Integration of Sensor Web Services into Grid Environment

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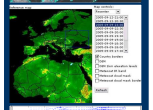
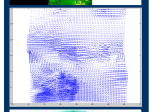
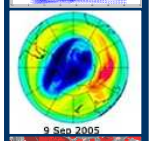
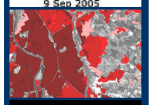
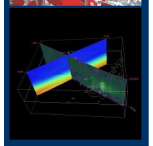
Content





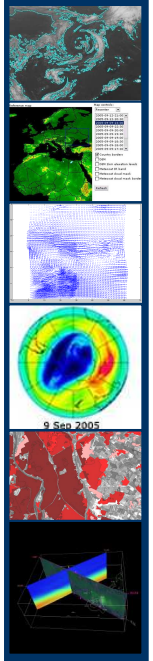


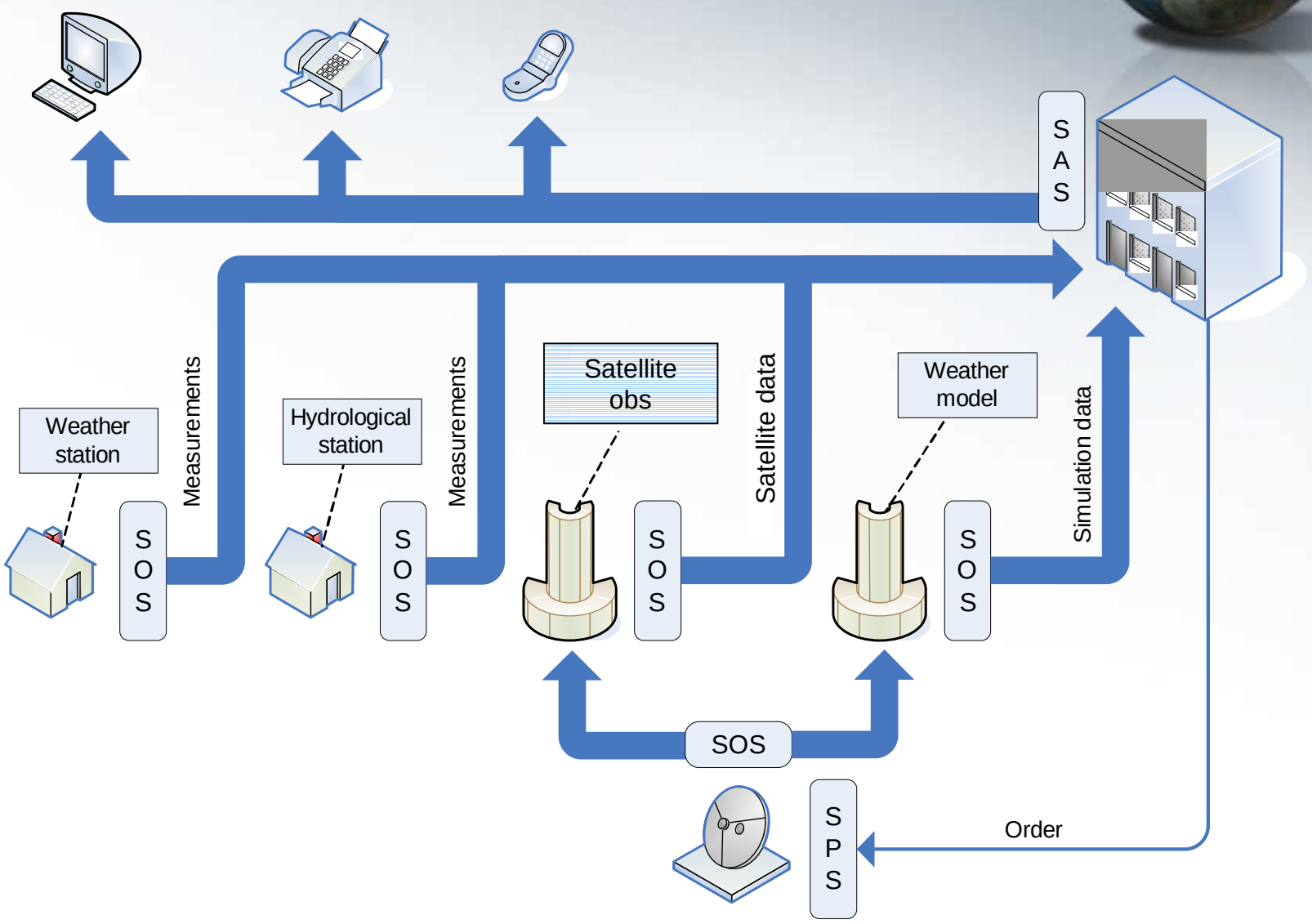




- Sensor Web Scenario for Flood Applications
- SOS and SensorML: technical issues
- Sensor Web & Grid Integration
  - General concept & benefits
  - Problems & issues

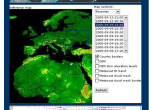
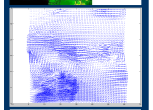
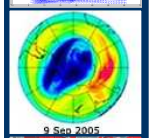
SW Perspective for Flood Application

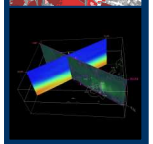


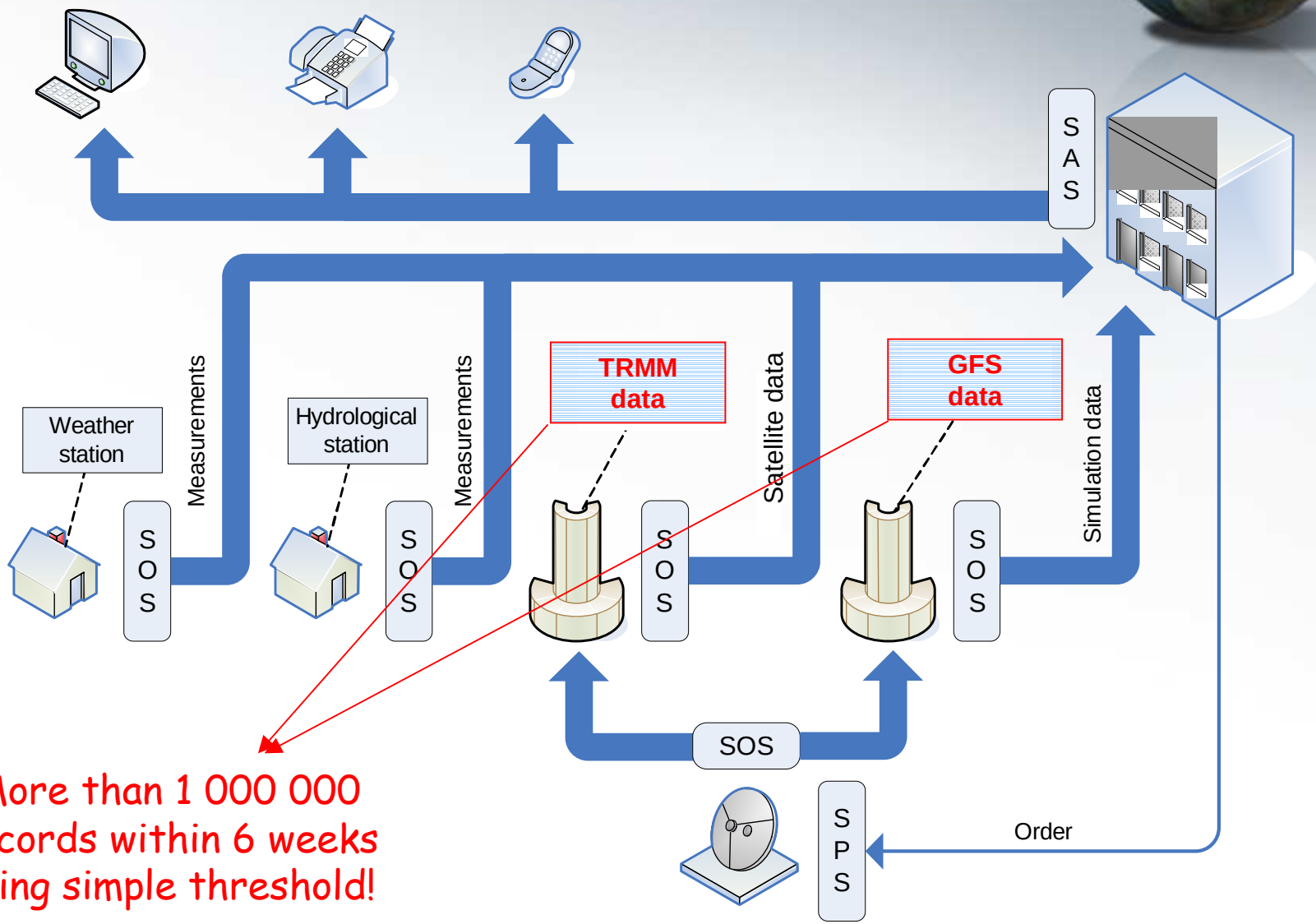


SW Perspective for Flood Application



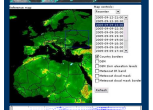




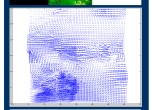


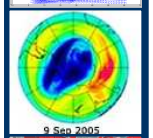


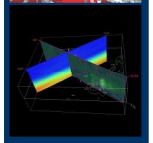
More than 1 000 000 records within 6 weeks using simple threshold!

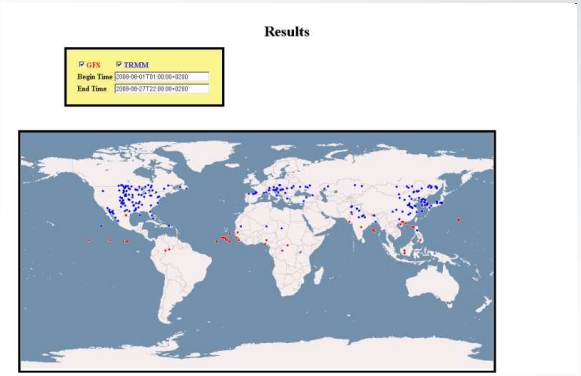
Scenario of GEO-Ukraine Response to GEOSS AIP CFP-2





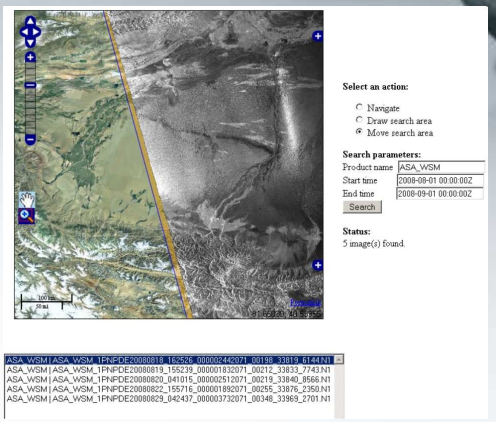






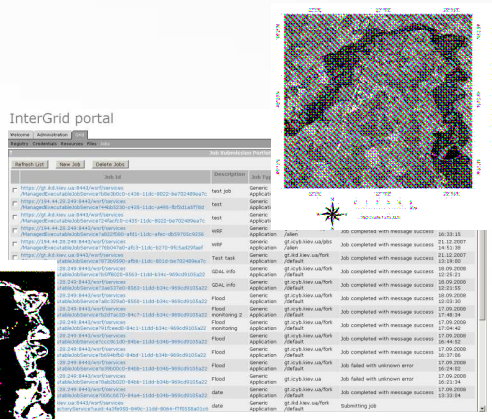
SOS Interface to GFS & TRMM data

SPS



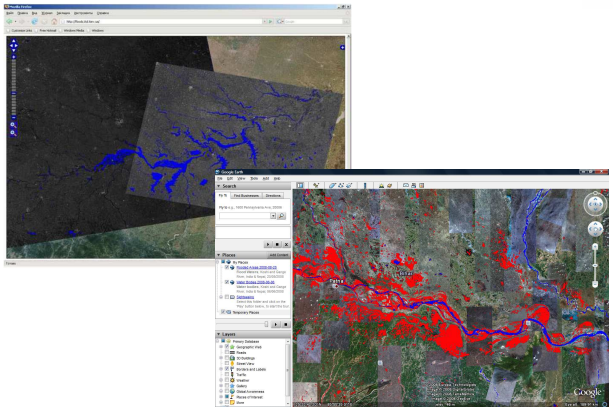
Satellite Observations

WPS



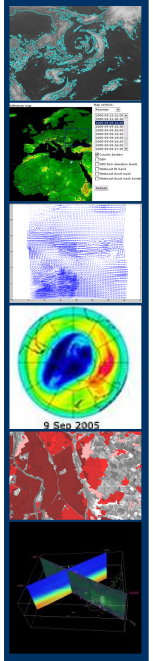
Data Processing in Grid

WMS



Visualization of Data

SOS



- Example of a single SOS measurement...

```
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 <om:samplingTime>
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   <gml:timePosition>2005-04-14T04:00:00+04</gml:timePosition>
  </gml:TimeInstant>
 </om:samplingTime>
 <om:procedure xlink:href="urn:ogc:object:feature:Sensor:WMO:33506"/>
 <om:observedProperty xlink:href="urn:ogc:def:phenomenon:OGC:1.0.30:temperature"/>
 <om:featureOfInterest>
  <sa:Station gml:id="33506">
   <gml:name>WMO33506</gml:name>
    <sa:sampledFeature xlink:href=""/>
    <sa:position>
    <gml:Point>
     <gml:pos srsName="urn:ogc:crs:epsg:4326">34.55 49.6</gml:pos>
    </gml:Point>
   </sa:position>
  </sa:Station>
 </om:featureOfInterest>
 <om:result uom="celsius">10.9</om:result>
</om:Measurement>
```
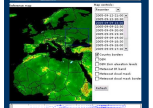
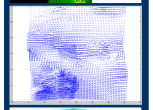
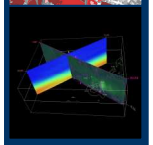

Sensor Observation Service



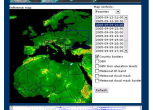
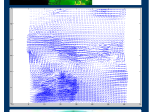




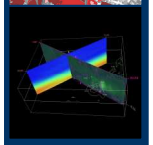
- ... and the whole time series of observations

```
<om:result>2005-03-14T21:00:00+03,33506,-5@@2005-03-
15T00:00:00+03,33506,-5.2@@2005-03-15T03:00:00+03,33506,-
5.5@@2005-03-15T06:00:00+03,33506,-4.6@@2005-03-
15T09:00:00+03,33506,-2.2@@2005-03-
15T12:00:00+03,33506,1.7@@2005-03-
15T15:00:00+03,33506,1.7@@2005-03-
15T18:00:00+03,33506,2.4@@2005-03-15T21:00:00+03,33506,-
0.7@@2005-03-16T00:00:00+03,33506,-1.4@@2005-03-
16T03:00:00+03,33506,-1.1@@2005-03-16T06:00:00+03,33506,-
1.1@@2005-03-16T09:00:00+03,33506,-1.3@@2005-03-
16T12:00:00+03,33506,0.5@@2005-03-
16T15:00:00+03,33506,1.7@@2005-03-
16T18:00:00+03,33506,1.5@@</om:result>
```

SOS and SensorML

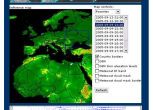
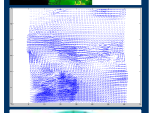
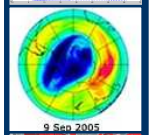




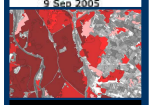
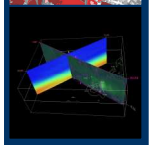




- SOS
  - Current implementations mostly deal with **point observations** and **not with geospatial data**
  - Remote sensing image with the size 1K-by-1K will produce **1M of “point” observations!**
  - The appropriate way is to store links to the images – **future implementation should support the processing geospatial data!**
- SensorML
  - We used it to describe the weather modelling process using WRF numerical model
  - There are nearly **50 inputs** and **20 outputs** for basic WRF configuration
  - Each of them requires quite significant amount of XML code to be properly described!
  - It would be great if next revision of SensorML will include some elements for simpler description of multidimensional data

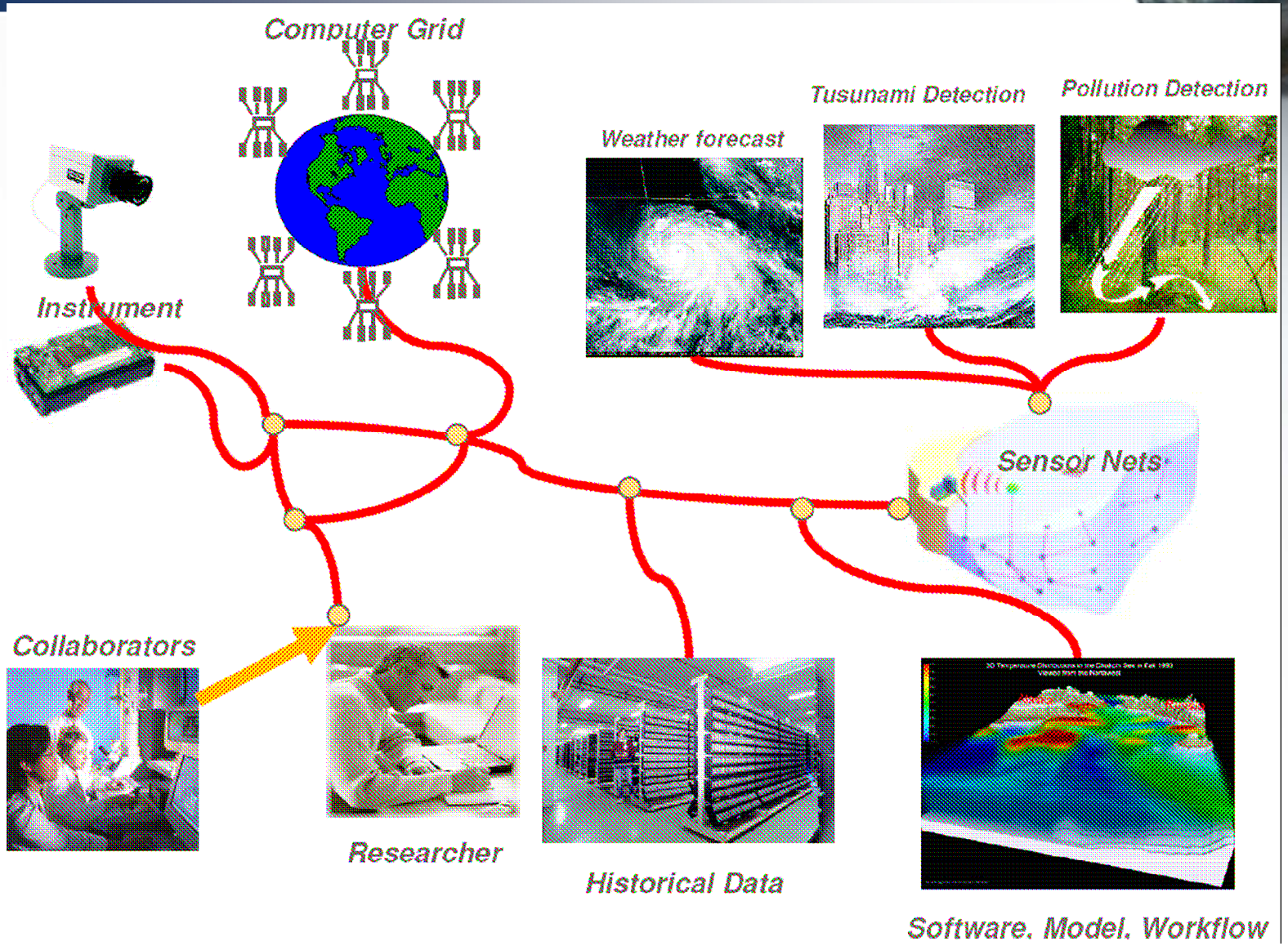
SW & Grid Benefits

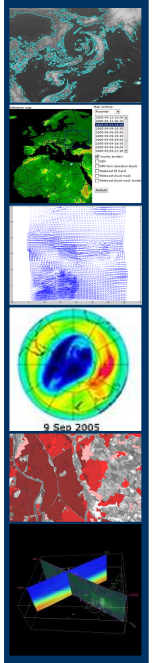
- **Data (Information) Grid**
  - provide an infrastructure to support data **storage**, data **discovery**, data **handling**, data **publication**, and data **manipulation** of large volumes of data actually stored in various **heterogeneous** databases and file systems
- **Sensor Grid – Catalogs of Sensors**
  - integrates **wireless sensor networks** with grid infrastructures to enable **real-time sensor data collection** and the sharing of computational and storage resources for **sensor data processing and management**
- **Computational Grid**
  - provide secure access to huge pool of **shared processing power** suitable for **high throughput applications** and **computation intensive computing**

SW & Grid

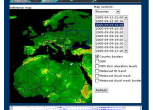


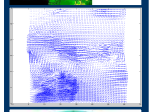
Chu and Buyya (2007) Service Oriented Sensor Web

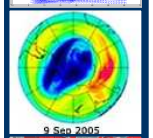
Integration of SW & Grid - Middleware

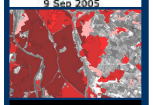


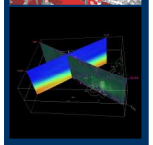
- SensorWeb 2.0 Middleware (June, 2008)
  - GridBus project - The University of Melbourne, Australia
  - Pros
    - Implements OGC's Sensor Web Enablement (SWE)
    - Open Sensor Web Architecture (OSWA) – based on Web service concept
  - Cons
    - Includes a bunch of software to be integrated. We experienced a lot of integration issues when installing
    - Even implemented services are currently not yet fully functional











Thank you!