FOSS4G 2019 Data Challenge

KOMPSAT-3 SATELLITE SUPPORT FOR FARMING IN GERMANY

FOSS4G 2019
Bucharest, Romania, August, 2019

Bang Pham Huu

Jacobs University | rasdaman GmbH
Bremen, Germany
b.phamhuu@jacobs-university.de

Acknowledgements

The author would like to thank:

- **Rasdaman** - www.rasdaman.org

First **„Big Raster Data Analytics**“ database

Contact: **Peter Baumann** p.baumann@jacobs-university.de

- **SIIS** jimin.park@si-imaging.com
  - For providing KOMPSAT-3 imageries
- **CREODIAS** msykucki@cloudferro.com
  - For providing virtual machine on the cloud
- **NASA** - https://worldwind.arc.nasa.gov/web/
  - For providing 3D Javascript WebWorldWind client

Challenge "Explore your country using KOMPSAT"

Challenge description: "EO based data is very useful to know more about your neighborhood and country. KOMPSAT constellation can help you to explore your country by providing high quality VHR optical satellite images, ranging from 1m to 0.55m.

We expect fresh and smart idea to show industrial and **agricultural feature,** unique heritage and nature, or active change of your country by using satellite images.“

KOMPSAT 3A *[KARI]*

Challenge Question

Difficulties:

+ **Labour** shortage in agriculture
+ Waste of **fertilizer**, farm **machines**
+ **Fertility** land management

How to use **statellite technology**

in farming for maximum **profitability**

and **production**?

Source: DW

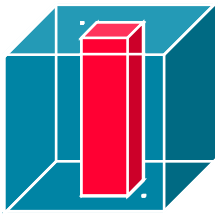
Proposed Solution

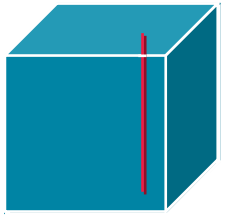
- Provide a **demo system** that enables the **evaluation** of ***land uses for agriculture, forestry***. Based on the output results, **German *farmers/researchers/governors*** can determine apropriate decisions.
- For example, it can help farmers check the **status of plants/trees** growing in each part of the field/forest to optimize fertilization, crop protection to increase yields and save costs.
- At the government level, it can **estimate how much crop will be harvested** in one region in order to make decisions on crop treatment strategy, logistics, storage capacities, and food security.

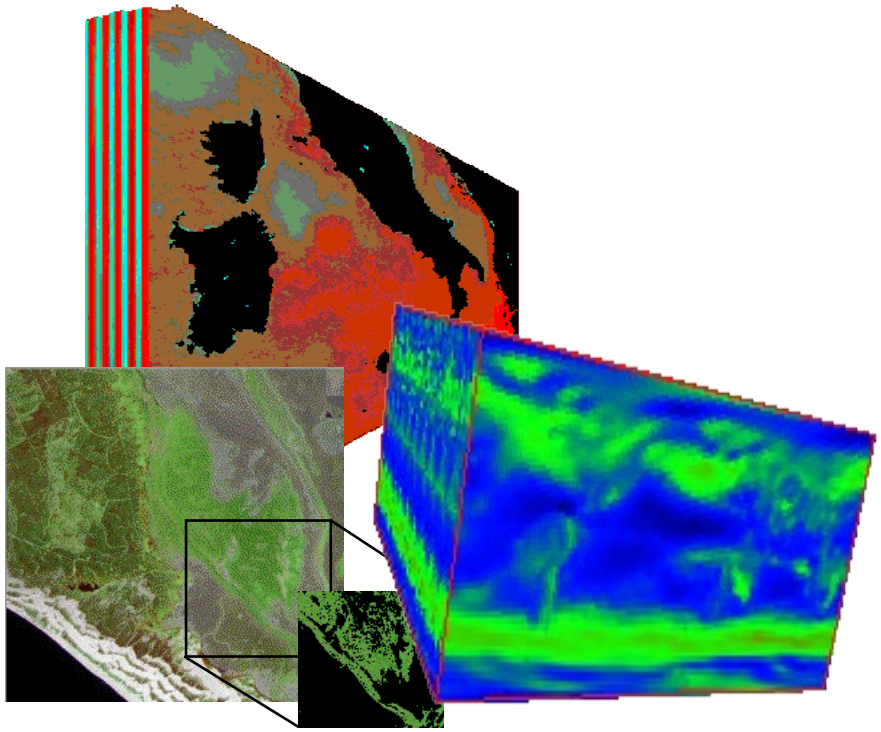
Selected Technologies

- **Rasdaman** – Raster Data Manager - Array DBMS for massive n-D raster data (big data cubes).
- OGC Web Coverage Service **WCS** and Web Coverage Processing Service **WCPS** compliance.

trim | slice



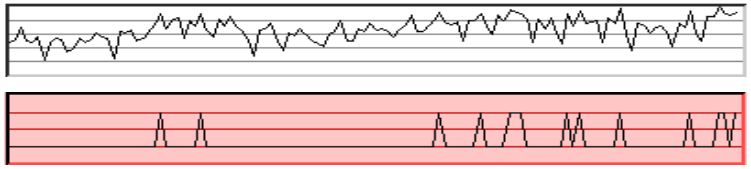




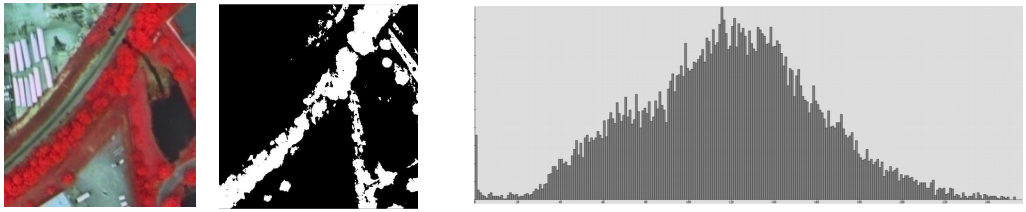
Web Coverage Processing Service (WCPS)

Raster Query Language: ad-hoc navigation, extraction, aggregation, analytics

- Time series



- Image processing



"From MODIS scenes M1, M2, M3: difference between red & nir, as TIFF"

- …but only those where nir exceeds 127 somewhere

```
for $c in ( M1, M2, M3 )
where
    some( $c.nir > 127 )
return
    encode(
        $c.red - $c.nir,
        "image/tiff"
    )
```

→ $(tiff_A, tiff_C)$

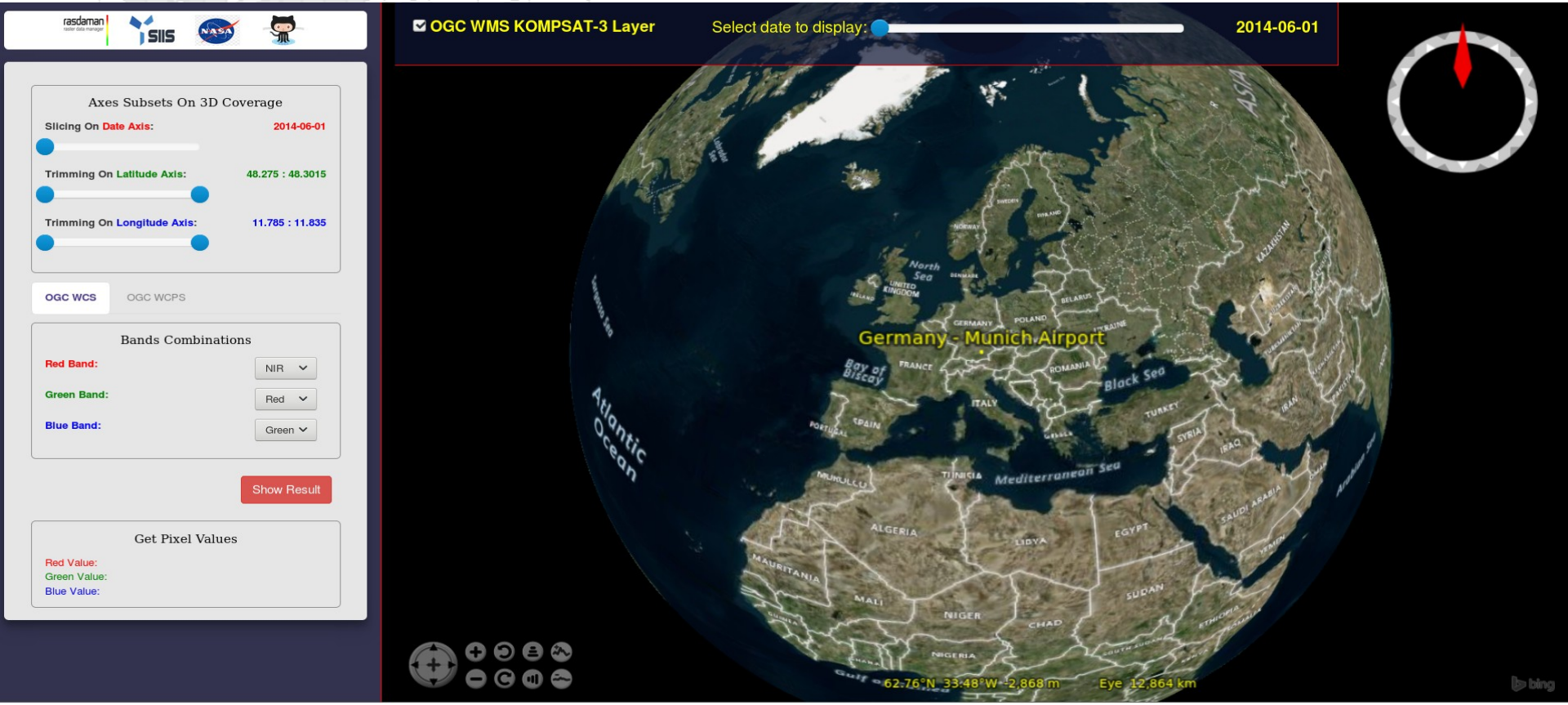
Work Flow

The working demo is built in these work flow:

- **Input:** 10 KOMPSAT-3 scenes nearby Munich Aiport from 2014 - 2018 are imported to Rasdaman by Rasdaman's **wcst_import** tool (OGC WCS-T standard).
  The result is 3D datacube with 3 axes: time, lat and long in Rasdaman.
- **Image analysis**: From 4 bands (Red, Green, Blue and Near Infrared) of KOMPSAT-3, creates **WCPS** queries which can show some meaningful results about land use and agriculture situation.
- **Create WebGIS client**: Make a web demo with showcases based on OGC WMS, WCS and WCPS standards which allow users to interact with 3D datacube KOMPSAT-3 over a selected region.

Result

- **The** demo is made **in 1 working week** with the **top** (**OGC WMS** with pyramid and **time** slider) and **left** (**OGC WCS** and **WCPS**) menus for interacting with the imported **foss4g** 3D datacube.



Result

- With Rasdaman, one can create complex queries from bands combinations to time-series processing to show the changes in land uses, crops and more. For example, below is the **false color** composite to **monitor crop health**.

rasdaman raster data management

JACOBS UNIVERSITY

THANKS!

Visit application demo:

http://185.178.87.50:8082/rasdaman

The **recorded demo** can be viewed on Youtube

https://youtu.be/Bw6dgwoM1aA

The **code repository** can be viewed on Github

https://github.com/bangph/foss4g-2019