

3rd GRID & e-Collaboration Workshop for the Earth Science Community

ESA CAT-1 Project — Wide Area Grid Testbed

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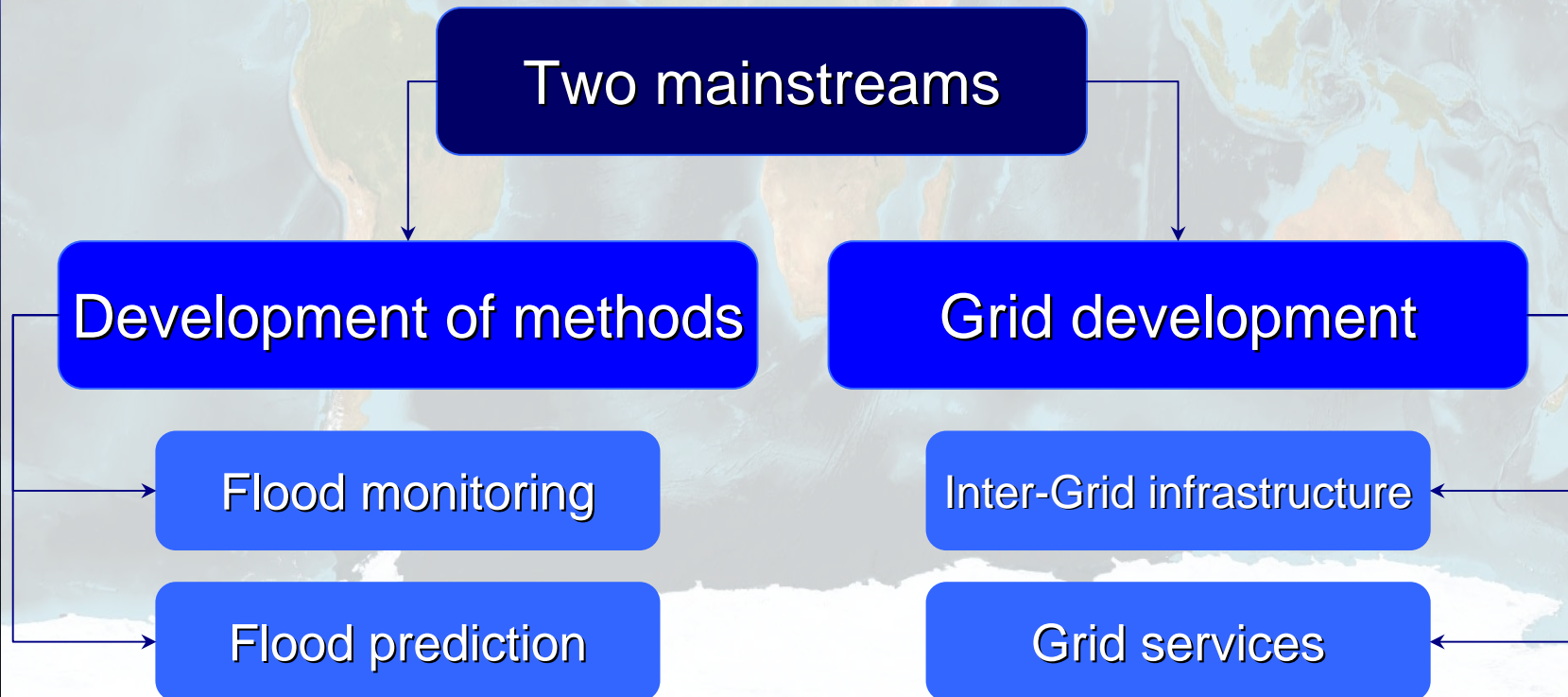
Space Research Institute NASU-NSAU
Ukraine

Outline

- Project's objectives
- Flood monitoring and forecasting
- Grid infrastructures

Objectives

- To develop GRID services for flood monitoring using spaceborne radar and optical data
- The proposed services would be considered as the WAG testbed with further integration with EO Grid



Methods

- Flood extent mapping
 - multitemporal technique
 - neural networks
- Flood prediction
 - cascade of models
 - Meteorology
 - Hydrology
 - model coupling
- GRID
 - Middleware: GT4, gLite
 - Grid archive: OGSA-DAI
 - Grid portal: GridSphere, UPortal, P-GRADE

Participants

- **ESA**
 - data provision: ERS-1/2, Envisat
 - SAR processing tools
 - GRID on demand facilities
- **Space Research Institute, NASU-NSAU, Ukraine**
 - Flood extent extraction (from SAR images)
 - Meteorological and hydrological models run
 - GRID services development
- **CNES, France**
 - middleware analysis, WAG ideology
- **Remote-Sensing Satellite Ground Station, China**
 - GRID service development (TerraGRID connection)
 - SAR processing

A world map showing the continents in shades of green and brown, with the oceans in light blue. A horizontal red dashed line is drawn across the top of the map, just below the Arctic region.

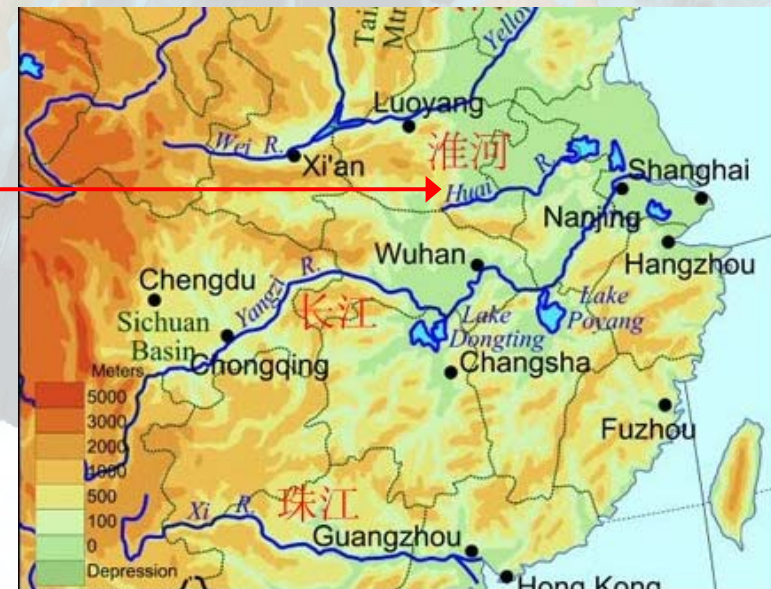
Flood monitoring and forecasting

CASE STUDY AREAS

- Ukraine
 - Carpathian mountains

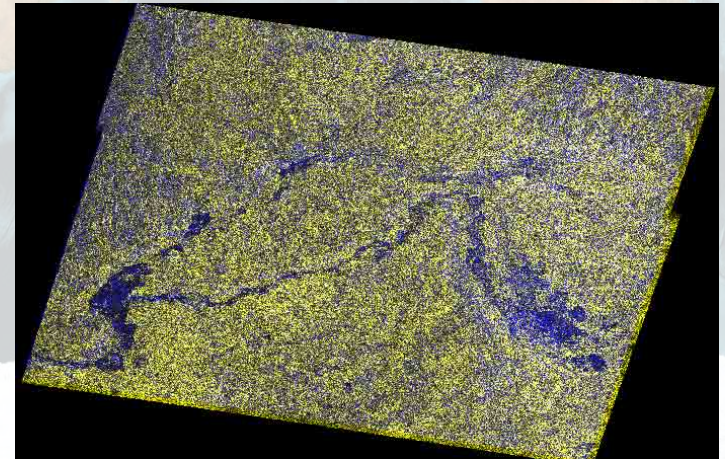
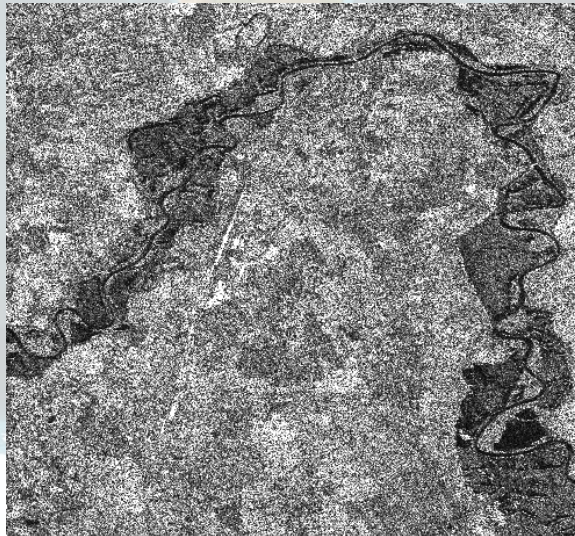


- China
 - Huaihe River

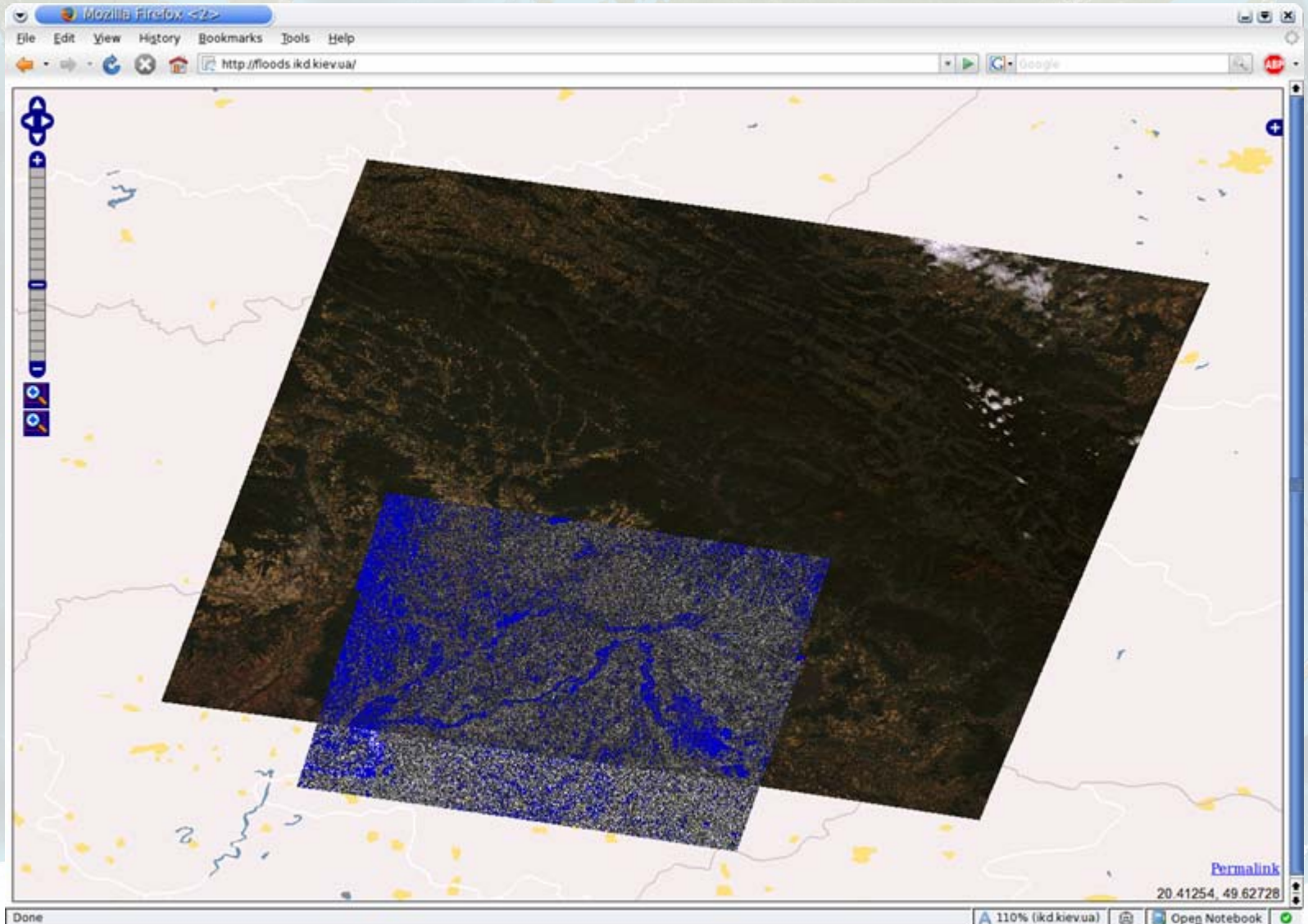


Flood monitoring

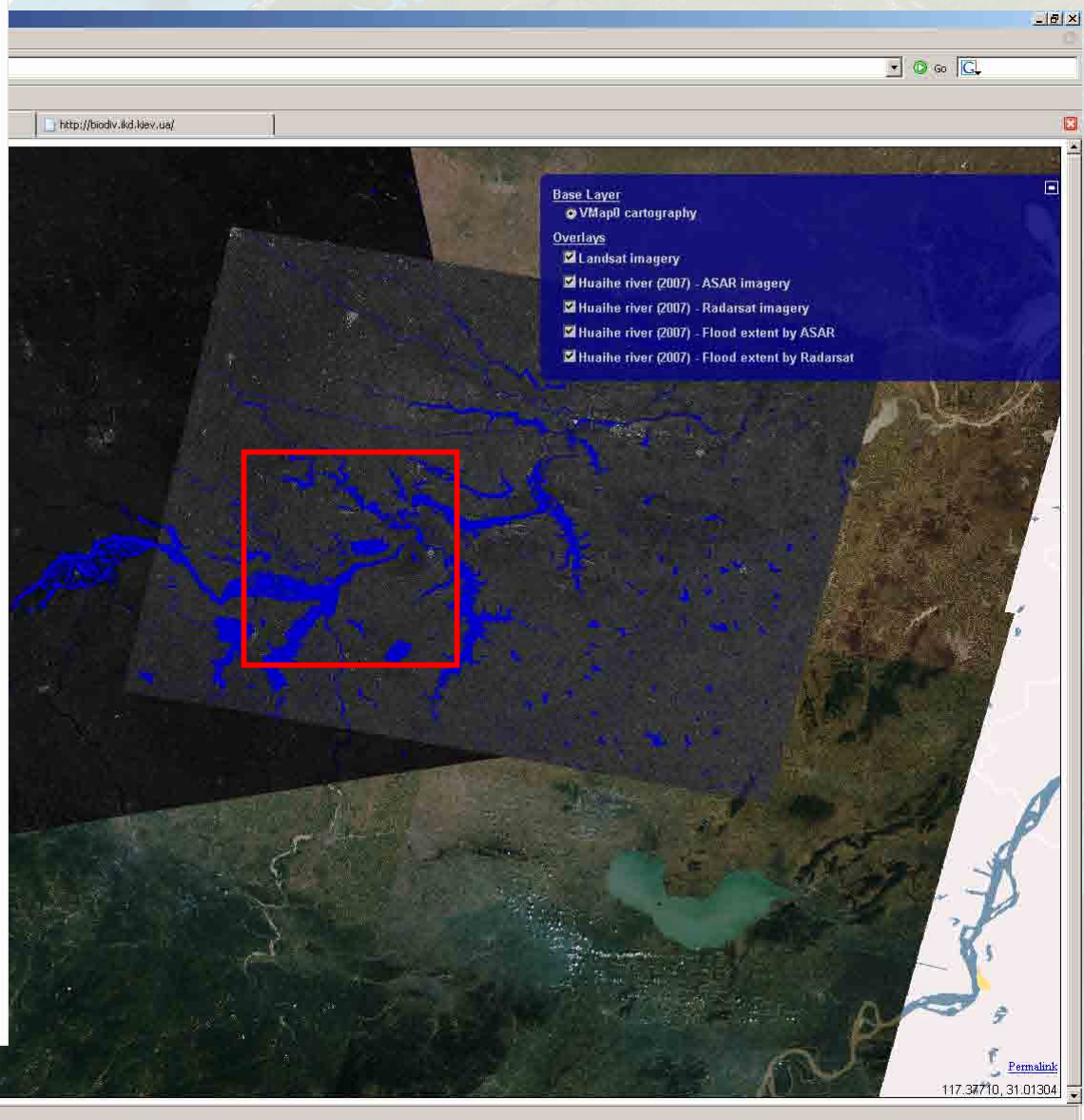
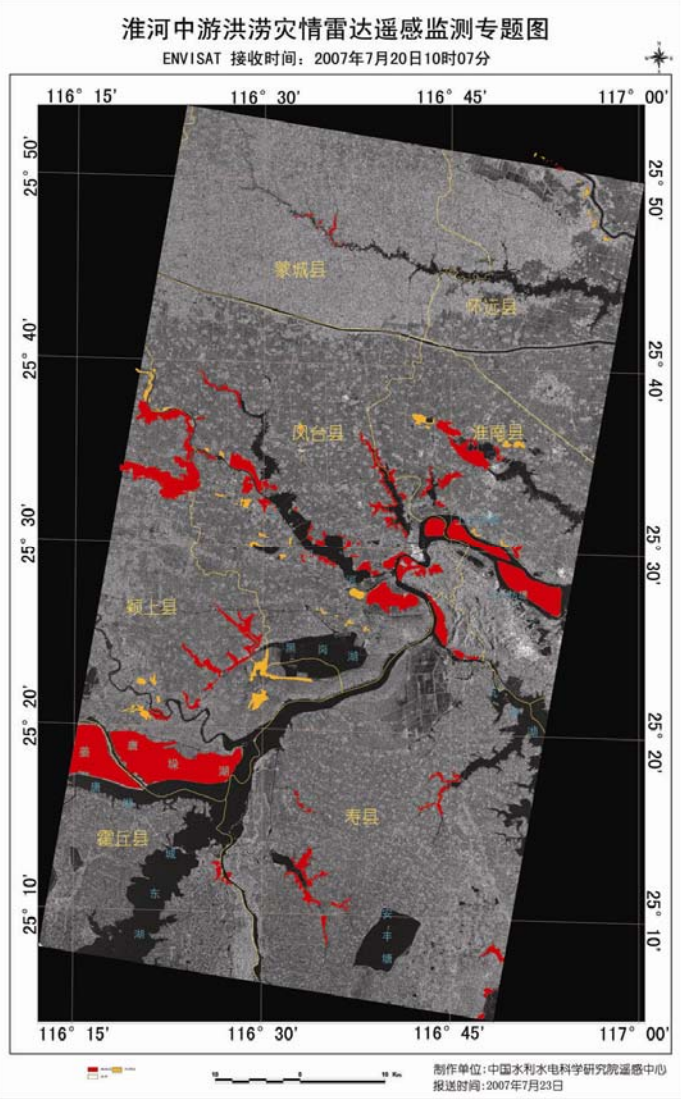
- We developed neural network method for flood extent extraction using SAR satellite images
- Method was successfully tested for:
 - ERS-2/SAR, flood on Tisza river (Ukraine), 2001
 - Envisat/ASAR WSM and Radarsat-1, flood on Huaihe river (China), 2007



Ukrainian case – Tisza river, 2001



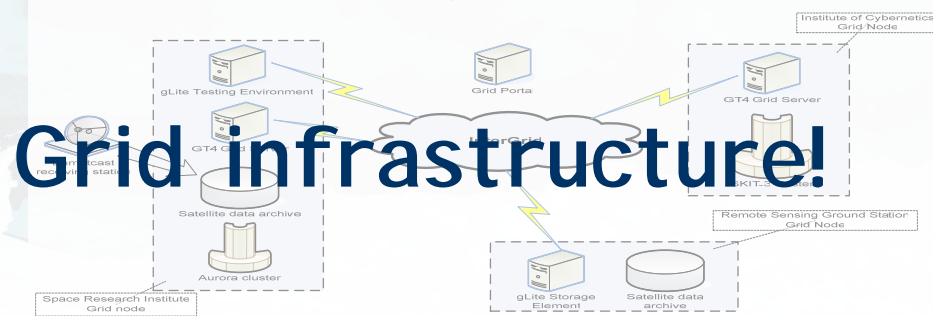
Chinese case – Huaihe river, 2007



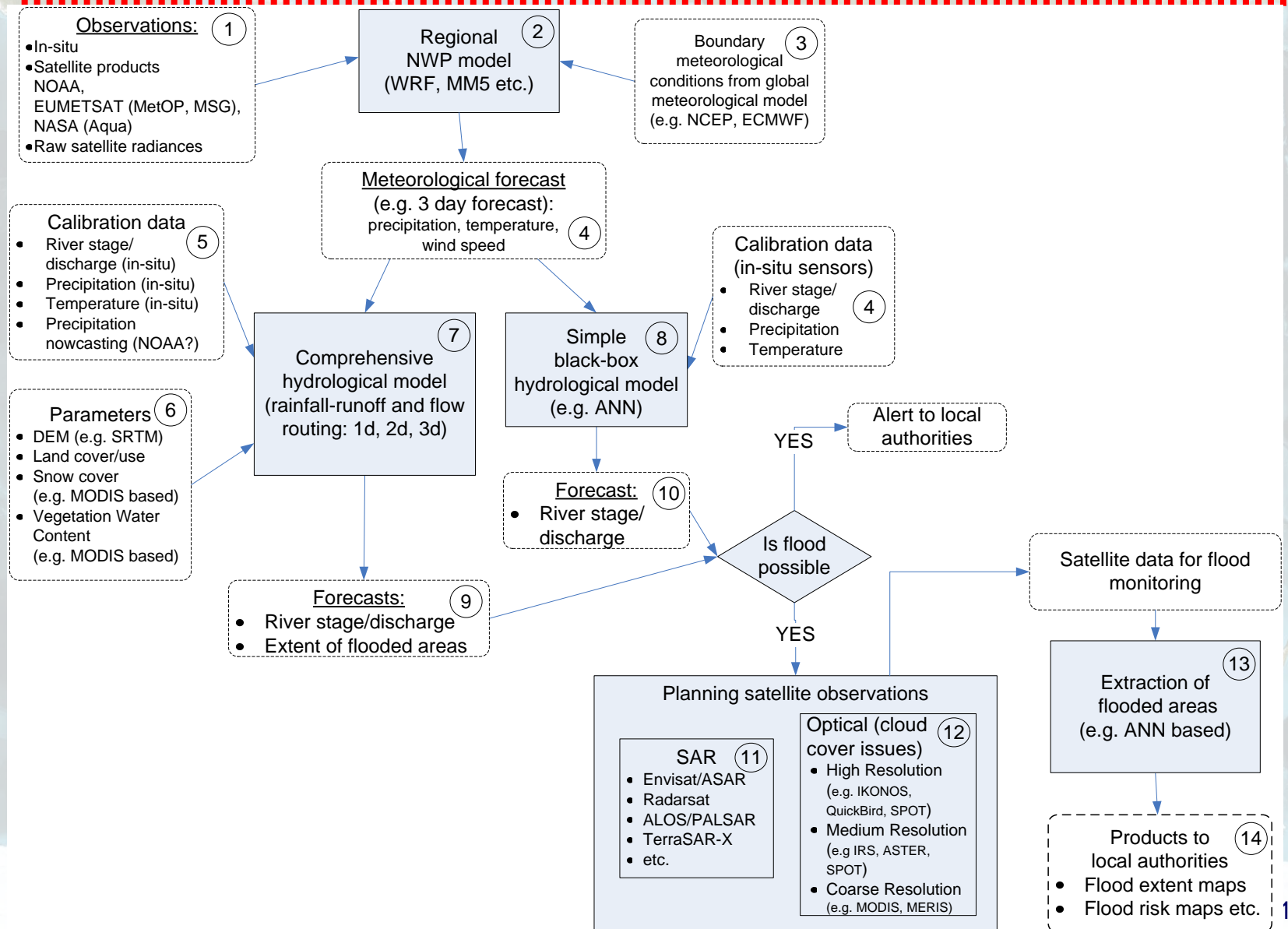
Transferring data from mapserver.ikd.kiev.ua...

Flood monitoring

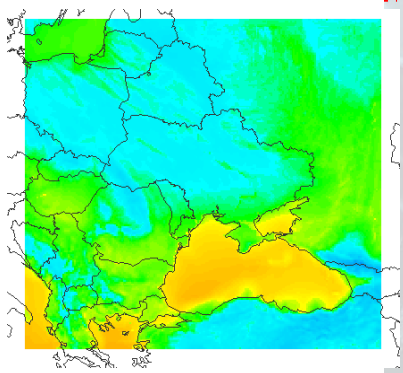
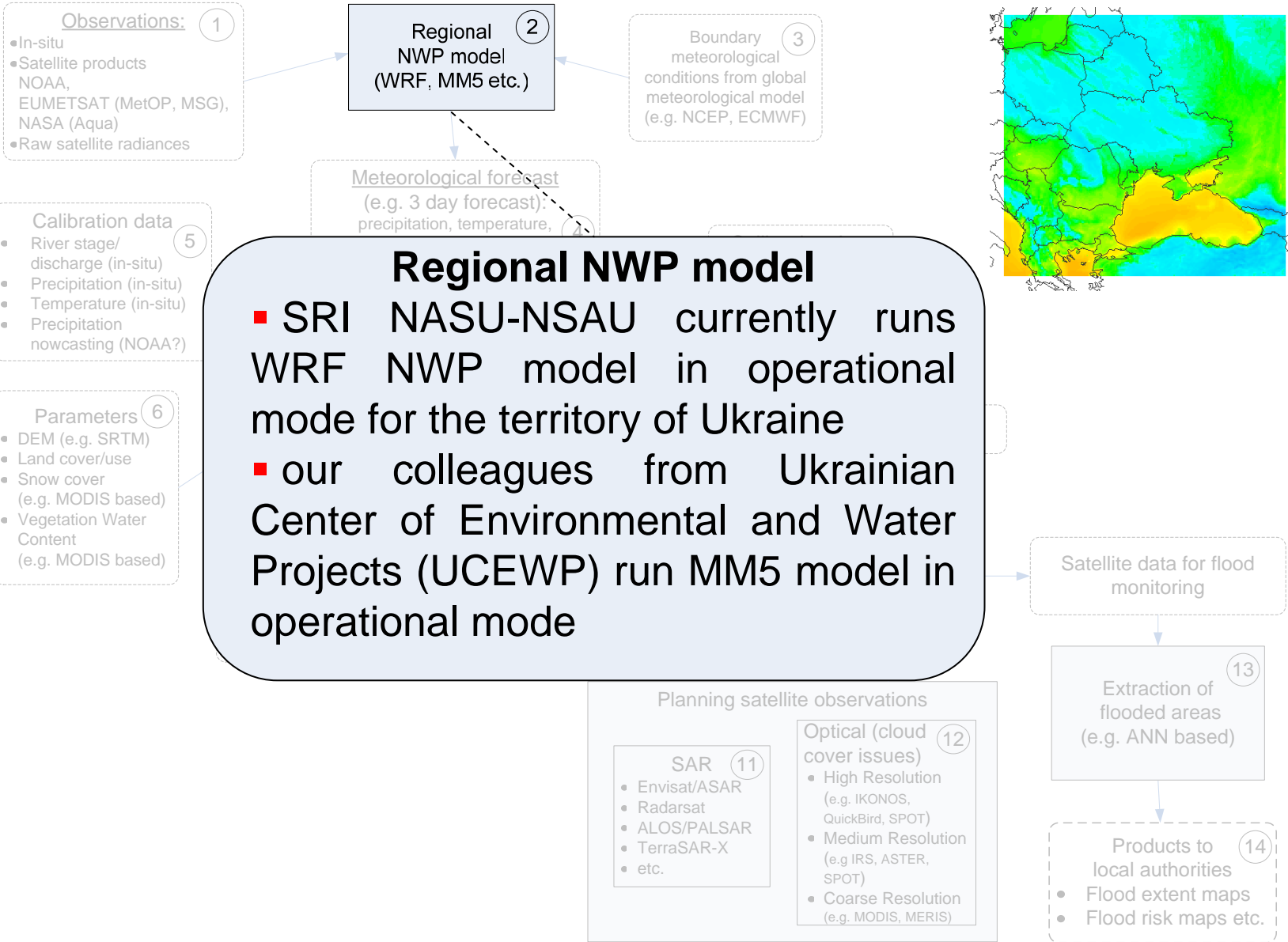
- Characterized by
 - Data integration from multiple sources
 - e.g., Envisat/ASAR and Radarsat-1
 - Mosaic composition
 - e.g., Landsat-7 as background
 - Near real-time computations
 - e.g., in the framework of International Charter "Space and Major Disasters"



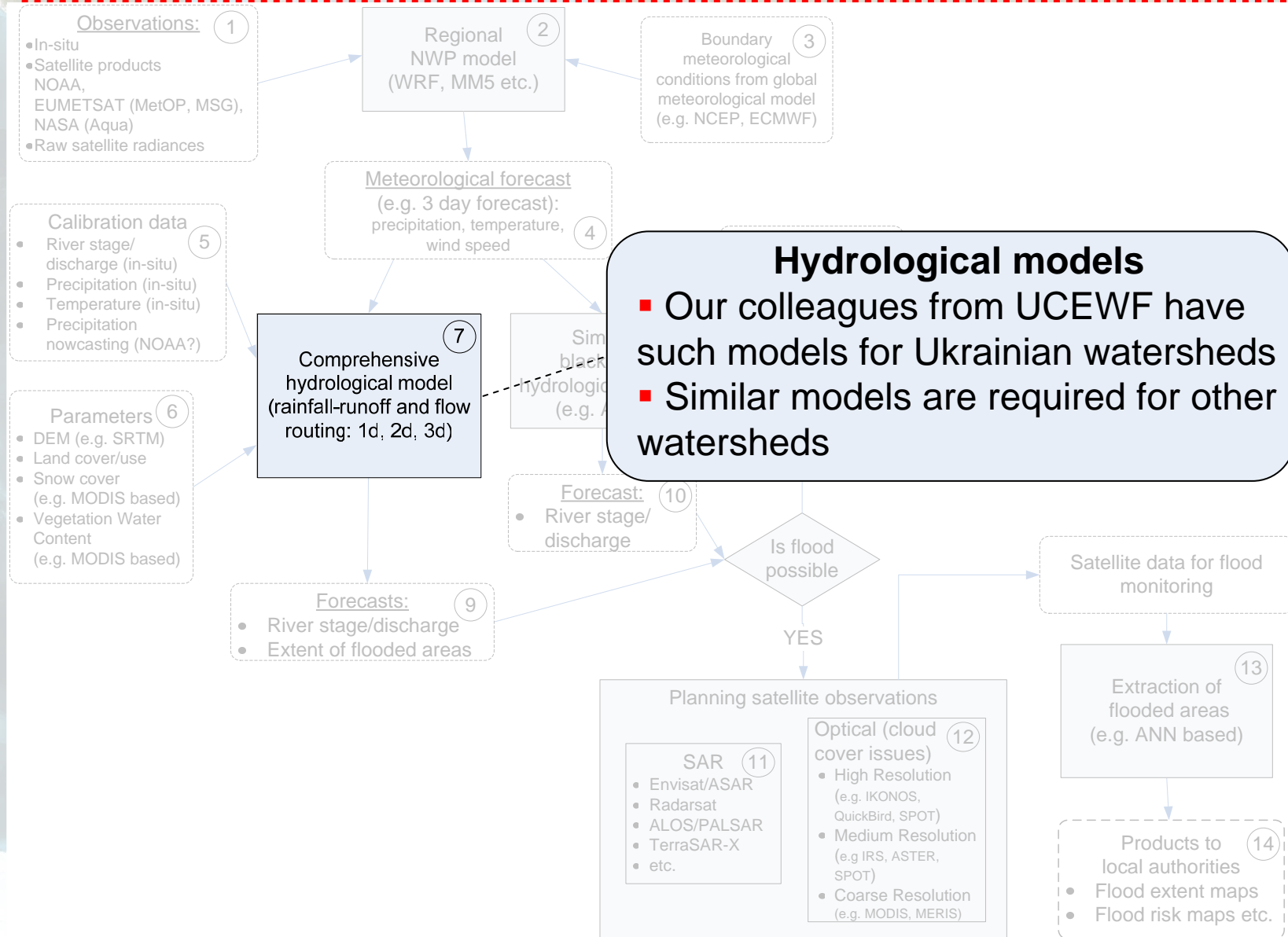
General Flowchart for Flood SensorWeb Use Case



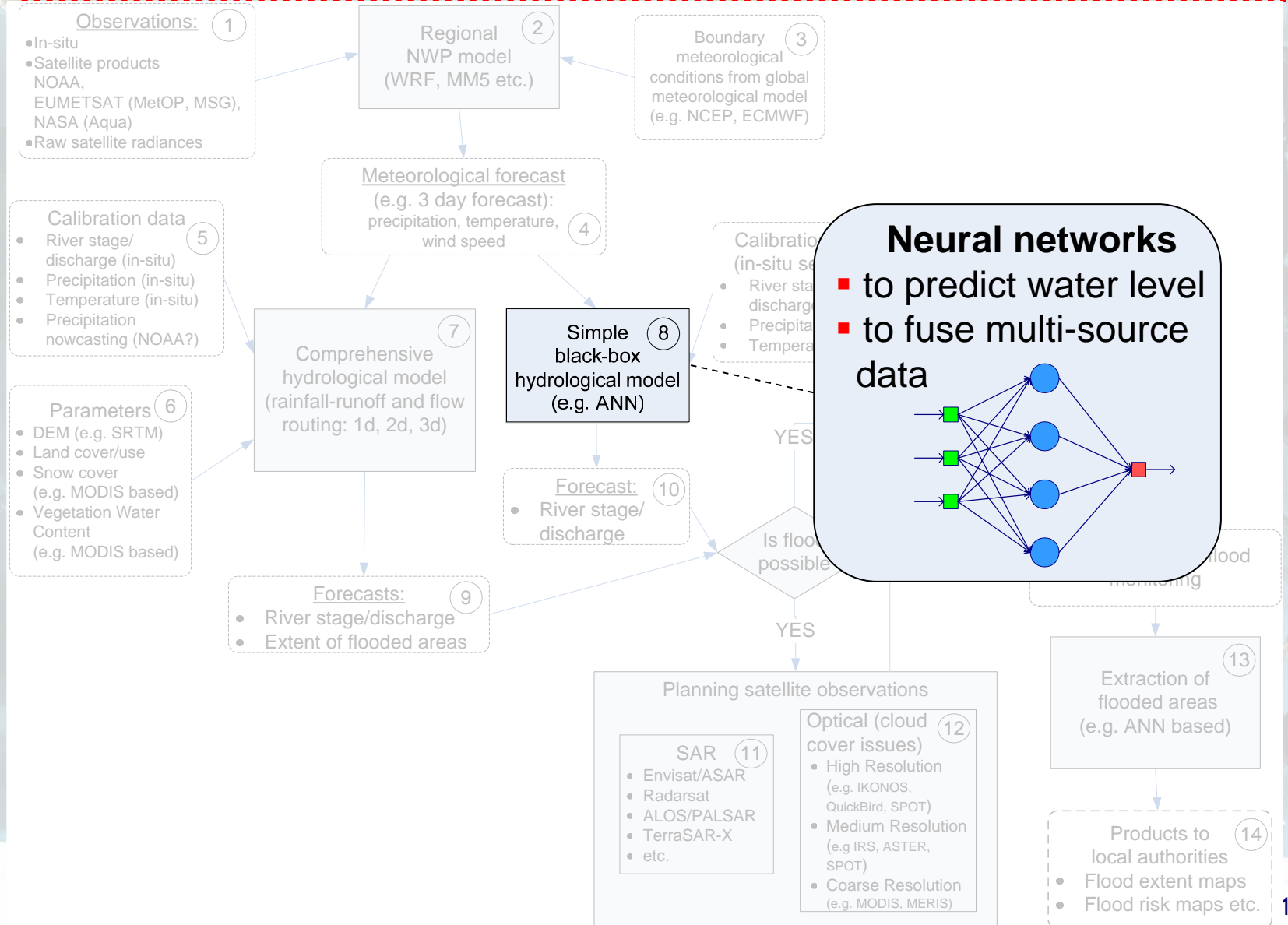
General Flowchart for Flood SensorWeb Use Case



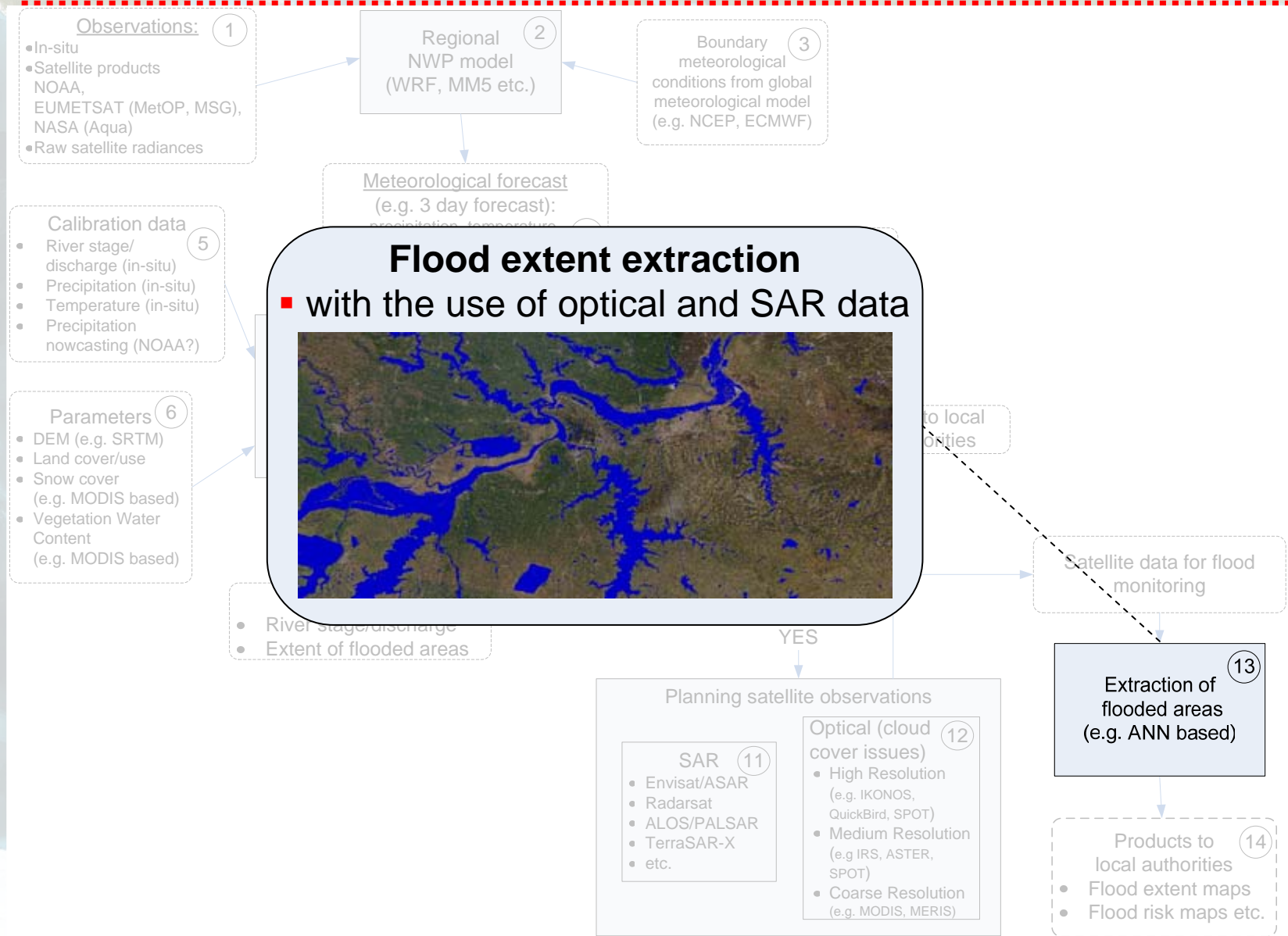
General Flowchart for Flood SensorWeb Use Case



General Flowchart for Flood SensorWeb Use Case



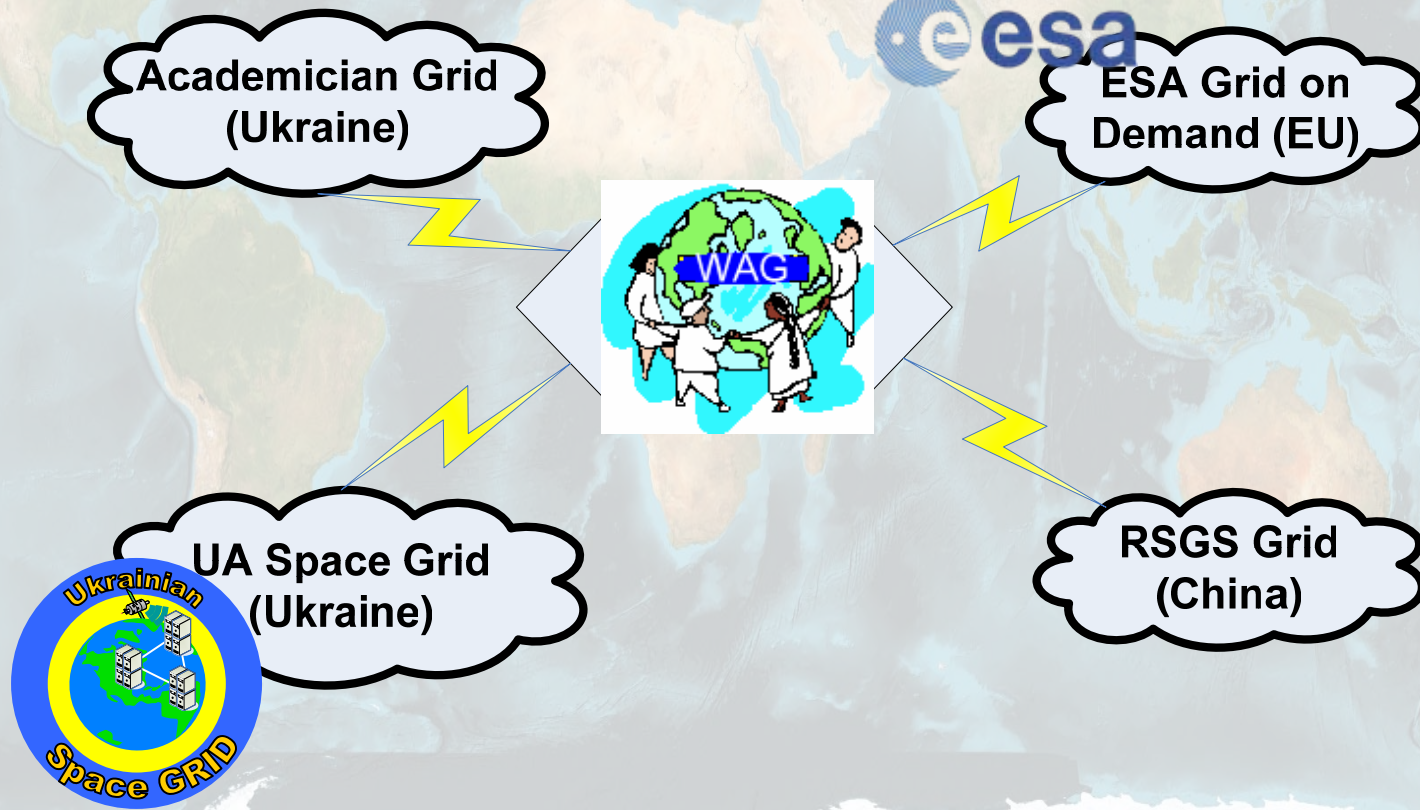
General Flowchart for Flood SensorWeb Use Case



A world map showing the continents of North America, South America, Africa, Europe, and Asia. A horizontal red dashed line is drawn across the top of the map, just below the Arctic region. The text 'GRID infrastructure' is overlaid on the map in a large, blue, outlined font.

GRID infrastructure

Integration of Grid Systems



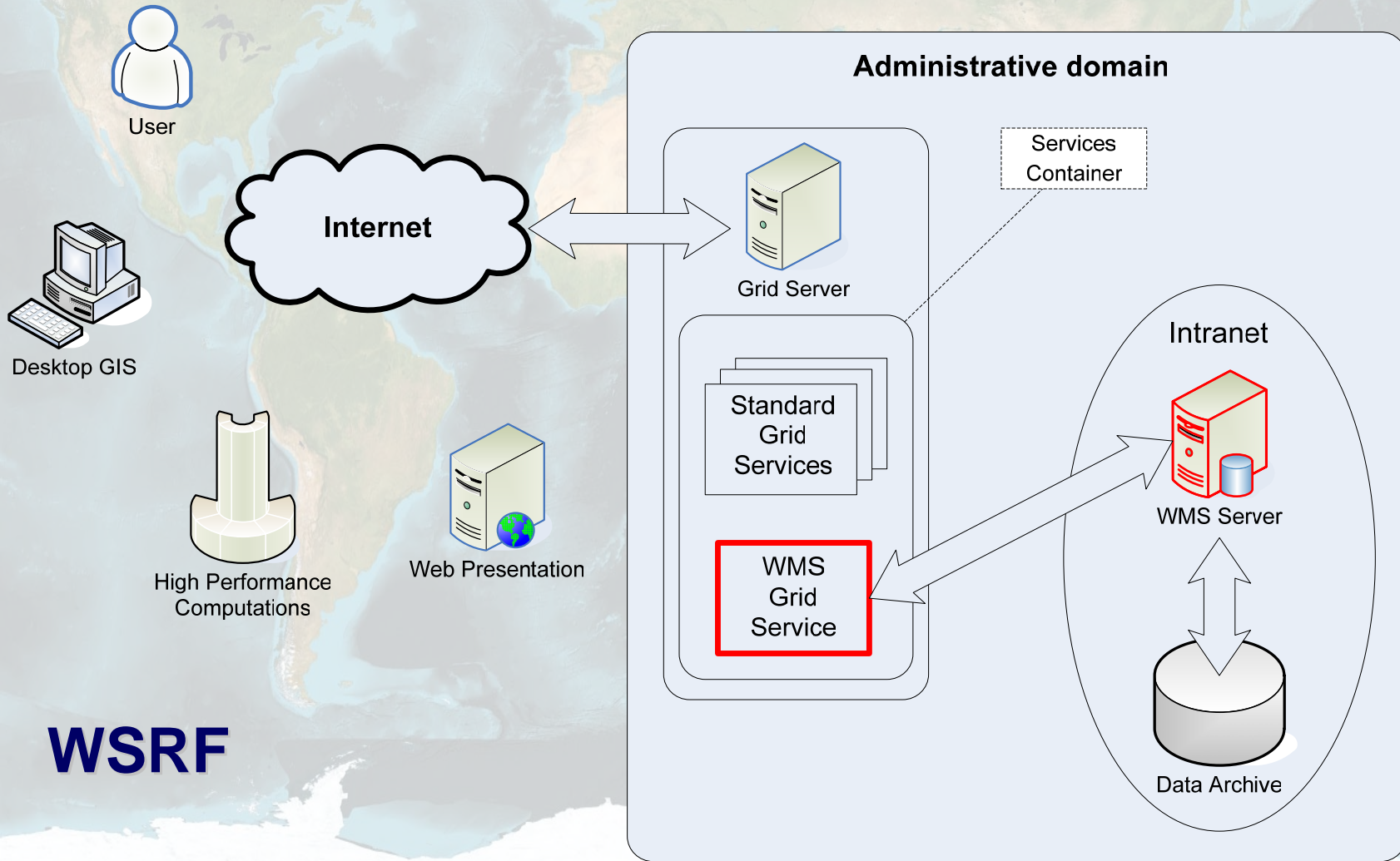
InterGrid: Problems and Solutions

- Main prerequisite: certificates trust (EGEE, RDIG)
- Tasks:
 - Data transfers and high-level access to geospatial data
 - Development of common catalogues
 - Jobs submission and monitoring
 - Portal

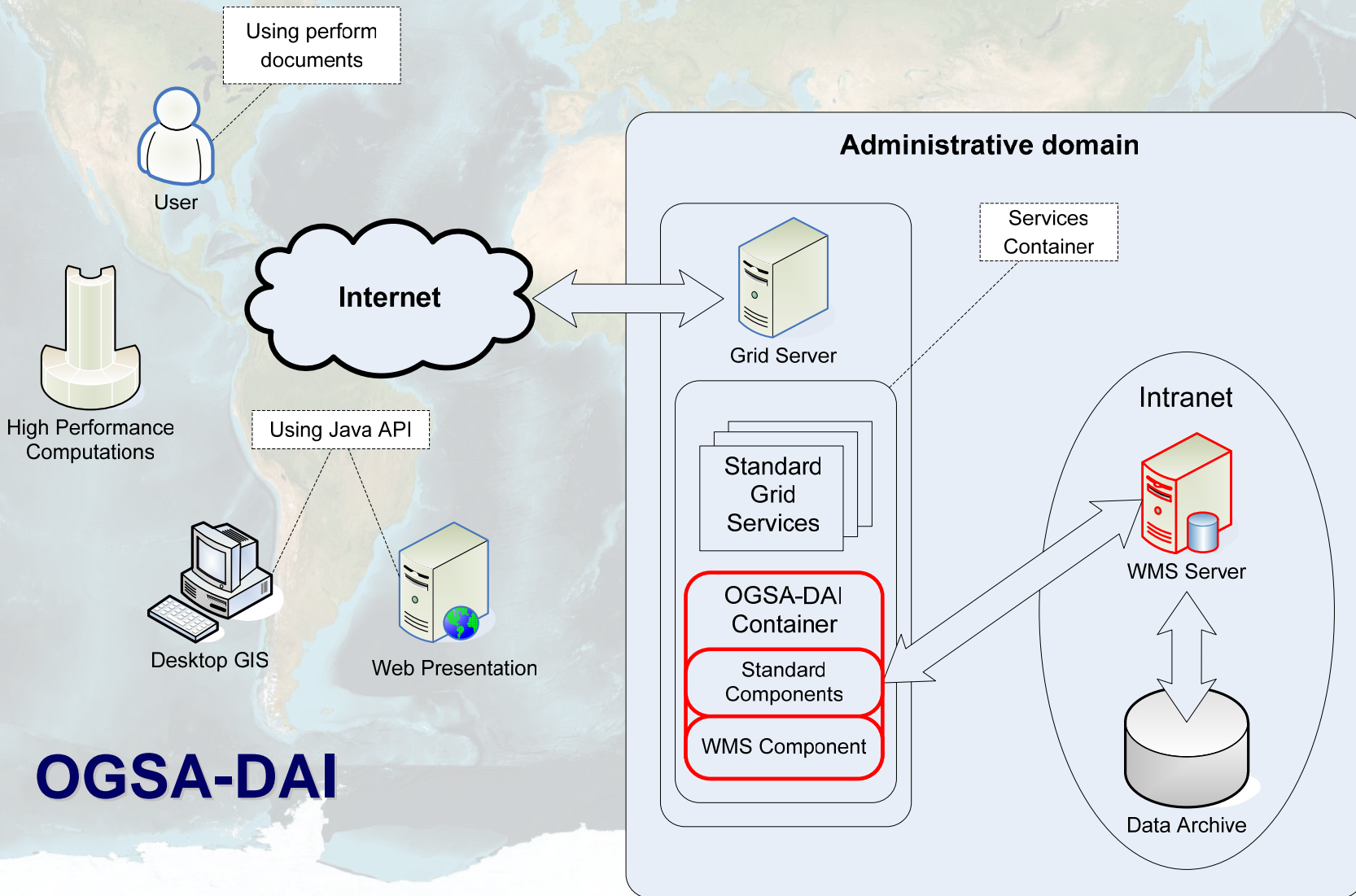
InterGrid: Data Transfer

- GridFTP – good solution for data transfers
- Requires transparent network infrastructure
- Works in InterGrid integrating RSGS (China), SRI (Ukraine) and ESA

InterGrid: Access to Geospatial Data

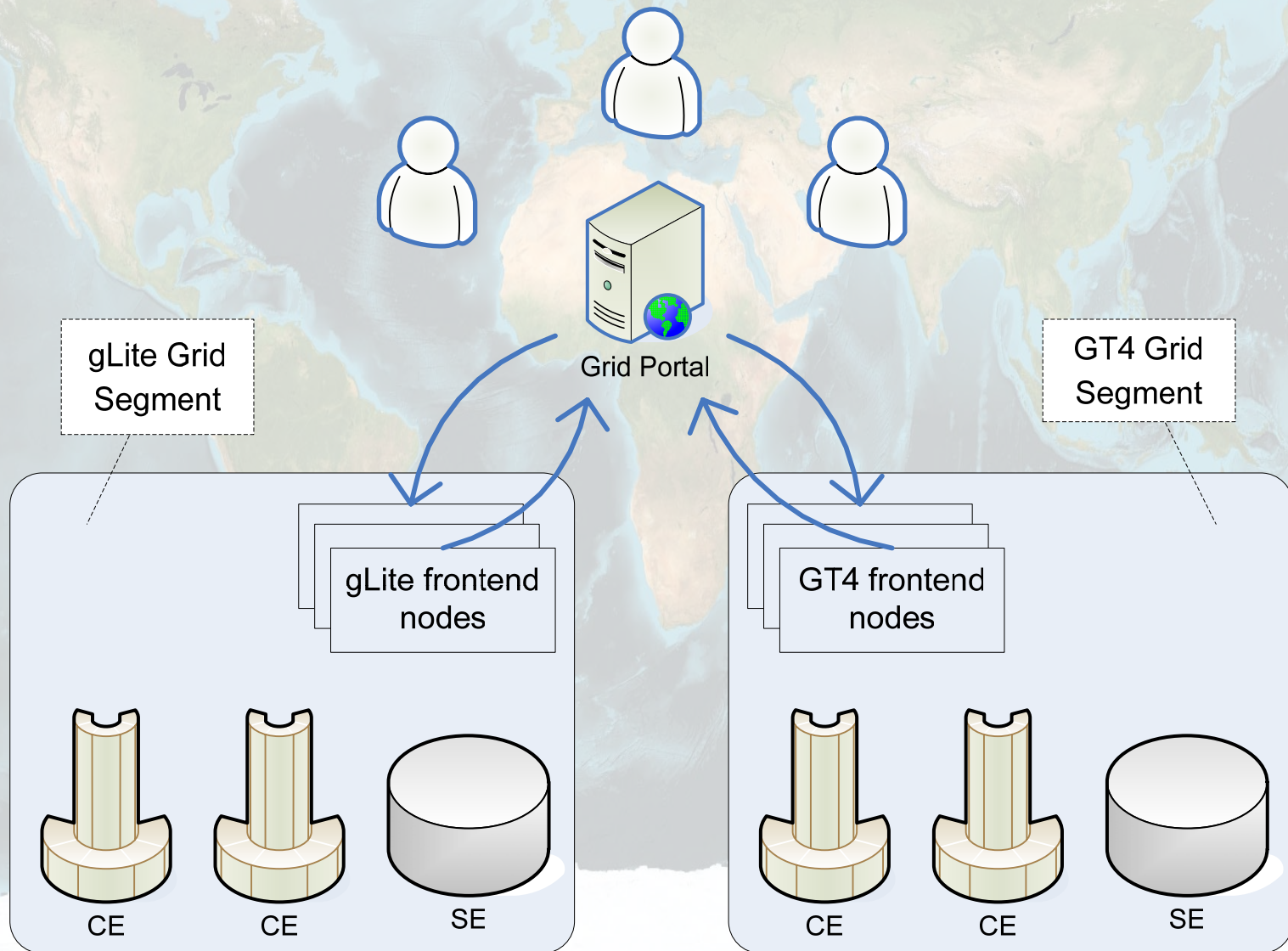


InterGrid: Access to Geospatial Data

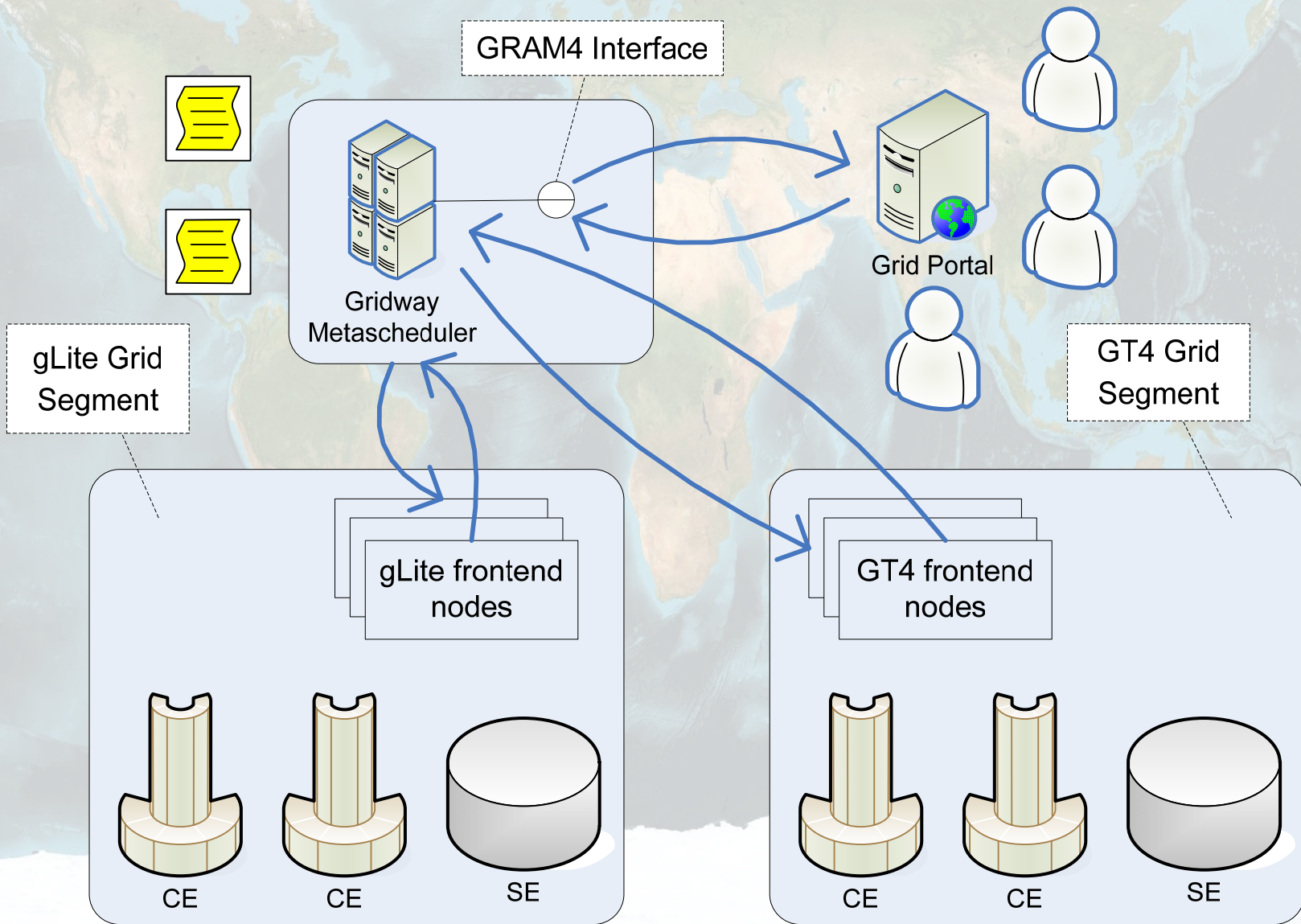


OGSA-DAI

Job Submission – Grid Portal



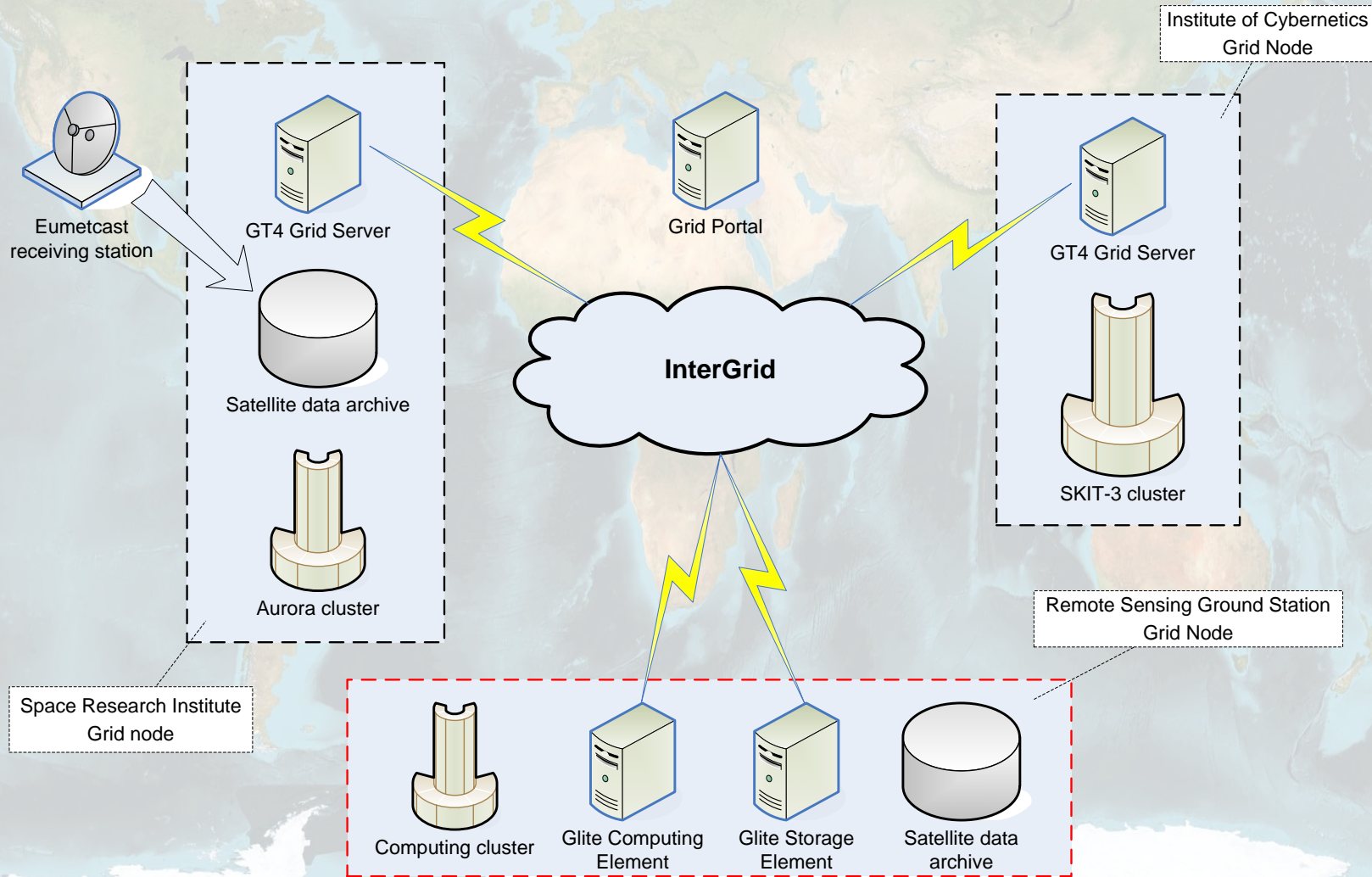
Job Submission – Metascheduler



InterGrid: Job Submission

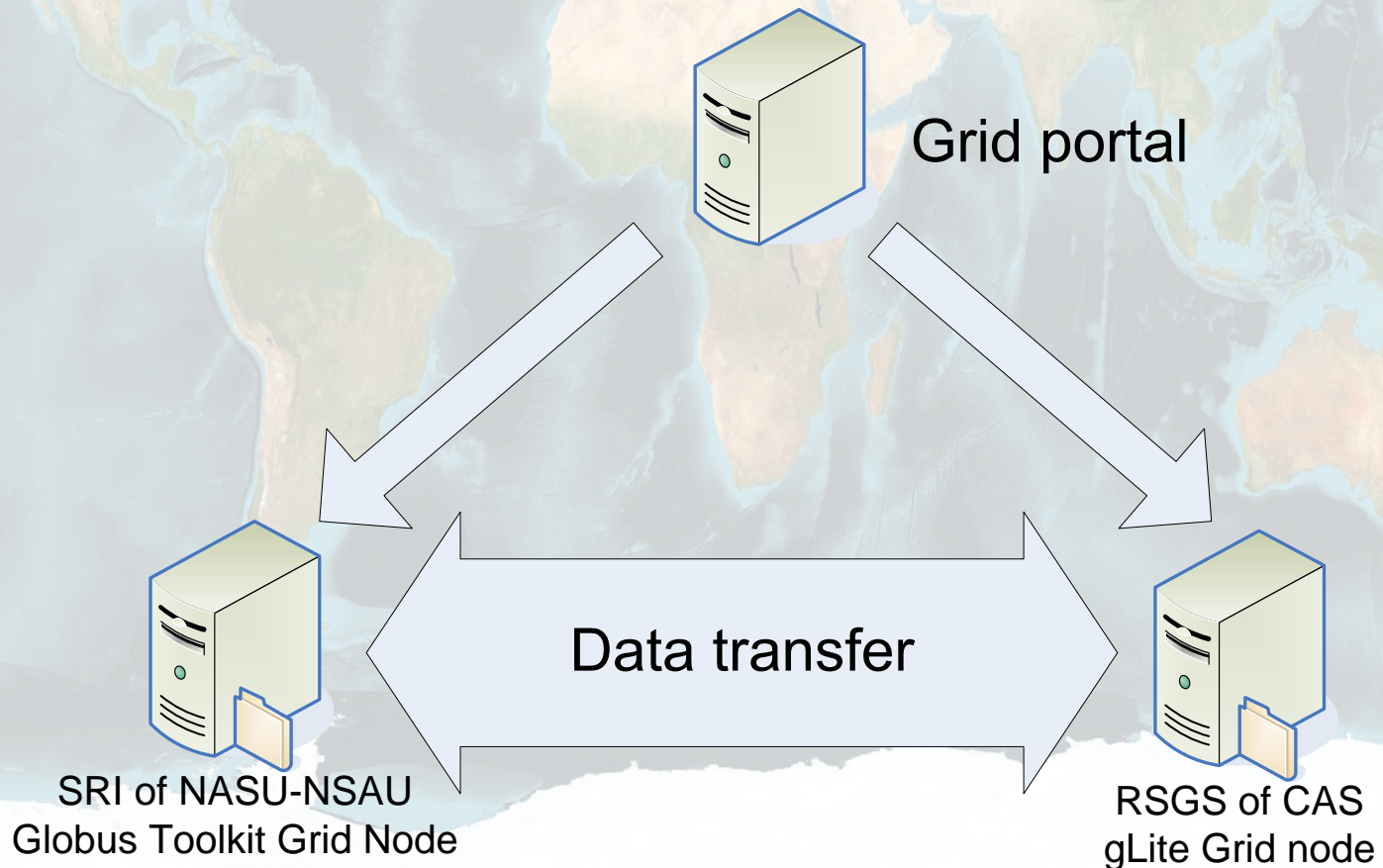
- **Grid portal solution**
 - easy to deploy and maintain
 - it doesn't provide application interface and scheduling capabilities
- **Metascheduler approach**
 - much more difficult to maintain comparing with portal
 - however, it provides API with advanced scheduling and load-balancing capabilities
- Grid Portal is still very reasonable addition to metascheduler

CAT-1 Current Status: Architecture



CAT-1 Current Status: Data transfer

- Data transfer is initiated by the Grid portal
- Transfer is performed between two nodes



Grid portal

- Enable access to InterGrid resources

The screenshot shows the GridSphere Portal interface in a Mozilla Firefox browser window. The URL is <http://gridportal.ikd.kiev.ua:8080/gridsphere/gridsphere?cid=85>. The page title is "GridSphere Portal - Mozilla Firefox". The browser's address bar shows the URL. The page content includes a navigation menu with "Welcome", "Administration", and "Grid" tabs. Below the navigation menu, there are links for "Registry", "Credentials", "Resources", "Files", and "Jobs". The main content area is titled "Resource Browser Portlet" and contains a "Refresh List" button and a "Hardware List" table. The table lists various resources with columns for Resource, Name, Address, Description, System, Processor, and CPUs. The date "December 21, 2007" is displayed below the table. The browser's status bar at the bottom shows "Done" and "110% (ikd.kiev.ua)".

Resource	Name	Address	Description	System	Processor	CPUs
Portal		gridportal.ikd.kiev.ua	Hosts the GridSphere Portlet Container	-	-	-
Aurora		gt.ikd.kiev.ua	Front-end to the Aurora cluster	Linux 2.6.9-023stab044.4-smp	x86	4 CPUs
SKIT-3 (GEOSS segment)		gt.icyb.kiev.ua	Front-end to the SKIT-3 cluster	-	-	-
RSGS SE		se.grid.rsgs.ac.cn	Remote Senging Ground Station Storage Element	Linux 1 Thu Oct 19 11:02:51 CDT 2006 2.4.21-47.0.1.EL	-	-
RSGS CE		ce.grid.rsgs.ac.cn	Remote Senging Ground Station Computing Element	-	-	-
SRI SE		se.grid.ikd.kiev.ua	Space Research Institute Storage Element	Linux 1 Thu Oct 19 11:02:51 CDT 2006 2.4.21-47.0.1.EL	-	-
SRI CE		ce.grid.ikd.kiev.ua	Space Research Institute Storage Element	-	-	-

CAT-1: Further work

- **Future**
 - Cascading and coupling of models for flood forecasting
 - Integration of Grid environment **with applications**
 - enabling User Interface to run transparently EO tasks and visualize the results of multi-source data processing
 - Adding **new data to OpenLayers Web-interface**

A world map showing the continents of North America, South America, Africa, Europe, and Asia. A horizontal red dotted line is drawn across the map, passing through the equator. The text "Thank you!" is centered over the map in a large, bold, blue font.

Thank you!