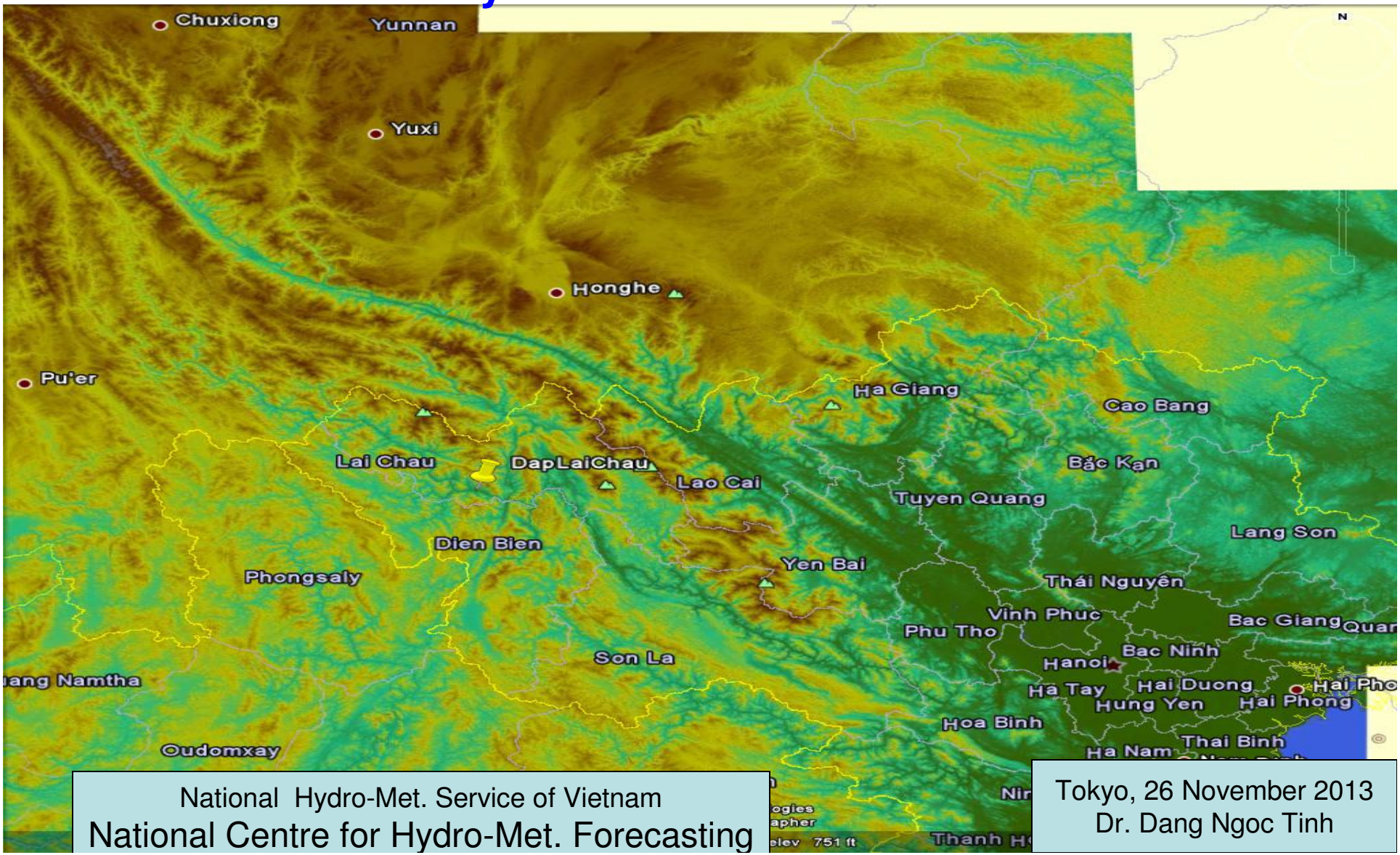
Vietnam Proposal

Project title: Utilizing satellite data, numerical rainfall forecast, combining with ground observations in flood forecasting for the Thai Binh River system



National Hydro-Met. Service of Vietnam
National Centre for Hydro-Met. Forecasting

Tokyo, 26 November 2013
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Introduction

An effective flood emergency management needs to be informed by a robust Flood Forecasting Systems (FFS). Before 1990's years, these systems were usually in the form of hard copy flood maps, graphs, tables and other hard copy documents. With recent advances in computer and communication technologies, these systems have been re-forming into more sophisticated forms; providing much needed real time flood information in more detail, in significantly less time-frame and with much higher quantity and quality. These systems are similar in some of the basic principles, such as computerization of the flood prediction operations with more available data, information and usage of GIS as a platform for interaction with the users.

Development of a flood forecasting and warning system using satellite data is highly expected, especially for developing countries where the collection of real time data on rainfall and water level in river basins faces on technical and financial difficulties.

Hydrological models are reliable on simulating discharge, but for water level prediction and flood wave routing, a hydrodynamic model is superior. That why usually apply in combination of hydrologic and hydrodynamic models in flood forecasting for whole river system from upstream to dowstream.

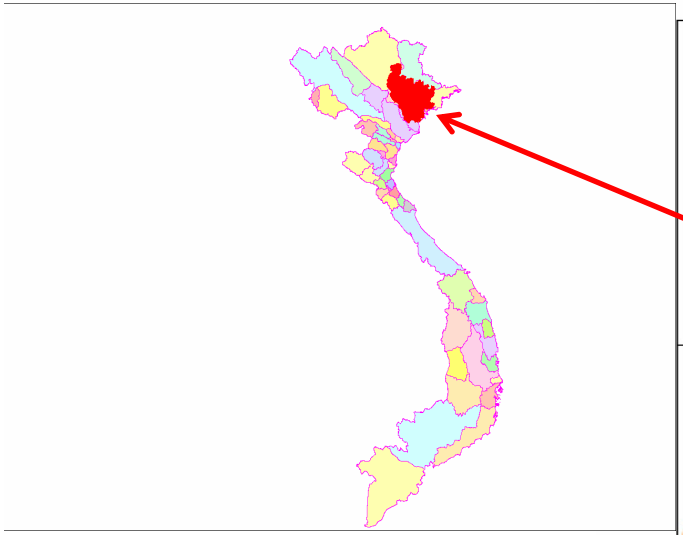
Problem encounter

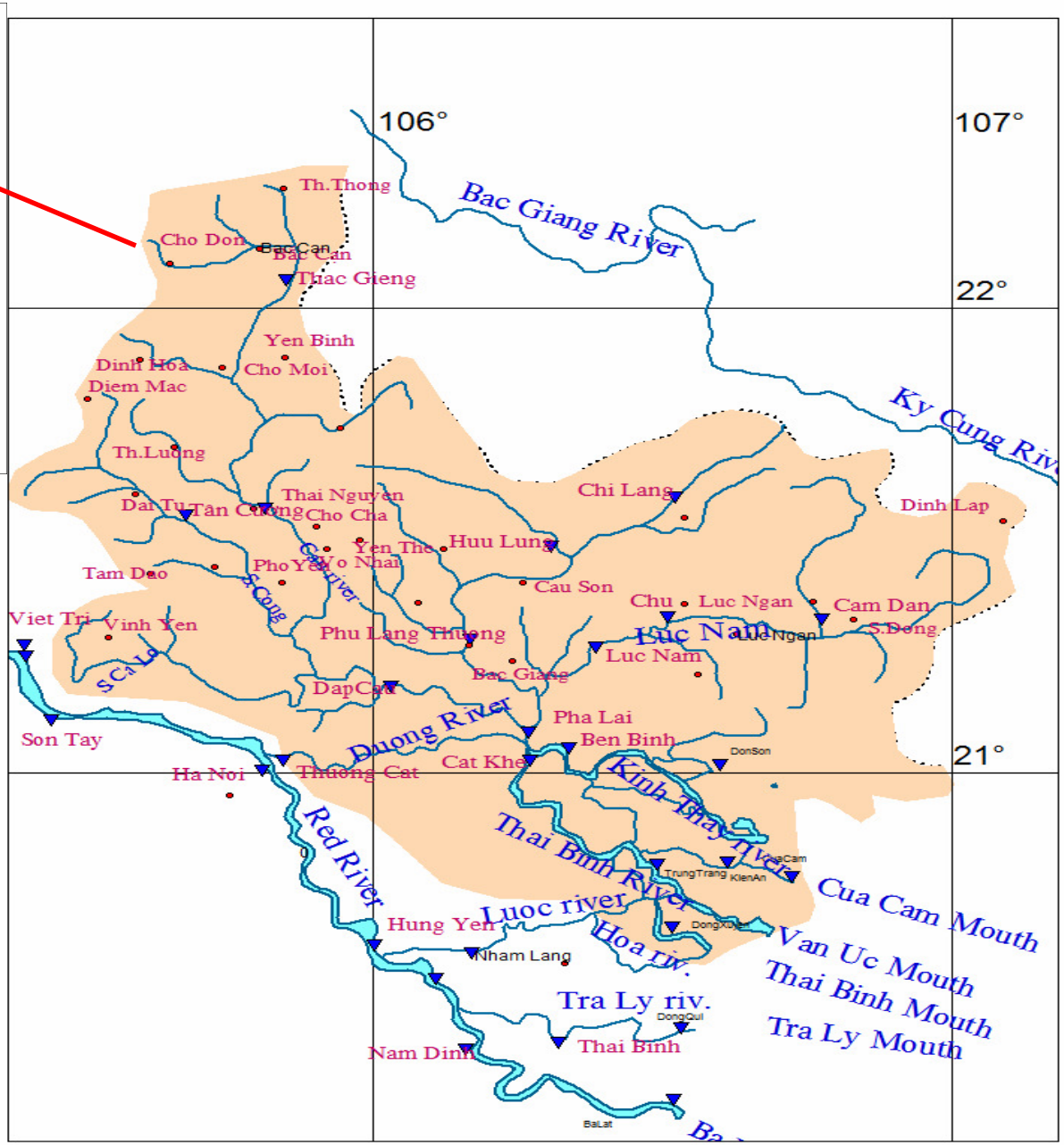
Despite exists several national and international projects which are conducted on flood forecasting in Vietnam , Thai Binh river system is less invested and flood forecasting accuracy and lead time for this river system have still a lot of limitations.

The Thai Binh River system is second big river system after the Red river system in the Northern Vietnam with basin area 17580km^2 (to Pha Lai station) and length of main stream 1650km. Upper part of the basin is located in moutainous area, but lower part is in low land and is affected by strong tide from the East sea.

Available near real time data for flood forecasting purpose from upstream to Pha Lai come only from 35 rain gauges, 14 water level gauges and 2 discharge gauges. These stations are sparsely and unevenly distributed. In upper reaches of the basin, where rainfall formulates runoff, there is no rain gauge, no flow measurement.

For the Thai Binh river system now exists only 12-24 hour flood forecast with low accuracy because of data lack and without of advanced forecasting technique.

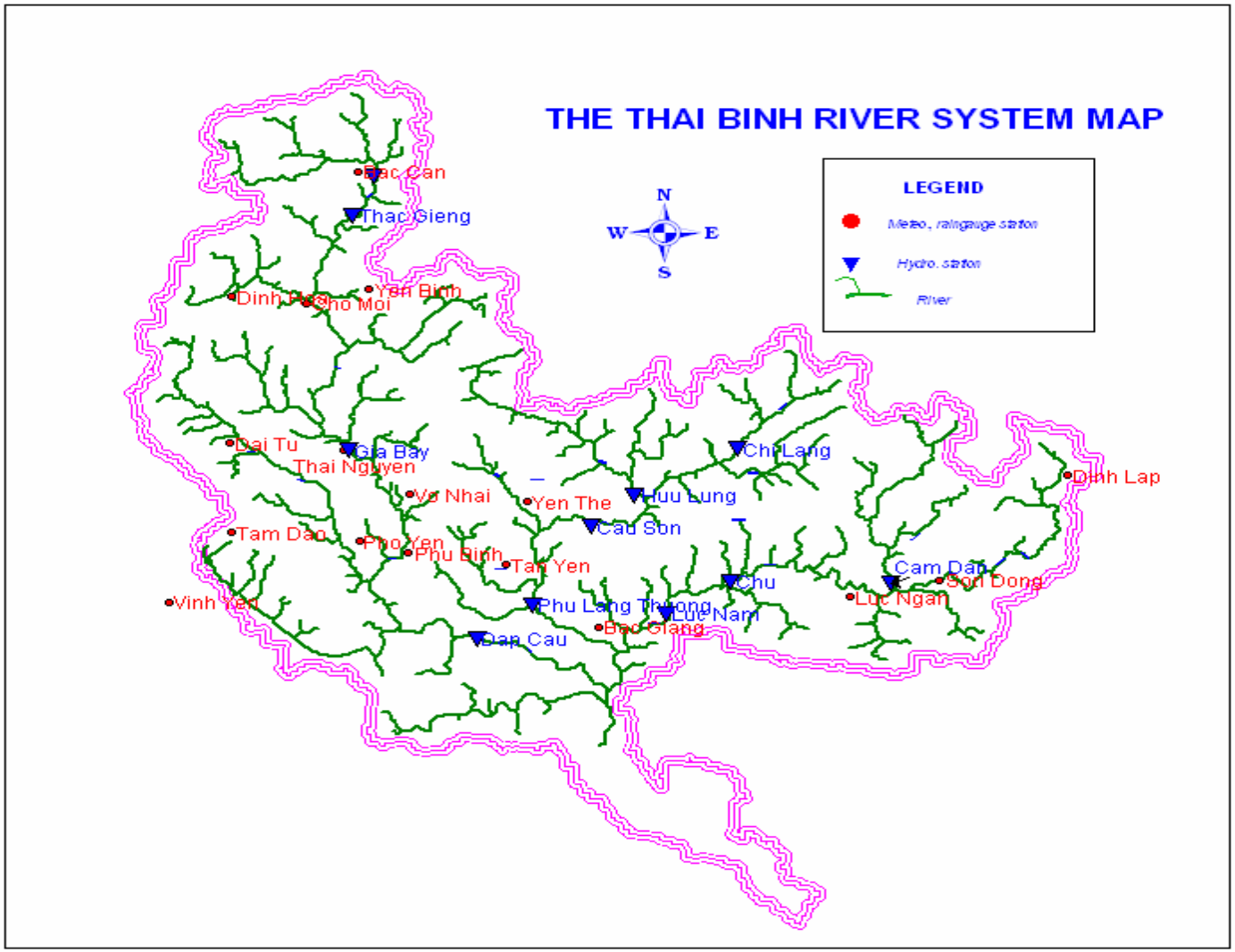




The Thai Binh River System Location

+ Area: 17580km^2 ,
+ Length: 1650km
+ 35 rain gauges,
+14 water level gauges
+ 2 discharge gauges
+ only 12-24 hour flood forecast

The Hydro-Meteorological Staion Network on Thai Binh River System Basin



Problem Solution

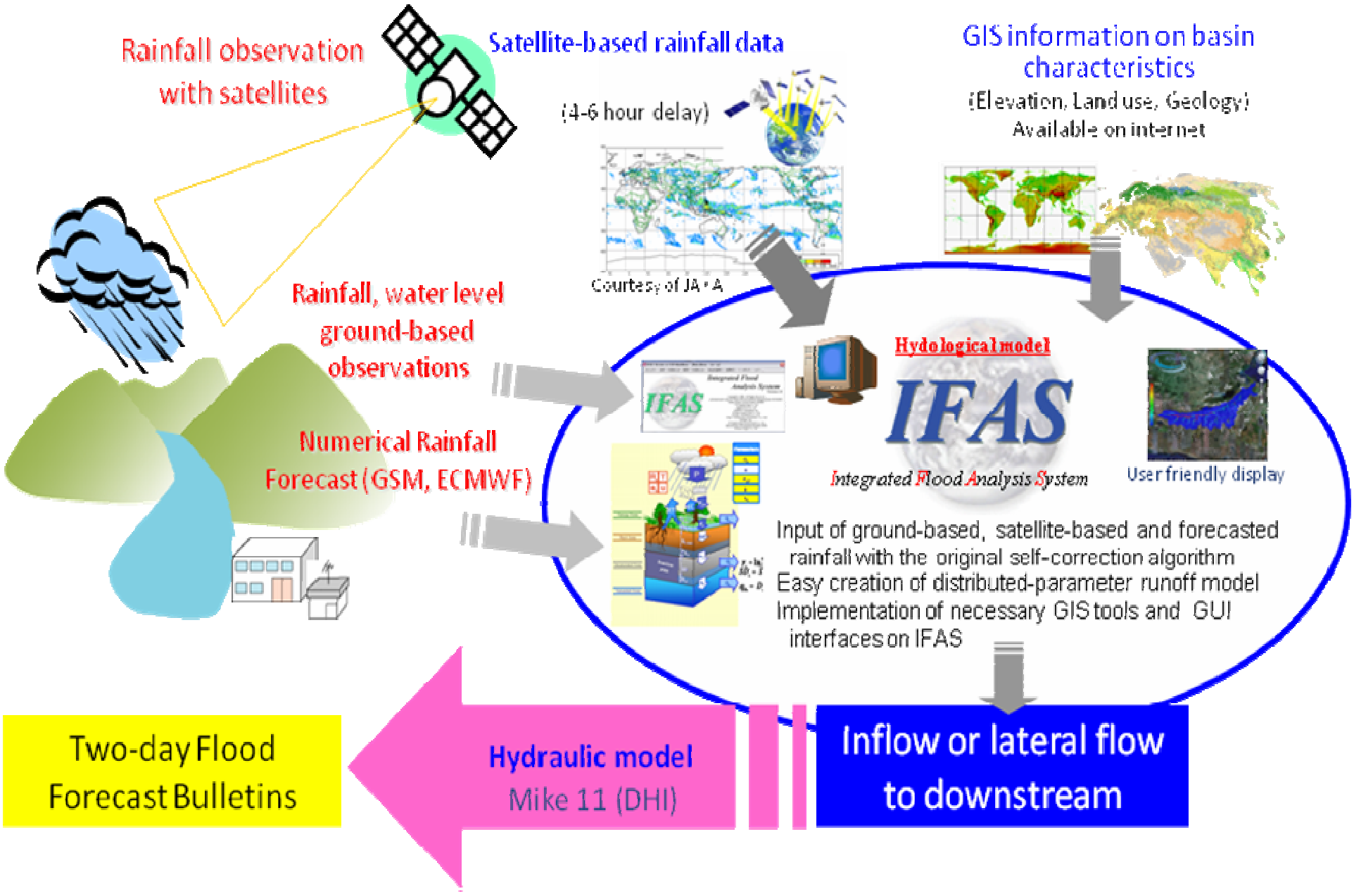
It is planes to utilize satellite data like GSMaP_NRT from JAXA (Japan), numerical rainfall forecasts like ECMWF, GSM; combining with hydro-meteorological ground observation data in flood forecasting for the Thai Binh River system.

For this purpose, the Integrated Flood Analysis System (IFAS) is used for calculating runoff on upstream sub-basins without hydro-meteorological data or with insufficient hydrological and geophysical information. This runoff is considered as inputs or lateral inflows into downstream mainstream. For downstream where there are enough ground data, the hydrodynamic model Mike 11 (DHI) used for flood forecasting. The system will increase lead time to 2-day flood forecast with improved and acceptable accuracy for the Thai Binh river system.

GSMap data: Data transmission Interval: 4 hour; Mesh size: 0.10~11km, A~120 km^2; NRT_daily: 0.25^0 ~ 275km, A~75,625km^2; Observation extent: Altitude 60 degree North ~Longtitude 60 degree South.

Numerical forecast data GSM (Global Spectral Model) provided by JMA: Interval of provided data: 6 hours with delay 4 hour; Mesh size: 1.25^0 ~125km; area: global; Physical Ground: corrected sea-level air pressure, east-west wind (10 m), south-north wind (10 m), parameters: temperature (1.5 m), relative moisture (1.5 m), accumulate precipitation, and air pressure; Atmosphere layer: 16 layers ... altitude, east-west wind, south-north wind, temperature. 7 layers ... relative moisture, upward flow, among which, the accumulate precipitation is used.

DATA FLOW CHART



1.Overall Goal

Effective utilizing available satellite data in flood forecasting

2.Project Purpose

Utilizing all available satellite data combining with numerical rainfall forecasts and ground observations in operational flood forecasting for Vietnam rivers (in case of the Thai Binh river system

3.Outputs

- Two-day flood forecast for main rivers of the Thai Binh river system
- Technical transfer to local forecasters at regional and provincial levels to operate the flood forecasting system.

4. Activities

(1) ***Data collection***

1) Available satellite data from JAXA such as DEM, Land use or Land cover from GlobalMap, GSMaP_NRT for last 6 years (2008-2013) from FTP server

2) DEM, Land use or Land cover, river network, GIS products.. from Vietnamese Mapping organization

3) Hydro-meteorological ground data: rainfall, water level, discharge for the Thai Binh river system from 2008-2013

4) Geographical data: cross sections, hydraulic constructions, lakes, reservoirs… in the basin

5) Numerical Rainfall forecast from GSM, ECMWF

6) Reporting

(2) Data processing and archiving

1) Processing DEM, Land use, Land cover to build correct basin boundary, river network

2) Processing and archiving hydro-meteorological and geographical data in required format for hydrological and hydraulic models

3) Reporting

(3) Calibration, verification of hydrological model (IFAS)

1) Set up IFAS model for the Thai Binh river basin
2) Calibration of IFAS model parameters
3) Verification of IFAS model
4) Reporting

(4) Calibration, verification of hydraulic model (Mike DHI)

1)Set up Mike model for the Thai Binh basin
2) Calibration of Mike model parameters
3) Verification of Mike model
4) Reporting

(5) Calibration, verification of forecasting system by combining hydrological model (IFAS) and hydraulic model (Mike DHI)

1) Set up forecasting system of hydrological-hydraulic models
2) Calibration of forecasting system
3) Verification of forecasting system
4) Reporting

(6) Final reporting.

5. Potential Collaborators

- National Hydro-Meteorological Service (NHMS), Ministry of Natural Resources and Environment (MONRE), Executing Agency
- The National Centre for Hydro-Meteorological Forecasting (NCHMF), Implementing Agency
- International Centre for Water Hazard and Risk Management under the auspices of UNESCO (UNESCO-ICHARM), Technical support, advanced training of IFAS
- The Japan Aerospace Exploration Agency (JAXA), Satellite data provider, Financial support from JAXA where possible (travel, per diem... for experts, training from ICHARM, workshop attending etc...)
- Regional Hydro-Meteorological Centre for the North-East Vietnam (RHM CNE), Ground Data provider and End-User
- Standing Office (SO) of Central Committee for Flood and Storm Control (CCFSC), End-User