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Development of Estimated Surface Air Temperature (ESAT) map based on OGC Web Services

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Live E! sensor map

～230 sensor sites

http://www.map-asp.net/Spatial_Gateway/pl/Gat

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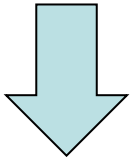
Sensor and Satellite data

- Sensor data
  - High time resolution (we can get the data every 1 – 10 mins.)
  - Low spatial resolution
- Satellite data
  - Low time resolution
  - High spatial resolution



collaboration

We think …

- It'll become easy to calibrate the satellite data frequently.
- It'll become easy to find the broken nodes among many sensors.

We develop the collaboration system for these data with easy user interface.

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MODIS LST

- MODIS Land Surface Temperature
  - Day/Night observation
  - Target accuracy ±1 K.
- Derived from Two Thermal infrared band channel
  - Band 31 (10.78 - 11.28 μm)
  - Band 32 (11.77 – 12.27 μm)
  - Using split-window algorithm for correcting atmospheric effect
- Not a true indication of “ambient air temperature”
- However, there is a strong correlation between LST and air temperature
  - Evaluation of a correlation between the measured air temperature from meteorological station and LST can estimated air temperature.

What kind of sensors we use.

- Weather sensors that can read ...
  - Temperature
  - Humidity
  - Pressure
  - RainFall
  - WindDir
  - WindSpeed
- Cost
  - US$200～3000

Vaisala WXT510

WM918

WMR968

VantagePRO2

One-Wire Weather Station

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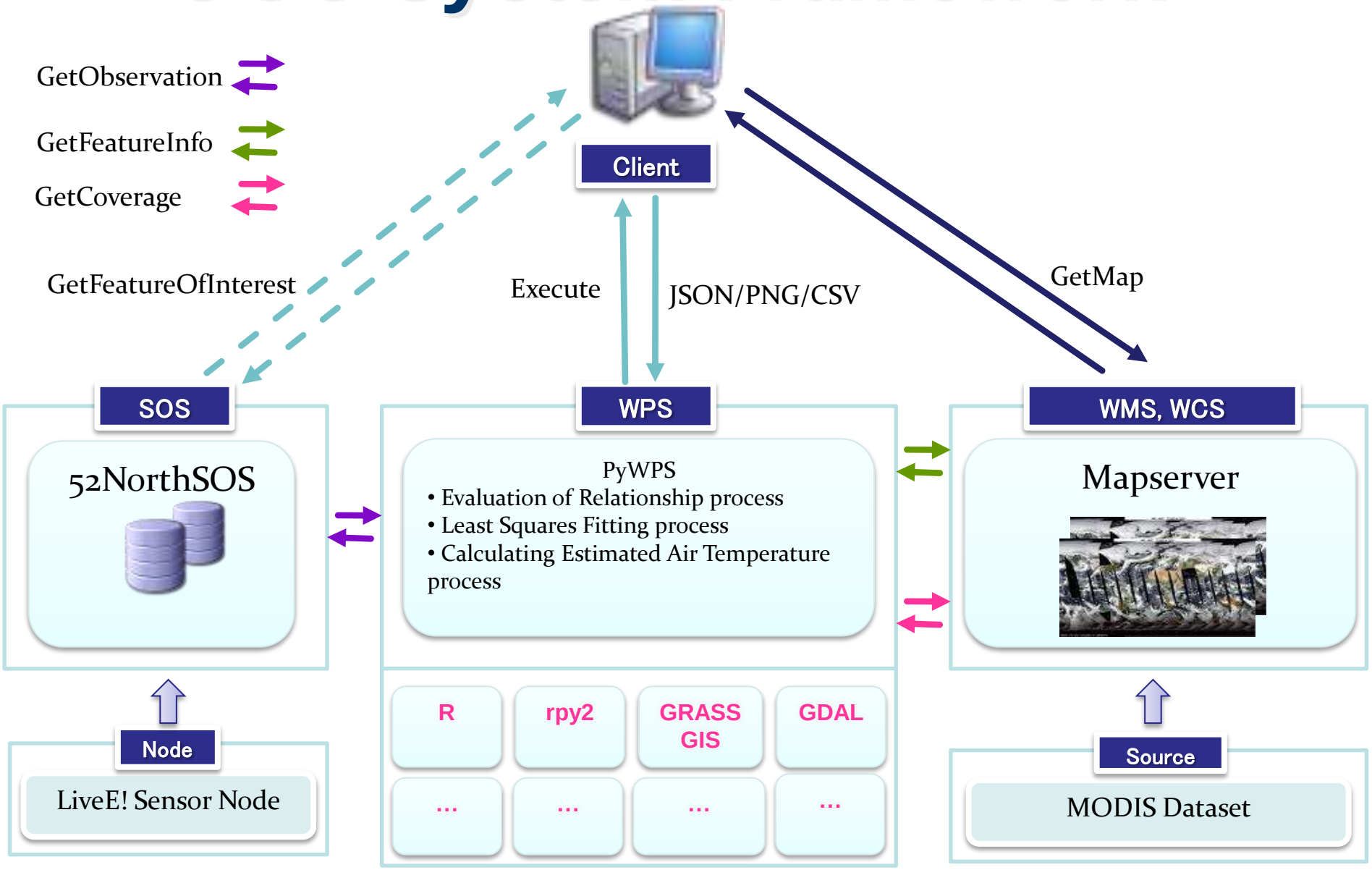
Development Framework

- This study focus on the development of a comprehensive web based framework
  - Estimating air temperature map
  - Using MODIS LST evaluated relationship with in-situ data collected over a distributed sensor network of Live E! weather station.
- Our software are based on various open standards of OGC (Open Geospatial Consortium) Web Service specifications such as
  - Web Processing Service (WPS)
  - Sensor Observation Service (SOS)
  - Web Mapping Service (WMS)
  - Web Coverage Service (WCS)

OGC System Framework



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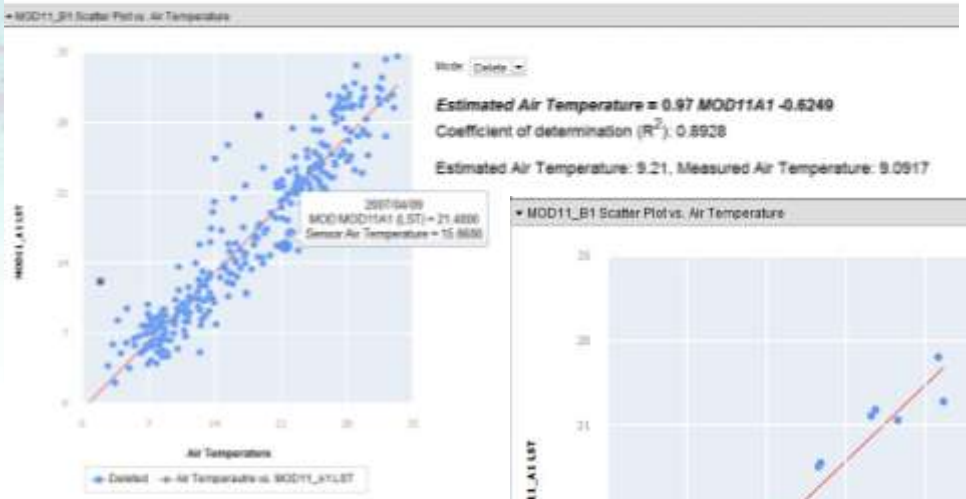
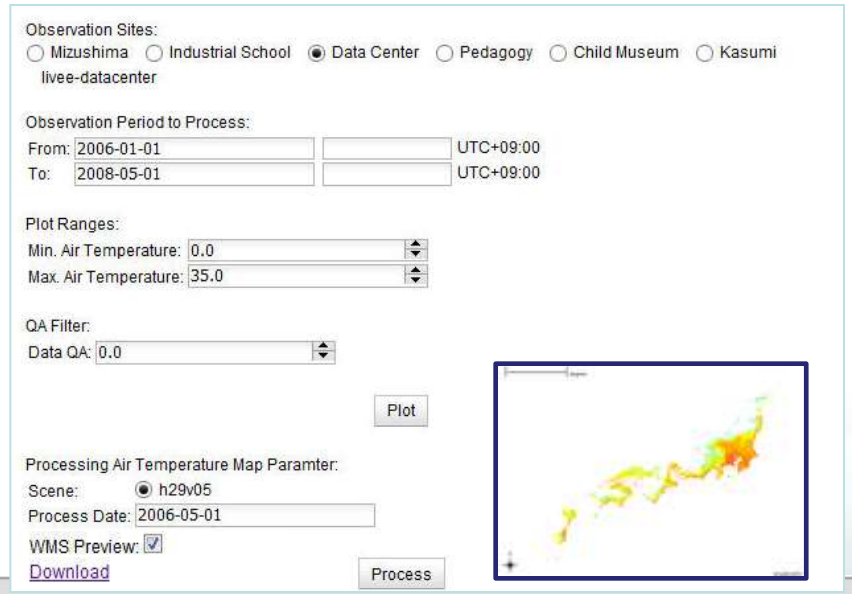
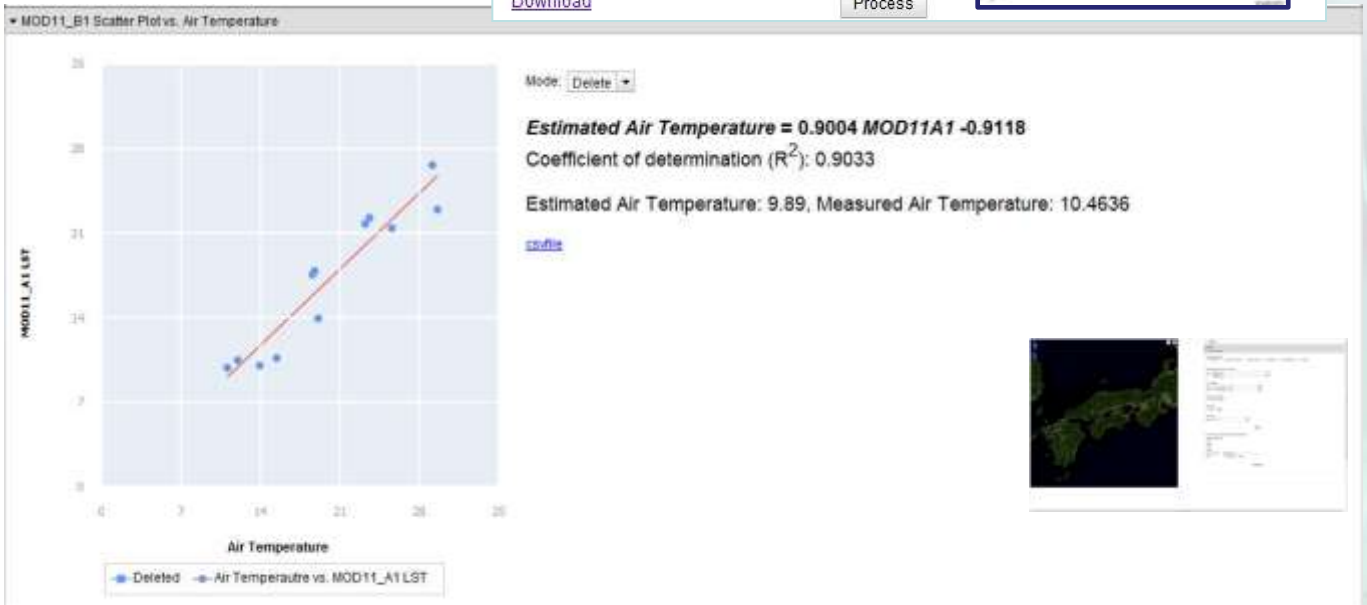
Prototype System







VDO Demo

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Conclusion

- Comprehensive web-based GIS system framework enabled
  - Based on various open standards of OGC specifications
  - Using FOSS
    - Mapserver, 52North SOS, PyWPS, R
    - OpenLayers, Dojo
- Integration of sensor observation data and satellite image
  - Wider area, More accuracy, Reasonable cost
- More information from estimated air temperature
  - Growing Degree Days (Insect, Disease vector development)
  - Pollen forecast
- We'll try to calibrate, estimate and predict the other data such as rainfall etc.