P-DAN Report

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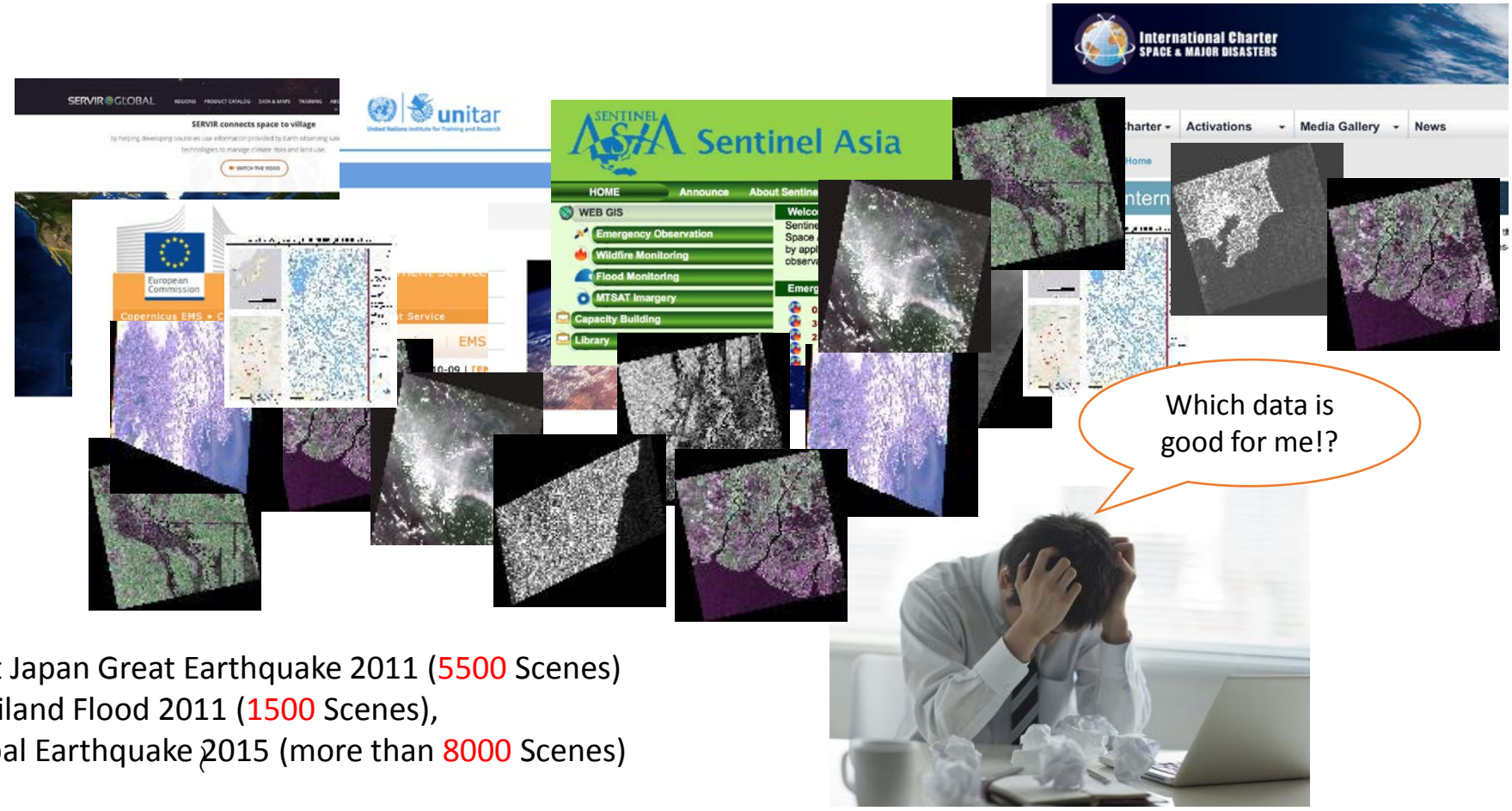
Nightmare of growing data…

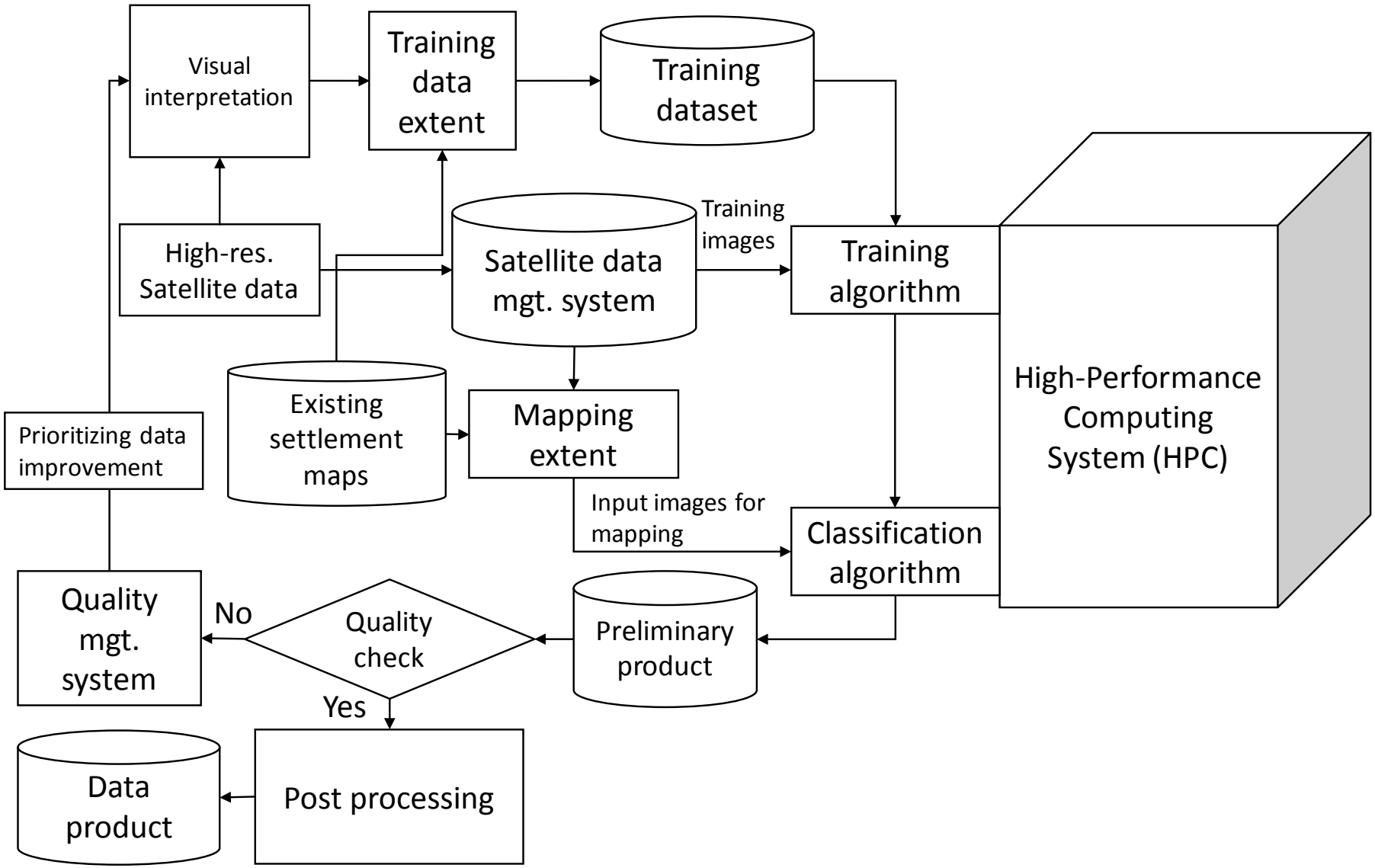


East Japan Great Earthquake 2011 (5500 Scenes)
Thailand Flood 2011 (1500 Scenes),
Nepal Earthquake 2015 (more than 8000 Scenes)

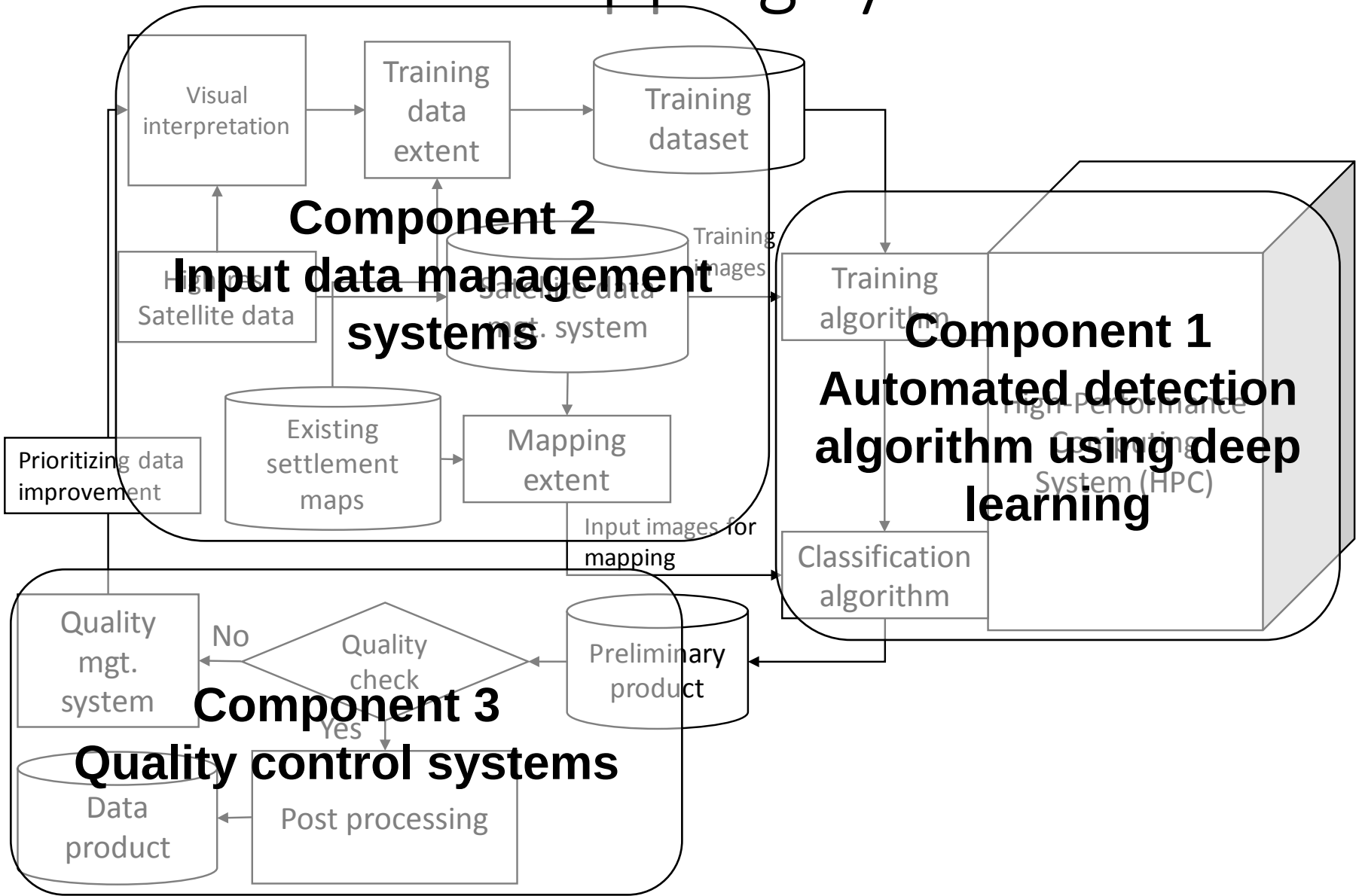
Solutions

- Automations of data processing
  - Automated detection of ground features in satellite imagery
- Precise data resources
  - Small-scale satellite data
    – key limitations and breakthroughs

Automated mapping system



Automated mapping system

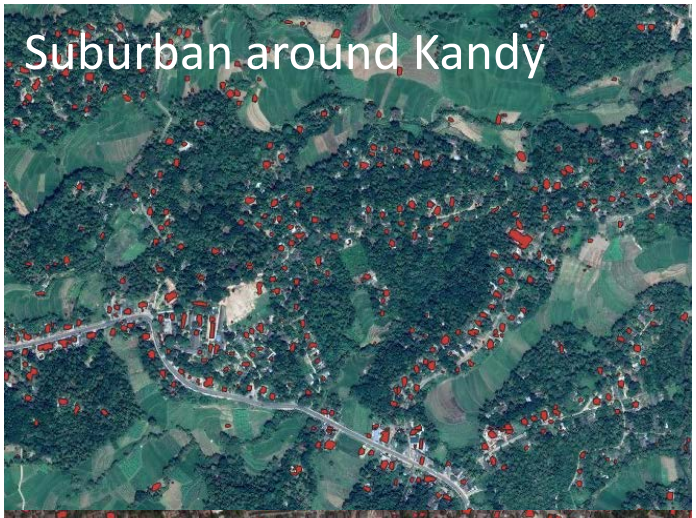


Functions by the component

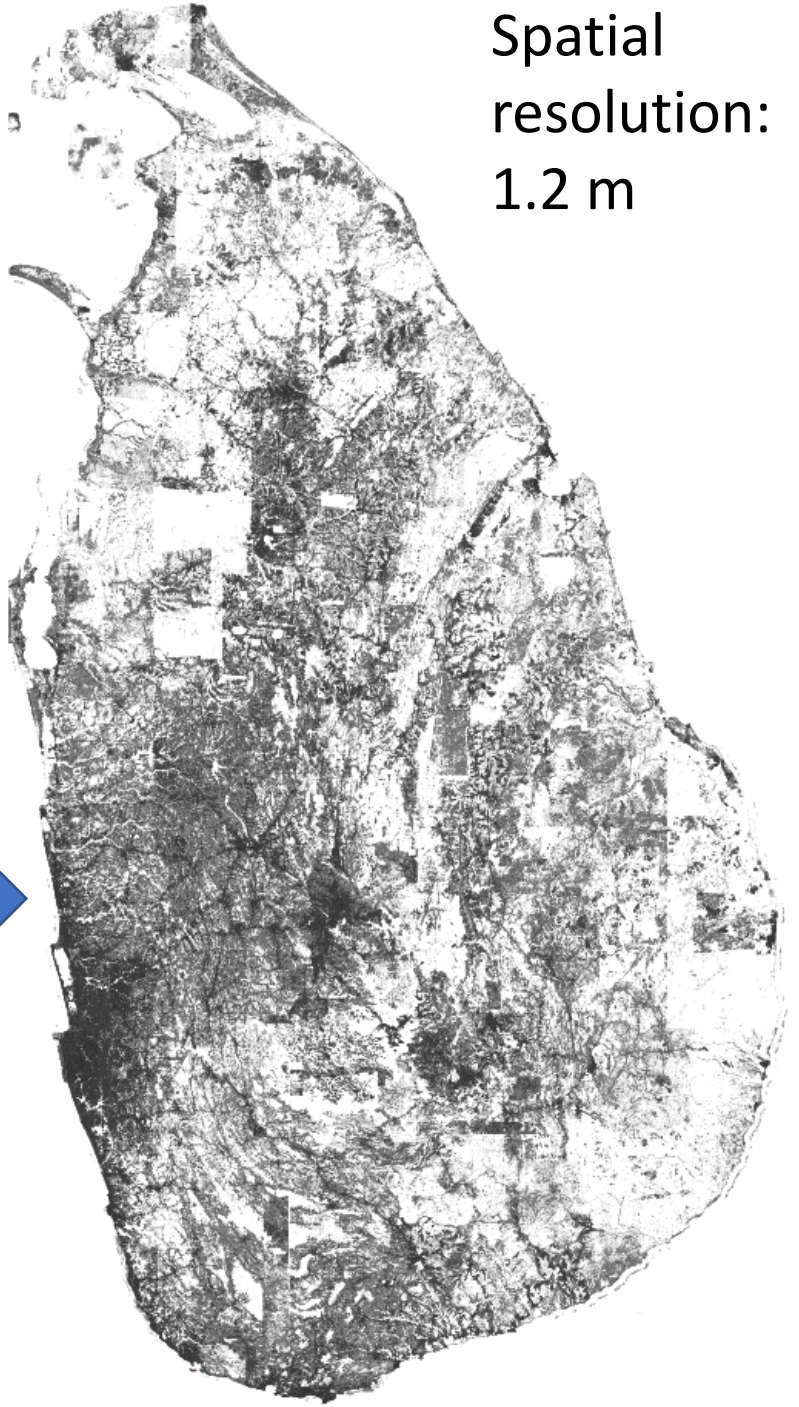
- Component 1—Automated detection using deep learning
  - Implementation of deep learning algorithm to detect ground objects (e.g. buildings) on high performance computing systems.
- Component 2—Input data management systems
  - User interface for creation and management of visual interpretation data.
  - Consistent management between visual interpretation data and satellite images for preparation of training data set.
  - Prioritize regions for data improvements according to quality assessment results.
  - Manage variety of massive satellite data in consistent coordinate systems.
- Component 3—Quality control systems
  - Assess quality of data products by region for prioritizing data improvements.

Component 1—Automated detection using deep learning

Pilot application to nation-wide building mapping from Google Maps' satellite images for Sri Lanka



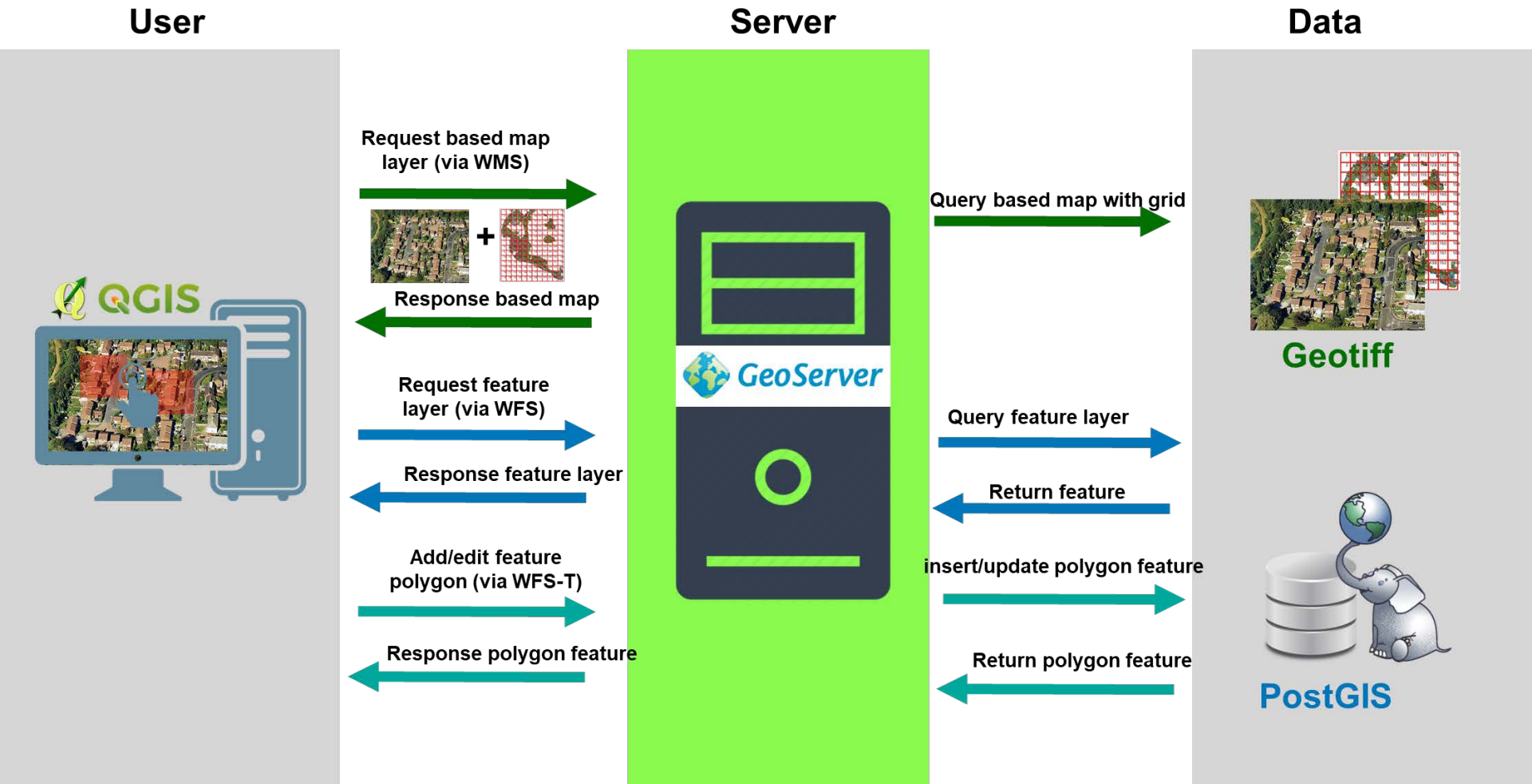
Nation-wide mapping



Spatial resolution: 1.2 m

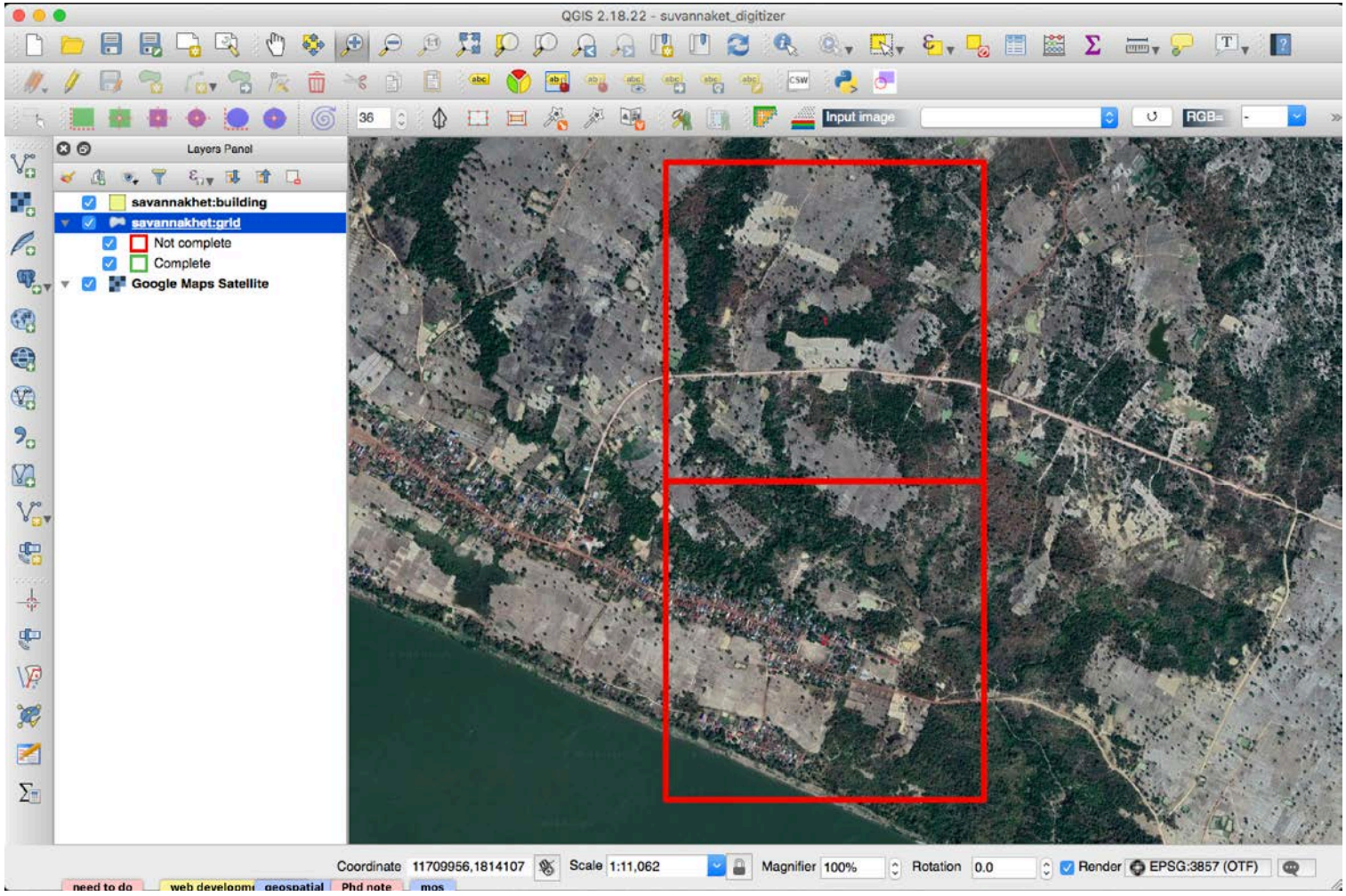
Component 2—
Input data management systems

Automated task/reward management of visual interpretation of ground objects over the Internet.



Component 2—
Input data management systems

Training data preparation using QGIS, the freely available GIS software
→ Anyone can contribute to the training data. Experimental operation with Japan, Thailand, Nepal, and Vietnam.



Remained works

- System improvements
  - Improve the detection/mapping algorithms
    - E.g. color balancing between images.
  - Full-automation of task/reward management for training data
- R&D of quality control systems

Expected befits to Sentinel Asia

- Application of the systems to automated damage mapping, such as collapsed buildings and land slides, for rapid damage assessments.
- Nation-wide mapping of demography and infrastructure for better preparedness and planning.

Solutions

- Automations of data processing
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- Precise data resources
  - Small-scale satellite data
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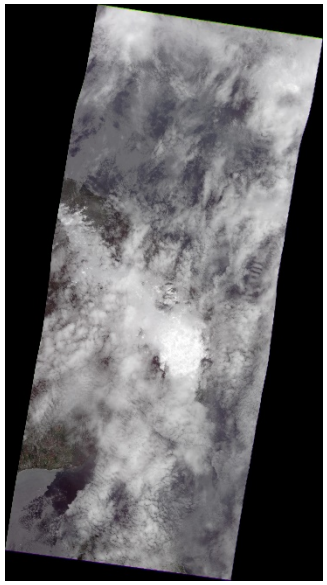
Earth observation from small-scale satellites

- Potentials to high-frequency global snapshots

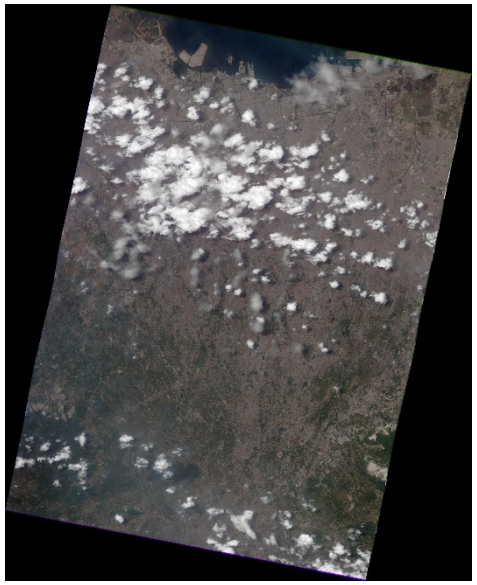
https://www.axelspace.com/en/axelglobe_/

Hodoyoshi-1 by AxelSpace, JPN

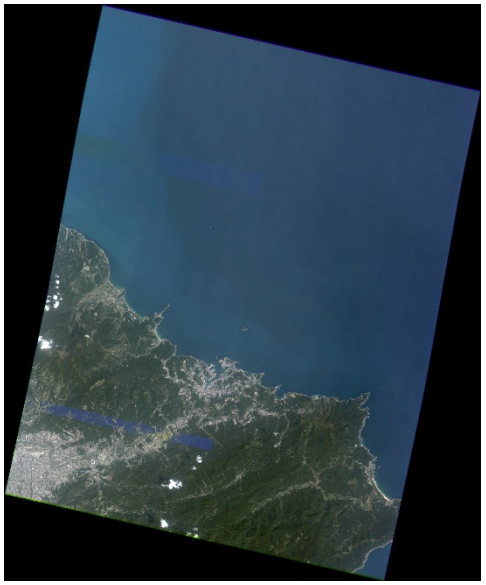
Sensor	Spectral bands	Res.	FOV/swath widts
Optical sensor	Blue (450-520nm) Green (520-600nm) Red (630-690nm) NIR (780-890nm)	6.7 m	27.8km x 179km



Eruption of Mt. Agung, IDN, Nov 2017



Jakarta, IDN, Aug 2017

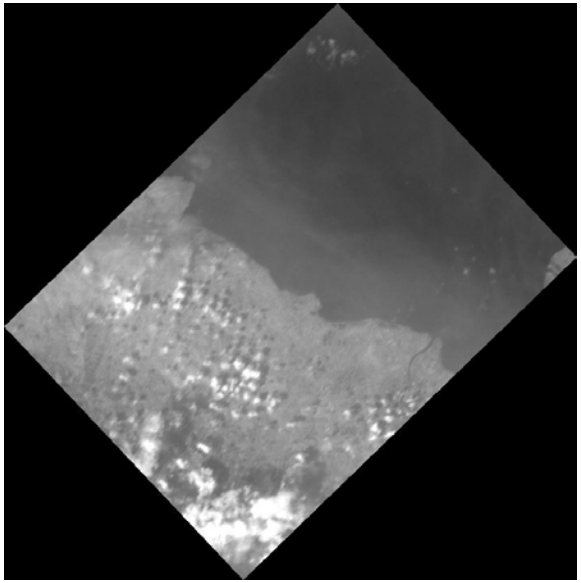


Taipei, TWN, March 2018

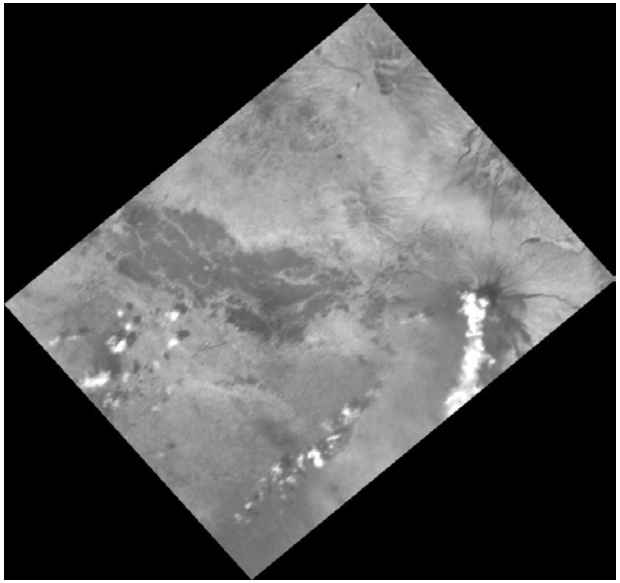
Diwata-1 by DOST, PHL & Tohoku Univ., JPN

Sensor	Spectral bands	Res.	FOV/Swath width
HPT (High Precision Telescope)	RGB+NIR	3 m	1.9 km x 1.4 km
SMI (Spaceborne Multispectral Imager)	Visible and NIR 420–700 nm 650–1050 nm	80 m	30 km x 40 km
WFC (Wide Field Camera)	Panchromatic	7 km	180º x 134º
MFC (Mid-Field Camera)	Color	185 m	121 km x 91 km

Observation data of SMI available at https://data.phl-microsat.xyz/



Floods in Cagayan de Oro, Mindanao
Jan-Feb 2017



Eruption of Mayon Volcano
Jan 2018

Key limitations

Hodoyoshi-1

Positional accuracy + shifts of the NIR sensor

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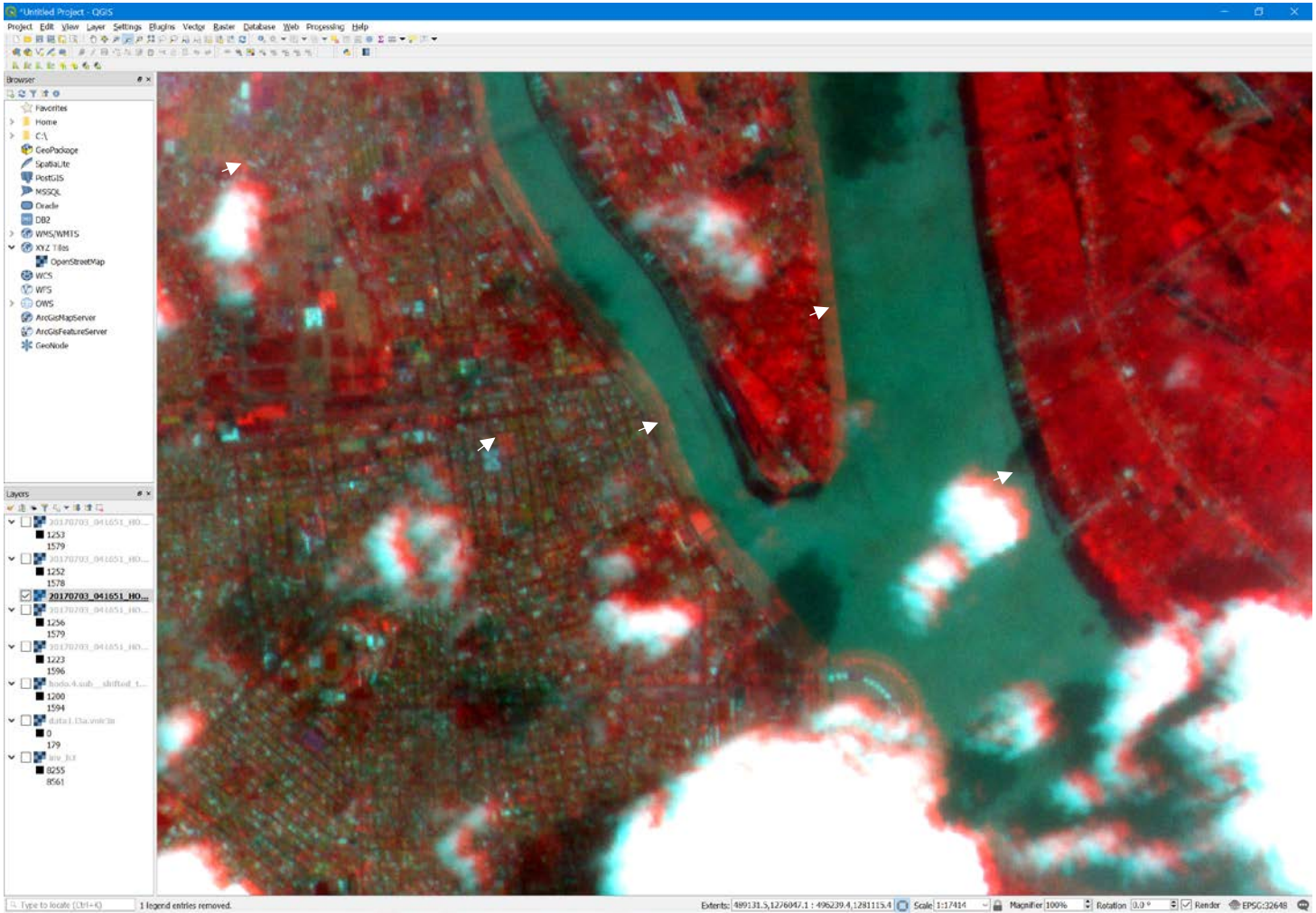
Hodoyoshi-1

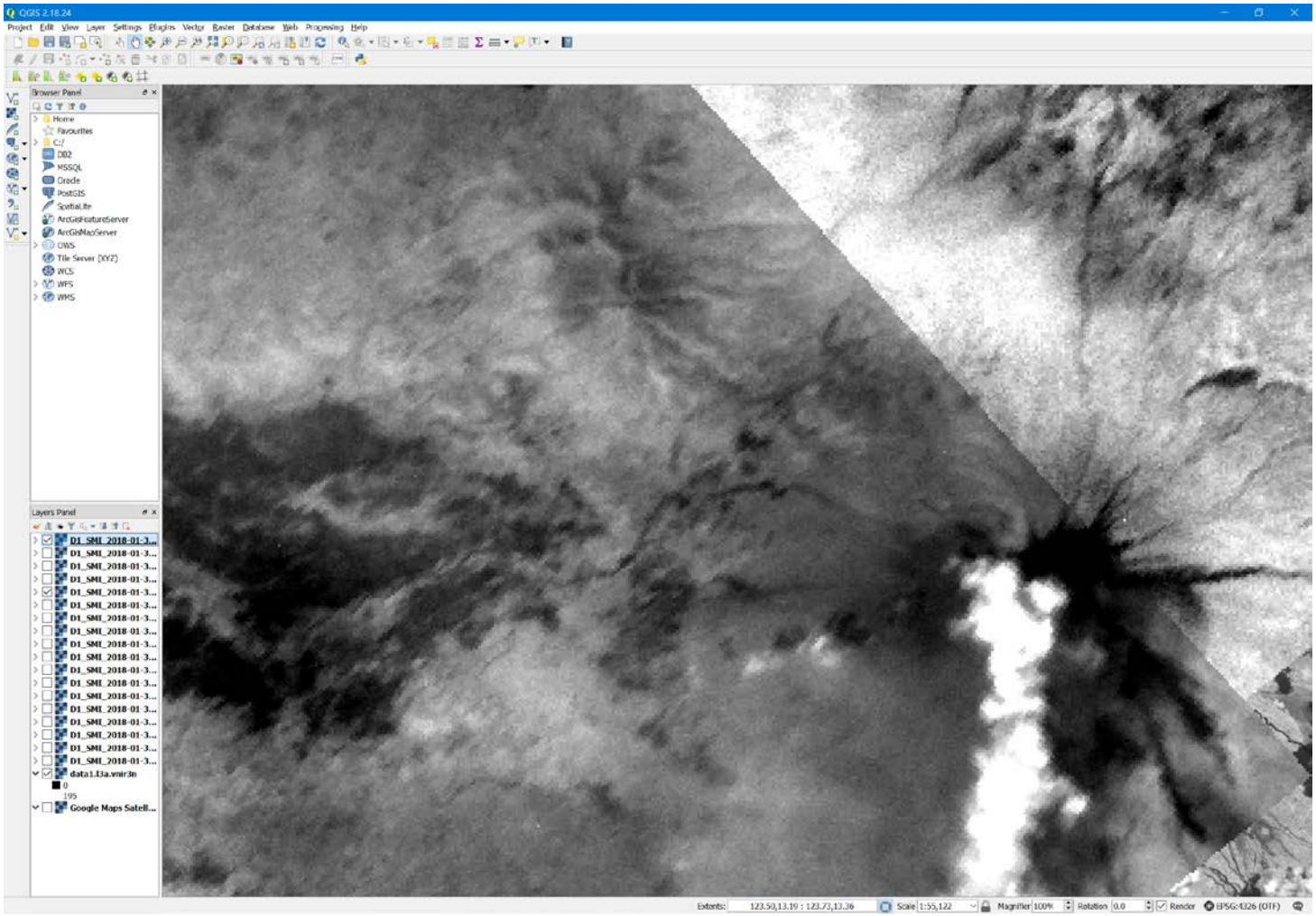
Positional accuracy + **shifts of the NIR sensor**



Key limitations

Diwata-1

Positional accuracy



Solution
– automated co-registration

arosics 0.8.8

Latest version

```
pip install arosics
```

Last released: Oct 22, 2018

An Automated and Robust Open-Source Image Co-Registration Software for Multi-Sensor Satellite Data

Navigation

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- Release history
- Download files

Project links

- Homepage

Statistics

View statistics for this project via Libraries.io, or by using Google BigQuery

Meta

Project description

An Automated and Robust Open-Source Image Co-Registration Software for Multi-Sensor Satellite Data

- Free software: GNU General Public License v3
- Documentation: http://danschef.gitext.gfz-potsdam.de/arosics/doc/

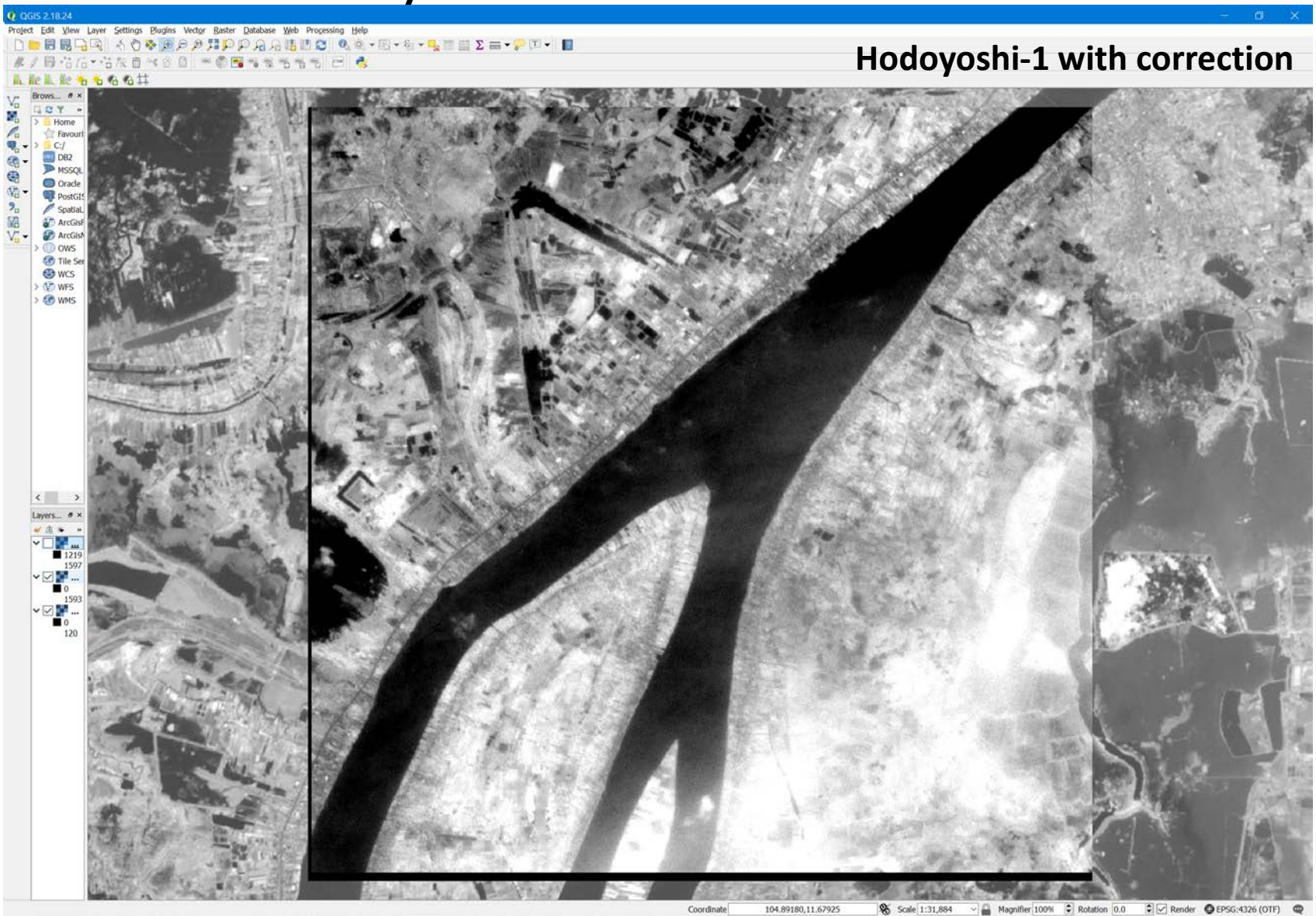
Status

pipeline passed | coverage 83.00% | pypi v0.8.8 | license GNU General Public License v3 | python 2.7 | 3.3 | 3.4 | 3.5 | 3.6

See also the latest coverage report and the nosetests HTML report.

Features

Preliminary trial



Preliminary trial

Expected benefits to Sentinel Asia

- More options with better preciseness
  - Potentially more available combinations of pre- and post-disaster observations even with different satellites and sensors.
- Remained works
  - Examine applications to hazard/damage mapping with the co-registered images.
  - Develop instructions/manuals.

Concluding remarks

- Automations of data processing
  - Nation-scale building mapping is ongoing for some countries.
  - Potential extension to automated damage mapping for rapid responses (collapsed buildings, land slides, etc.)

Strengthening mapping capacity by the automation and newly growing data resources

- Precise data resources
  - Possible applications of small-scale satellite data to disaster mapping.
  - A success in automated co-registration of image data from the small-scale satellites
    → Integrations with existing satellite data for better change/damage detection between pre- and post-disasters.

Acknowledgement

- The Hodoyoshi-1 data is granted by AxelSpace Corporation, Japan, under an agreement on collaborative research on the data applications to disaster risk management.
- The large-scale building mapping was processed on a HPC provided by Sakura Internet Inc., Japan.