



ESA-MOST Dragon Cooperation

中国科技部-欧洲空间局合作“龙计划”

DRAGON 2 FINAL RESULTS AND DRAGON 3 KO SYMPOSIUM

“龙计划”二期总结研讨会暨三期启动会

MONITOR

Dr 3 project Id. 10510

D. Asimakopoulos and G. Huili

Project's partners and roles

- **China:**

- Dr. M. Wang, Beijing Normal University
- Prof. Y. Zhang, College of Resource Environment and Tourism
- Prof. Y. Chen, Beijing Normal University
- Prof. H. Sun Beijing Normal University
- Prof. J. Li, Beijing Normal University

- **Europe:**

- Prof. C. Cartalis, University of Athens
- Dr. N. Chrysoulakis, Foundation for Research and Technology - Hellas
- Prof. B. Su, University of Twente
- Dr. M. Petrakis, National Observatory of Athens
- Dr. M. Stathopoulou, University of Athens
- Dr. N. Adaktylou, University of Athens

Project's objectives

- Main objective: to bridge the gap between EO scientists and urban managers/planners by demonstrating the ability of current EO systems to support the definition and application of a set of dynamic indicators with distinct social and environmental interest.
- Contribution to the Dragon 3 call objectives:
 - to promote research in the areas of land environment and hydrology (including hazards);
 - to support the cooperation between academic and research entities in China and Europe;
 - to demonstrate the potential of EO data to support urban applications with solid environmental and solid dimension;
 - to provide space for the improvement of EO processing techniques;
 - to provide the framework for the involvement of young scientists.

Definition of EO-based urban indicators (UI)

UI(1) - Urban fabric and sprawl;

UI(2) - Urban microclimate;

UI(3) - Urban geological hazard;

UI(4) - Urban flood.

Project's partners and roles

- The particular tasks of the Chinese team relate to all urban indicators, land subsidence, land surface temperature and retrieval of the land cover and land use.
- The particular tasks of the European team related to urban indicators (urban fabric/sprawl and urban microclimate), as well as to the analysis and definition of urban flood.

Data to be used/exploited

- ESA and ESA TPM Missions:

Satellite/Sensor (eg ENVISAT/ASAR)	Sensor mode (eg IMS)	Number of archive scenes	Number of New acquisitions	Comment
<i>ALOS</i>	<i>AVNIR</i>		<i>20</i>	<i>For LULCC</i>
<i>ALOS</i>	<i>PRISM</i>		<i>20</i>	<i>Triples format L1B1 for DTM and for AVNIR fusion and orthorectification</i>
<i>ENVISAT</i>	<i>AATSR</i>		<i>60</i>	<i>For LST</i>
<i>ENVISAT</i>	<i>MERIS</i>		<i>60</i>	<i>For AOT</i>
<i>ENVISAT</i>	<i>ASAR</i>	<i>5</i>	<i>5</i>	<i>Wide Swath Mode</i>
<i>ENVISAT</i>	<i>ASAR</i>	<i>5</i>	<i>5</i>	<i>Alternating Polarisation Mode</i>
<i>ENVISAT</i>	<i>ASAR</i>	<i>5</i>	<i>5</i>	<i>Image mode</i>
<i>ERS-1/2</i>	<i>AMI</i>	<i>5</i>	<i>5</i>	<i>SAR Image mode</i>

Data to be used/exploited

- Chinese Missions:

Satellite/Sensor	Sensor mode	Number of archive scenes	Number of New acquisitions	Comment
<i>CBERS 01, 02</i>	<i>CCD Camera</i>	<i>2</i>	<i>8</i>	
<i>CFOSAT</i>	<i>SCAT</i>	<i>5</i>	<i>5</i>	
<i>Beijing 1 and 2</i>			<i>tbd</i>	
<i>FY series</i>			<i>tbd</i>	
<i>HY-1 and 2</i>			<i>tbd</i>	

Data to be used/exploited

- Other satellite data:
 - MODIS
 - AVHRR
 - Landsat
 - ASTER
 - SPOT-5
 - Ikonos
 - Quick Bird
 - Radarsat SAR

Project schedule and planning

- **WP1: Project Management.** University of Athens and the National Capital University of Beijing will lead WP1. WP1 will be active during the whole project's lifecycle.
- **WP2: Urban Planning Requirements.** Includes an assessment of the requirements as complimented by data collection and analysis. Acquisition and pre-processing of the basic data: July 2012 – January 2013.
- **WP3: Definition of EO-based indicators.** UI(1) - Urban fabric and sprawl; UI(2) - Urban microclimate; UI(3) - Urban geological hazard; UI(4) - Urban flood. WP3 will be active from January to June, 2013.
- **WP4: Local and regional application (case studies).** 1) Extraction of needed information and parameters; 2) Monitoring of parameters (July – December, 2013); 3) Dynamic temporal and spatial display; 4) Analysis of urban impact (January-June, 2014); 5) Assessment of impact (July-December, 2014); and 6) Classification (January-June, 2015).
- **WP5: Dissemination and Exploitation.** WP5 will be active during the whole project's lifecycle.

In-situ data requirements

- DEM data to be used to combine the extracted water area and estimate the depth information of the flooded area.
- The precipitation and water depth data of Beijing Municipal Meteorological Bureau on June 23, 2011 to be used to check up the extracted water area and flood depth data.
- The meteorological data over the past 20 years from Beijing Meteorological Bureau will be used to identify the historical time and simulate the future scenarios.
- The urban road traffic data, economic data, demographic data and other related socioeconomic data of the study area.
- Urban road traffic data to quantitatively evaluate the flood impact on the urban road traffic in Beijing.
- Thermopolis campaign in Athens.

Training of young scientists

- Young scientists will be selected by the PIs on the basis of the needs of the project. It is anticipated that 1-2 young scientists will be needed for the research work related to UI 1 and 2 and 1-2 two for the respective work for UI 3 and 4.
- They will be exposed in new techniques for the use of EO data, they will improve their capacities in terms of modeling and image processing and they will become acquainted to the use of EO data of various temporal and spatial scales.

Expected results

- Maps of the built-up area evolution, the urban sprawl of a city.
- Characteristics of urban sprawl.
- Intra-urban variation of LST, using both low and high resolution EO data.
- Evaluation of a thermal comfort indicator.
- Maps of the trend and the evolution of land subsidence.
- Urban flood maps, impact assessment and future conditions simulations.



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Beijing City Flood Monitoring and Assessment Based on Multiple Remote Sensing Data 10510

Gong Huili
Capital Normal University

- Background
- Object and Contents
- Methods
- Data requirements
- Schedule and planning
- Draining of young scientists

Background

- Extreme weather events are frequently happening.
- Floods have become an important factor to restrict rapid and sustainable development of the human society.
- As a high human gathering area, the impact of floods on urban development was pay more attention.

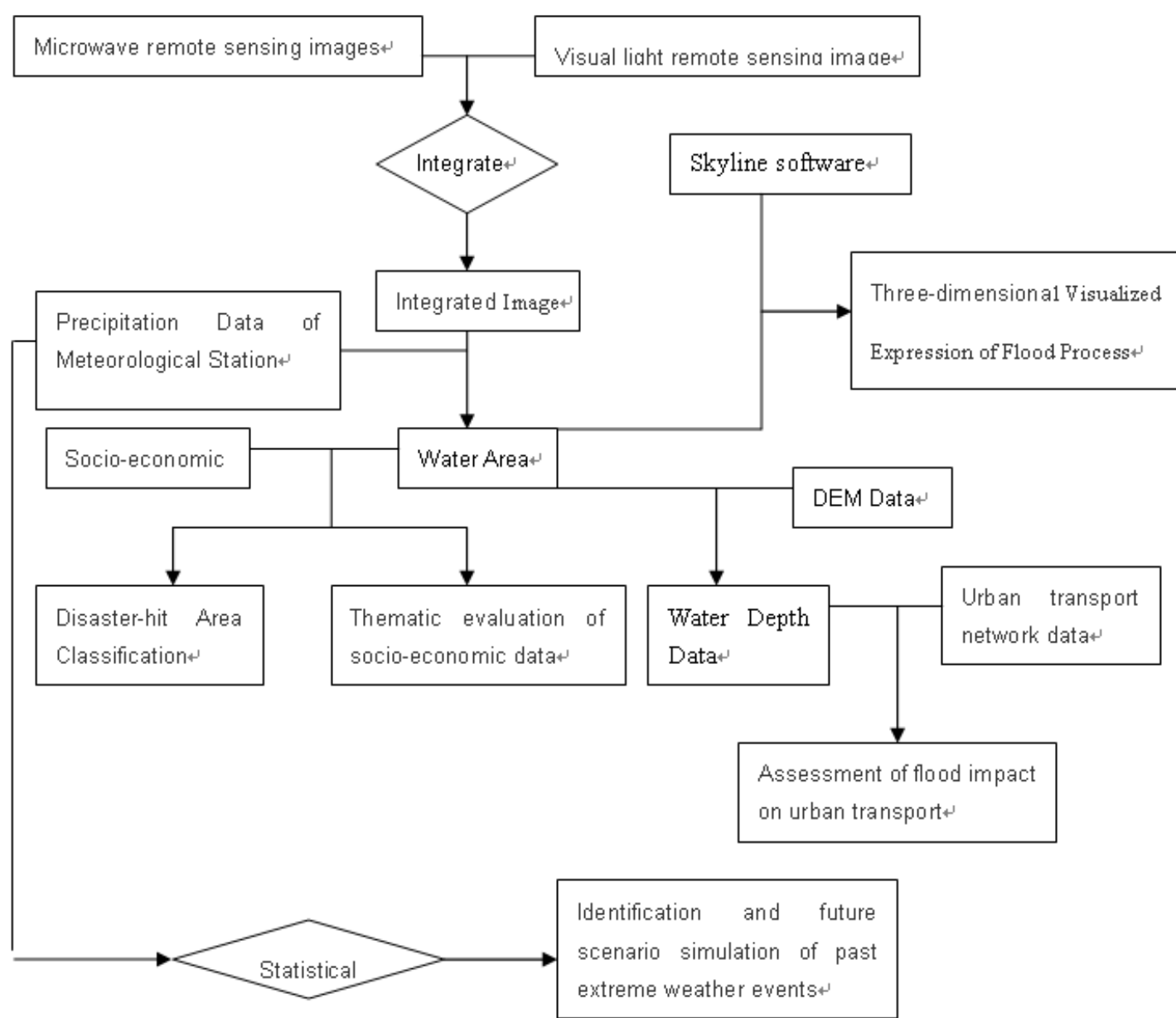
Object

This project is intended to monitor the flood disaster in the Beijing city (within the Fifth Ring Road area) taking SAR and visible remote sensing data as the data source, integrate the SAR data with pre-disaster LANDSAT-TM, SPOT-HRV, QuickBird and other visible light data to extract flood submerged area, and use the submerged area extracted from a variety of SAR data for mutual authentication, finally to get the real-time distribution map of the flood submerged area in the study area.

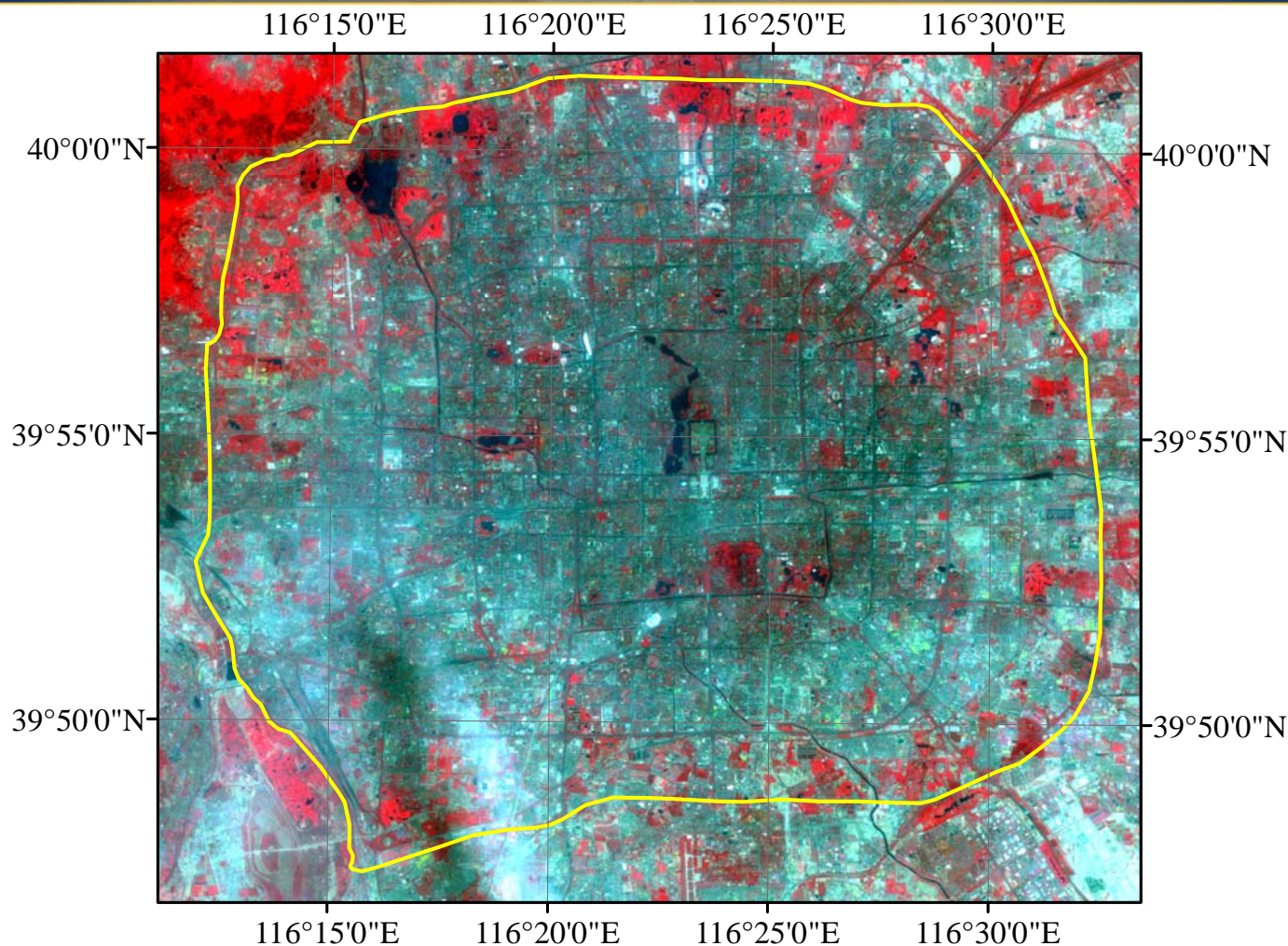
Contents

- Remote monitoring of urban flood
- Assessment of urban flood impact
- Visualization of urban flood process
- Past urban flood event mapping and future condition simulation

Methods



Technology Roadmap of this Study



TM image of study area on 26th June, 2010

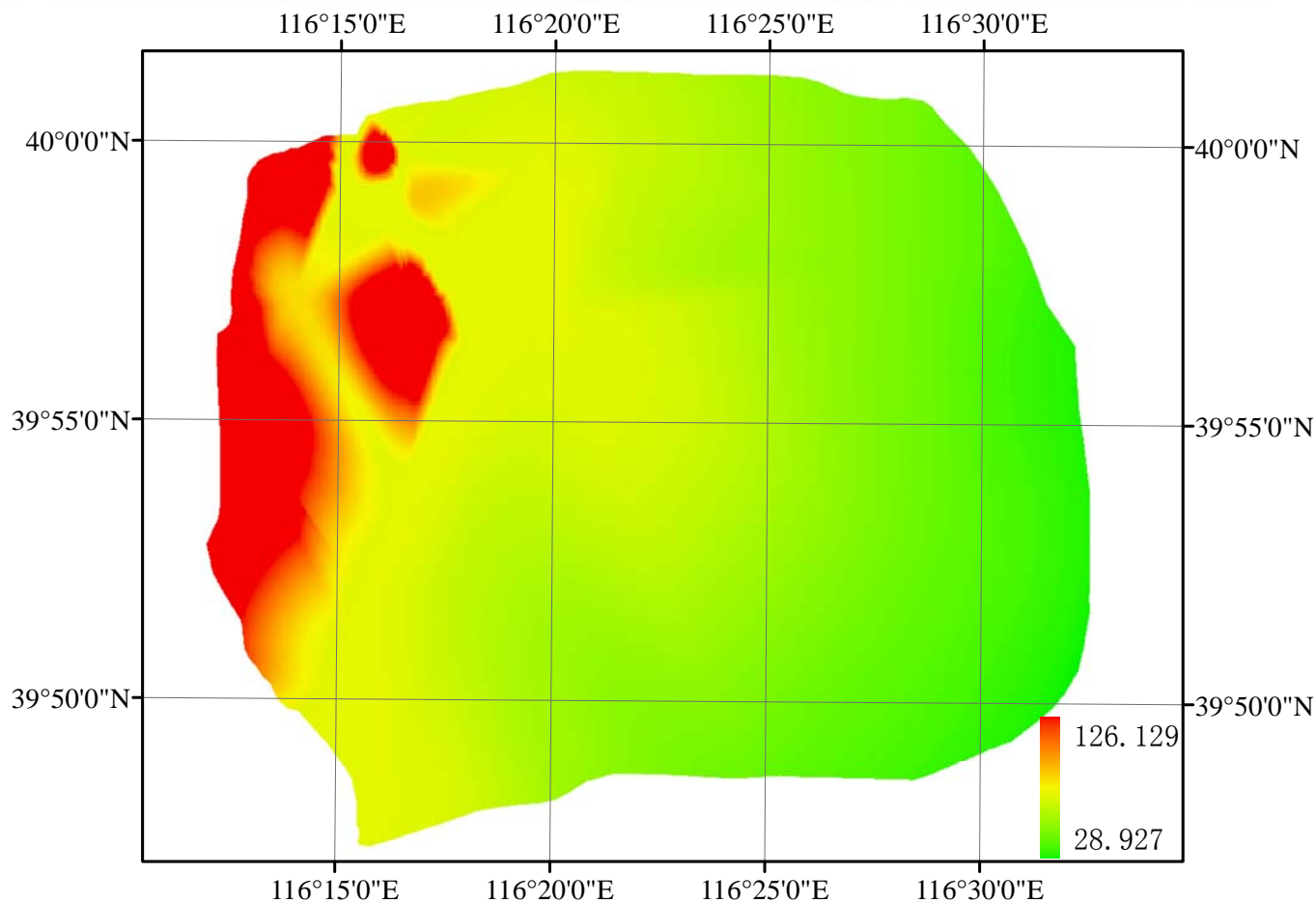
Data requirements

Satellite	Instrument	Product	Polarization mode	resolution	Imaging width
ERS-1/2	AMI (SAR) Image Mode	PRI: Precision Image SARPRI or SAR_IMP_1P	VV	30m	100km
ENVISAT	Image Mode	PRI: Precision Image ASA_IMP_1P	VV or HH	30m	100km
ENVISAT	Alternating Polarization Mode	PRI: Precision Image ASA_APP_1P	VV/HH or VV/VH or HH/HV	30m	100km
ENVISAT	Wide Swath Mode	Medium Resolution Image ASA_WSM_1P	VV or HH	150m	400km

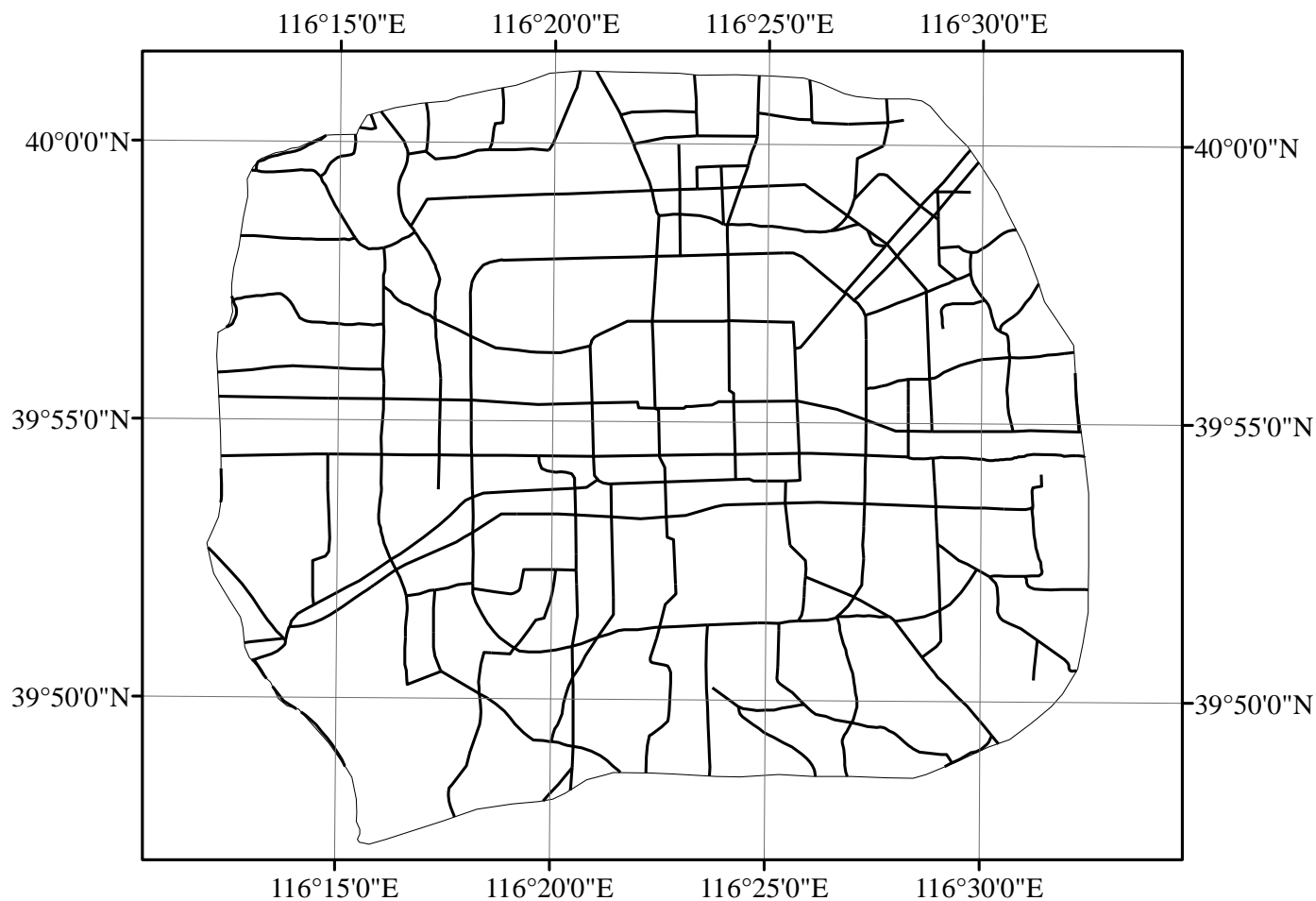
Data requirements

In order to complete the study more accurately, in addition to the above mentioned SAR data, we also need visible light remote sensing image data, DEM data, socio-economic data, precipitation data from weather stations and other necessary data, with the details as follows:

- The pre-disaster LANDSAT-TM, SPOT-HRV, QuickBird and other multi-spectral image data – Used to be integrated with the SAR data for an accurate extraction of the water area.
- The DEM data in the study area – Used to combine the extracted water area and estimate the depth information of the flooded area.
- The precipitation and water depth data of Beijing Municipal Meteorological Bureau- Used to check up the extracted water area and flood depth data. The meteorological data over the past 20 years from Beijing Meteorological Bureau will be used to identify the historical time and simulate the future scenarios.
- The urban road traffic data, economic data, demographic data and other related socio-economic data of the study area - Use the urban road traffic data to quantitatively evaluate the flood impact on the urban road traffic in Beijing. Combine the corresponding socio-economic data to assess the impact of flood, and obtain the flood impact assessment plans and integrated impact assessment plans based on different subjects.



DEM Data of Study Area (spatial resolution of 30m)



Urban Road Data of Beijing

Schedule and planning

- **Acquisition and processing of the basic data (January-June, 2012)**

The data as this project requires include the SAR and visible remote sensing data, the urban transport network data of Beijing, data from meteorological stations, and such socio-economic data of Beijing as economy and population density.

- **Extraction of water area and depth data (July-December, 2012)**

Use the integrated images to interpret the images and extract the flood inundated area by means of related remote sensing image software, and extract the depth data of the flooded area with the help of the DEM data of the study area.

- **Flood monitoring (January-June, 2013)**

Based on the multiple remote sensing images, we can extract the water inundated area in different periods and achieve monitoring of the flood process through comparative analysis of the sequence data.

- **Dynamic display of the flood process (July-December, 2013)**

Three-dimensional visualization software as Skyline to achieve dynamic simulation of the flood process use the data of the extracted multirate water flooded area.

Schedule and planning

- **Analysis of the flood impact on roads (January-June, 2014)**

Use the extracted water depth data, refer to the urban transport network data, to display the spatial distribution and length of the paralyzed roads.

- **Assessment of flood impact (July-December, 2014)**

Combine the water area, water depth, DEM, economy, population density and other data to achieve evaluation of the flood impact on different thematic data.

- **Disaster classification (January-June, 2015)**

Use the research results in (5) and (6), overlay the flood results based on different thematic data and give different weights to different thematic data to show corresponding importance.

- **Identification of historical events and simulation of future scenarios (July-December, 2015)**

Use the meteorological data of Beijing over the past 20 years to identify the occurrence time of the historical extreme weather events and map such historical events.

Innovations

This project is mainly to study and monitor this flood, and make after-disaster assessment, with the innovative points mainly shown as follows.

- **This project has firstly integrated microwave and visible light remote sensing images to monitor the flood in the Beijing urban area.**

The previous flood monitoring mainly concentrated on the basin scale, the research objects were mostly such natural ecosystems as basins and lakes, and there was rare monitoring of the urban ecosystems strongly interfered by the human, this project will firstly use remote sensing technology to monitor the flood process in Beijing.

- **This flood led to vast standstill of Beijing's urban transport network, which will be researched in this project for the first time.**

Flood has serious impact on the human society in many aspects and causes huge economic losses every year. On June 23, 2011, the heavy rain in the Beijing urban area led to serious waterlogging in several low-lying sections and resulted in the urban traffic paralysis. This project targets the urban transportation network of Beijing to study and probe into the impact of urban flood on such network.

Draining of young scientists

As an integral part of this project team, young scientists have their research fields related to hydrology, remote sensing, geographic information systems and other professions, and the implementation of this project will provide them with good opportunities for learning and practice.

With the help of the data provided by the project, as well as the good software and hardware conditions provided by their local units, young scientists will develop more profound new awareness and understanding of their respective research field during the project implementation to achieve creative results and lay a more solid foundation for future research work.

Thank You