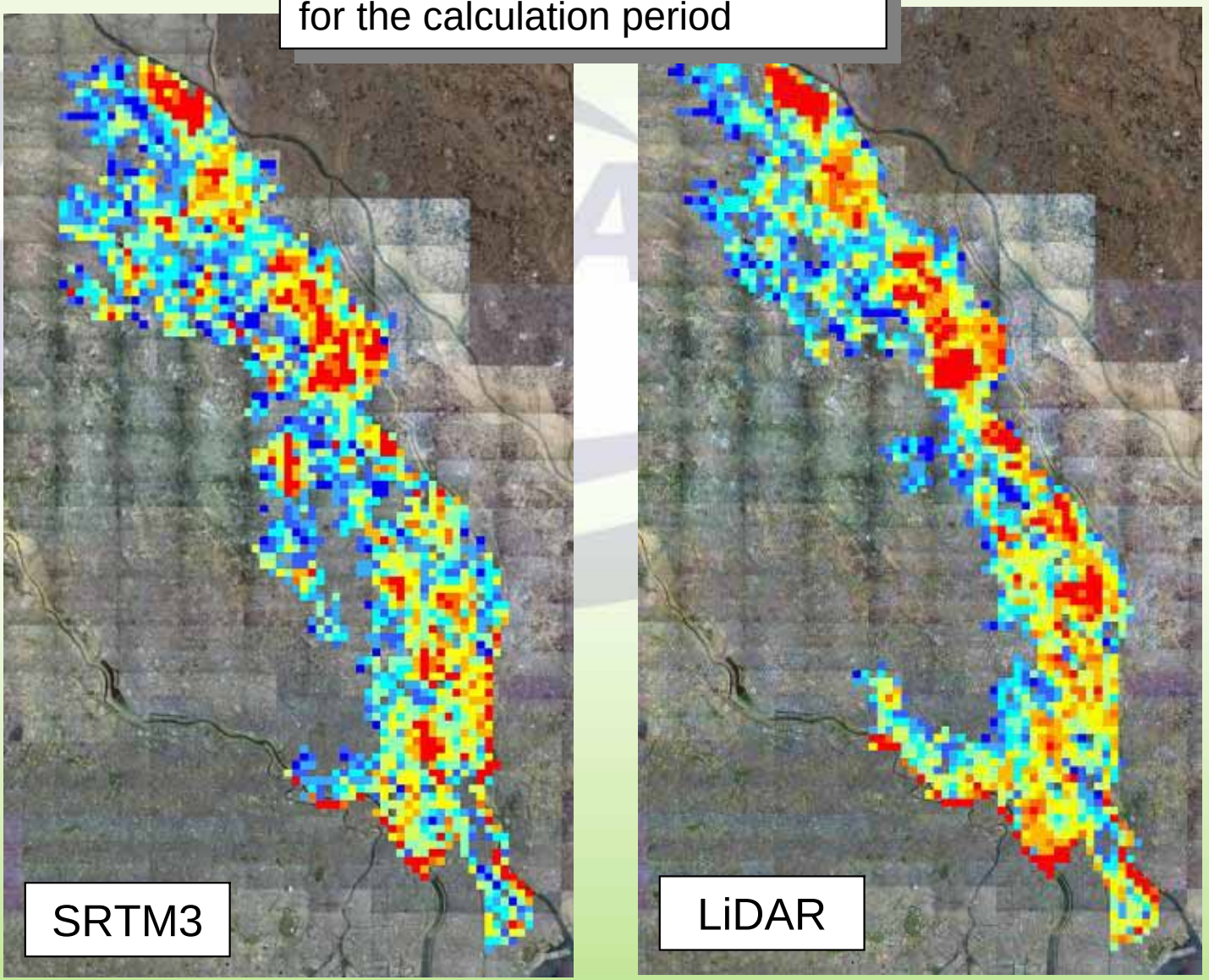
PALSAR (L-band SAR)
Cloud-free
Day-night observation

Flooding simulation with satellite-based DEM
- Inundation depth -

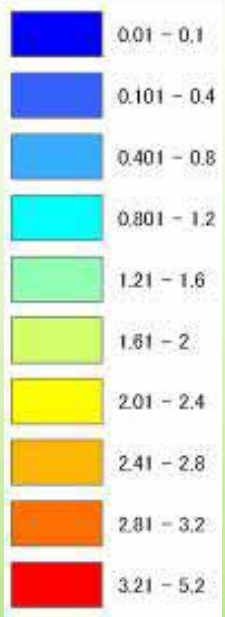
Absolute error of inundation depth from SRTM3 in this area

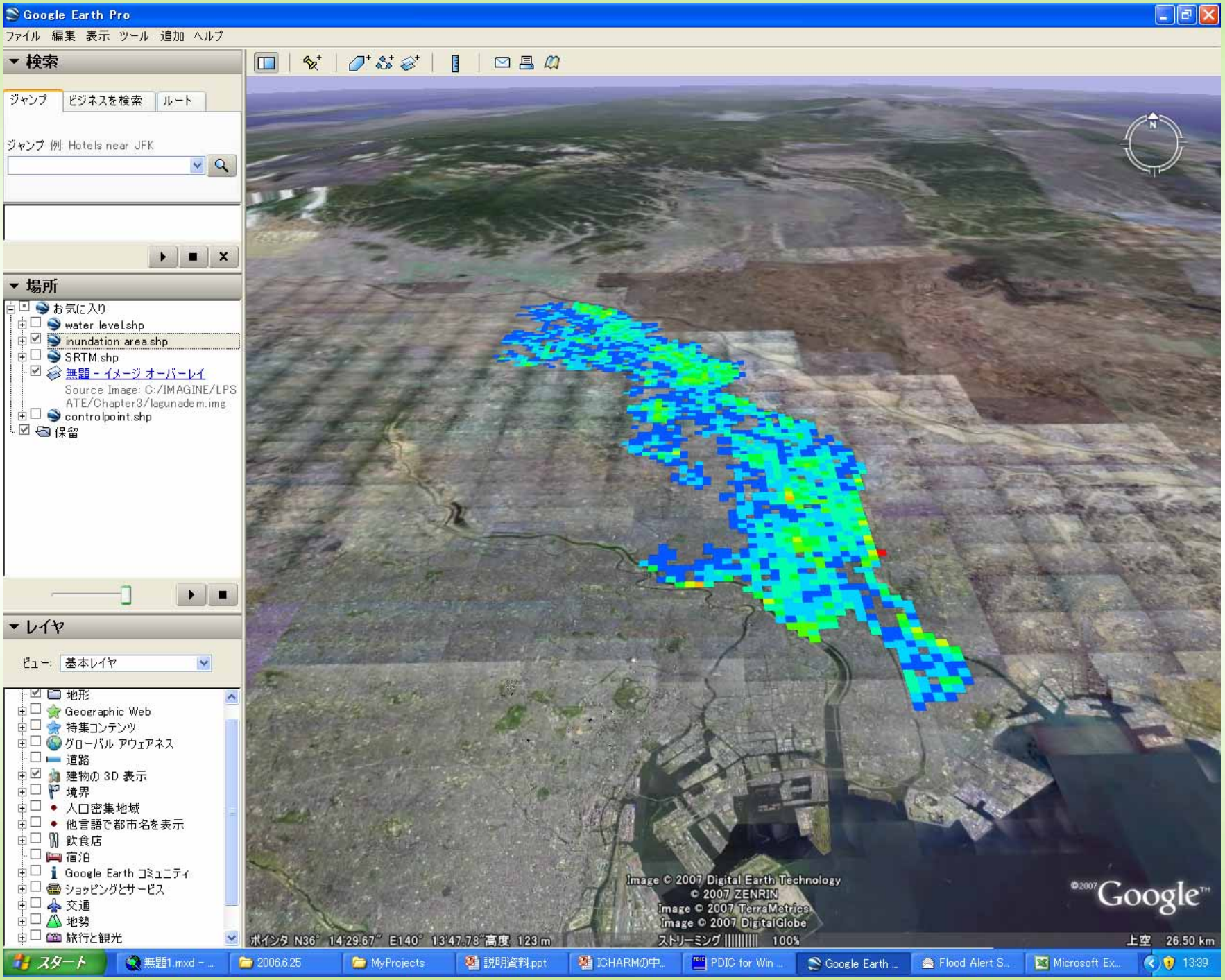
Mean: 0.06m
RMSE: 0.92m

Each grid have maximum value for the calculation period



Depth (m)




Google Earth Pro
ファイル 編集 表示 ツール 追加 ヘルプ
検索
ジャンプ
ビジネスを検索
ルート
ジャンプ 例: Hotels near JFK
場所
お気に入り
water level.shp
inundation area.shp
SRTM.shp
無題 - イメージ オーバーレイ
Source Image: C:/IMAGINE/LPS ATE/Chapter3/lagunadem.img
controlpoint.shp
保留
レイヤ
ビュー: 基本レイヤ
地形
Geographic Web
特集コンテンツ
グローバル アウェアネス
道路
建物の 3D 表示
境界
人口密集地域
他言語で都市名を表示
飲食店
宿泊
Google Earth コミュニティ
ショッピングとサービス
交通
地勢
旅行と観光
Image © 2007 Digital Earth Technology
© 2007 ZENRIN
Image © 2007 TerraMetrics
Image © 2007 DigitalGlobe
©2007 Google
ポインタ N36° 14'29.67" E140° 13'47.78" 高度 123 m
ストリーミング 100%
上空 26.50 km
スタート
無題1.mxd - ...
2006.6.25
MyProjects
説明資料.ppt
ICHARMの中...
PDIC for Win ...
Google Earth ...
Flood Alert S...
Microsoft Ex...
13:39

Training (examples)

- **Training courses**
  - Flood hazard mapping course (2004-, JICA)
  - River and Dam engineering course (1969-, JICA)
  - Comprehensive Tsunami training (2008-, ISDR)
- **Aftercare program** for implementation in trainees local communities (2006-, JICA)
  - KL, 2007; China, 2008
- **Master Course on Water-related Risk Management** with National Graduate Institute for Policy Studies (GRIPS) supported by JICA started in October 2007
  - With 11 students from Bangladesh, China, India, Nepal, Japan & Philippines

Master Course on Disaster Management Policy (water-related disasters)

- One year Master Course jointly established by GRIPS and PWRI supported by JICA
- Offered to practitioners in public & private sectors mainly in developing countries in Asia and Africa.
- Started in Oct 2007. The first year students are eleven from China, India, Bangladesh, Nepal, Philippines & Japan.
- Foster practice and solution oriented engineers who can plan and implement disaster management as part of development and lead the local practices.
- Through lectures, exercises and filed studies.
- Master theses will be Feasibility Study of local project proposals.
- Taught by univ profs & administrative practitioners

Information Networking (examples)

- Collection of local site-specific information
  - **ICHARM Local Study Series**
    - **Bangladesh, Philippines, Sri Lanka, (Nepal, …)**
  - **ICHARM Flood Year Book**
- Monitoring of the improvement of flood preparedness
- Analyses of global data sets collected elsewhere → policy effective information
    - Lead organization of WWDR Risk management chapter (WWDR2 Chapt 10 Managing Risk)