

Scalable Spatio-Temporal Analysis through Open Standards: The European Datacube Engine

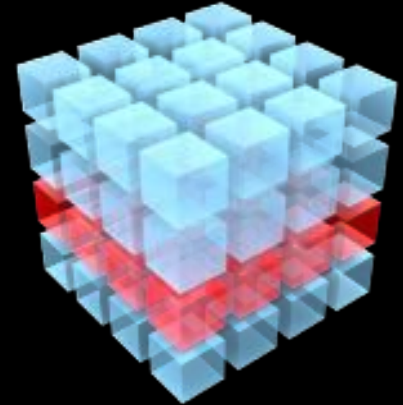
ESA Phi Week, Frascati, 2018-nov-16

Peter Baumann & the rasdaman team

Jacobs University | rasdaman GmbH

rasdaman: Big Datacube Analytics

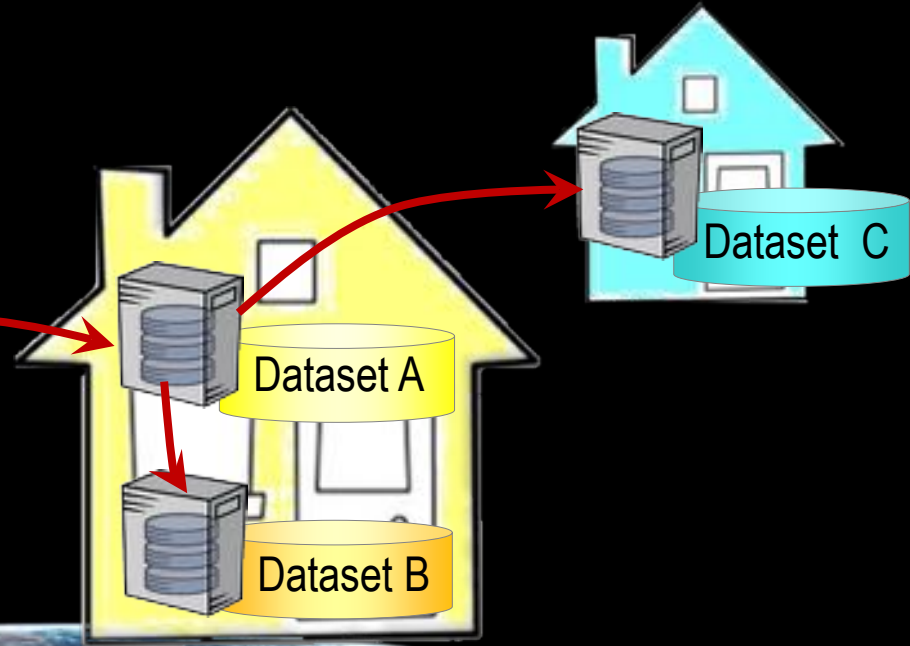
- = „raster data manager“: SQL + n-D datacubes
 - massively scalable Big Datacube Analytics engine
 - 2.5+ PB; 1000x parallelization
- „leading technology“ (ESA 2017)
 - Invented datacubes [Baumann 1992]
 - Research Data Alliance datacube report 2018:
 - 19 datacube tools inspected
 - „rasdaman can be 300x faster than other tools“
 - dx.doi.org/10.15497/RDA00024



Federated Processing with rasdaman

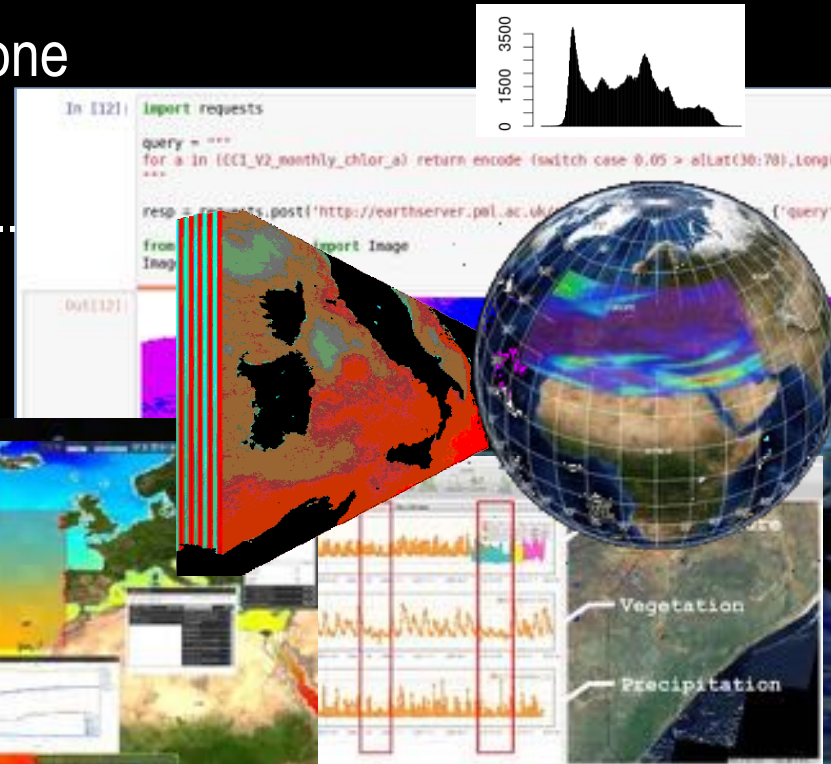
```
select
  max( (A.nir - A.red) / (A.nir + A.red) )
+ avg(B.green)
+ max( (C.red + C.green + C.blue) / 3 )
from A, B, C
```

1 query → 1,000+ cloud nodes
[ACM SIGMOD DanaC 2014]
[VLDB BOSS 2016]

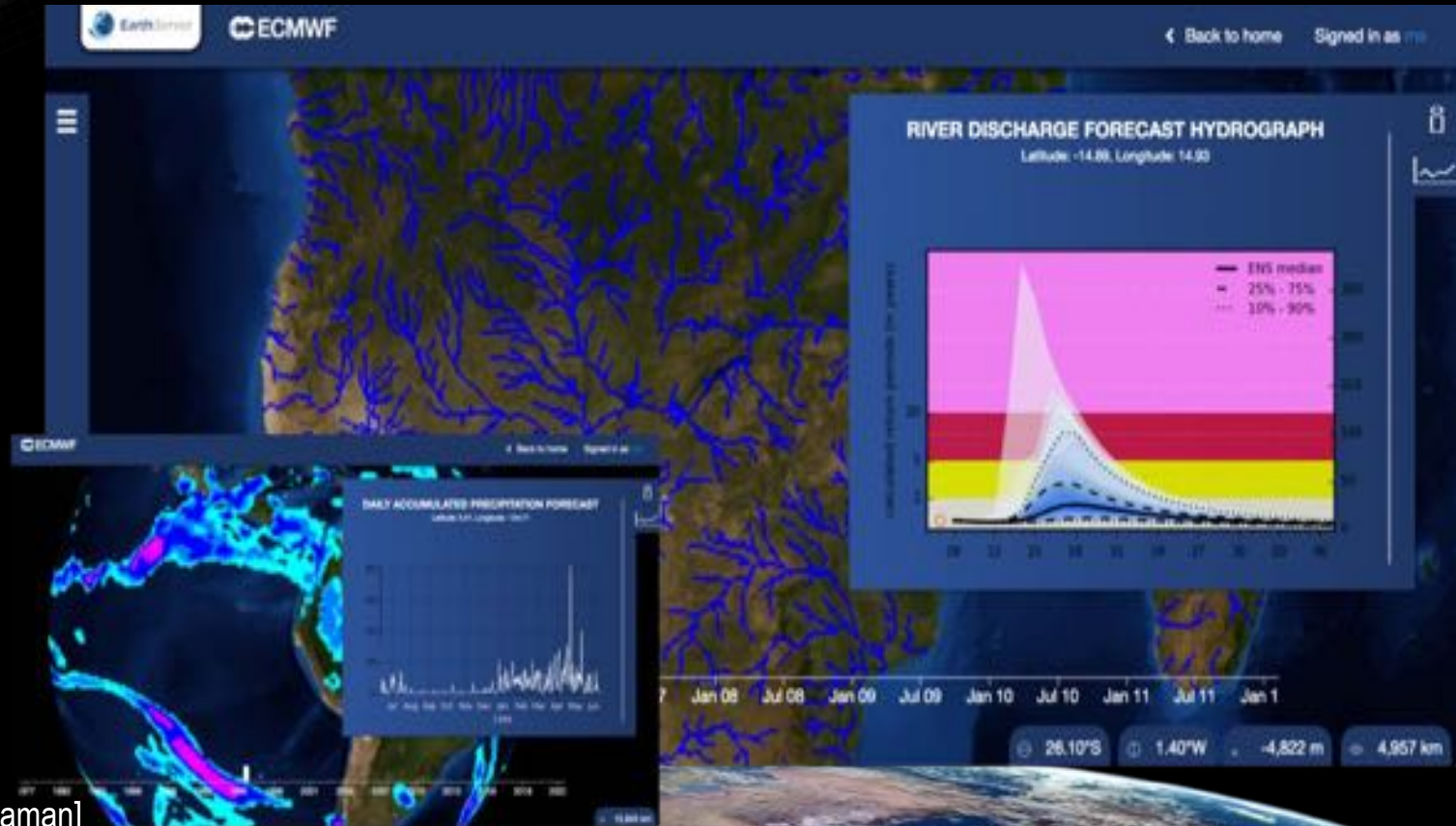


...But That's Not What You Want to See

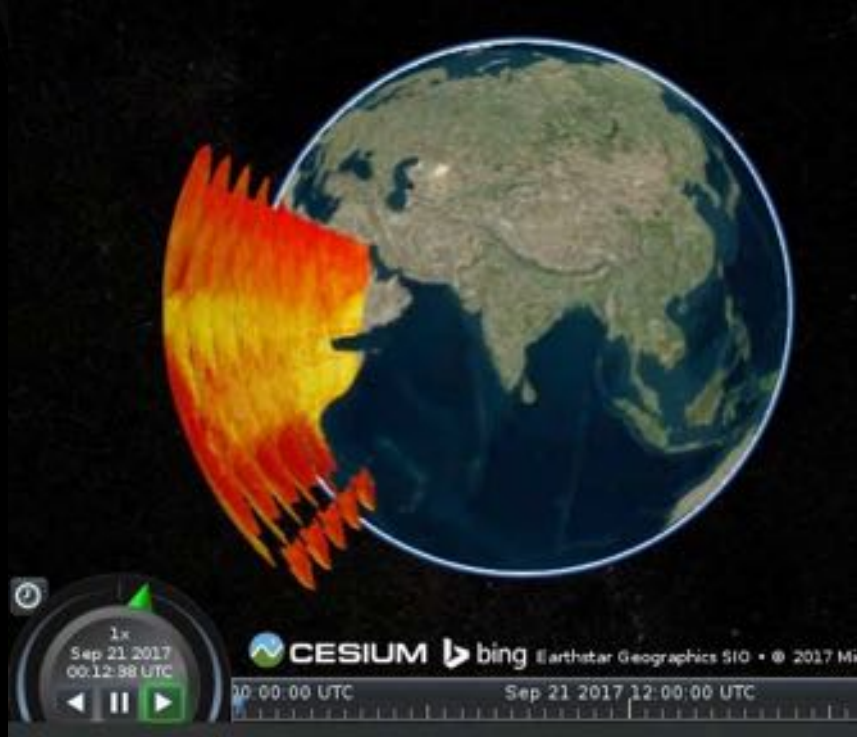
- Open standards → users in comfort zone
 - Map navigation: OpenLayers, Leaflet, ...
 - Virtual globe: NASA WorldWind, Cesium, ...
 - Web GIS: QGIS, ArcGIS, ...
 - Analysis: GDAL, R, python, ...



ECMWF River Discharge Timeseries



Datacubes on Virtual Globes



[running rasdaman]

NCI Australia: Landsat8 Datacubes

WCS service endpoint: <http://rasdaman.nci.org.au/rasdaman/ows> [Get Capabilities](#)

Available coverages ➤

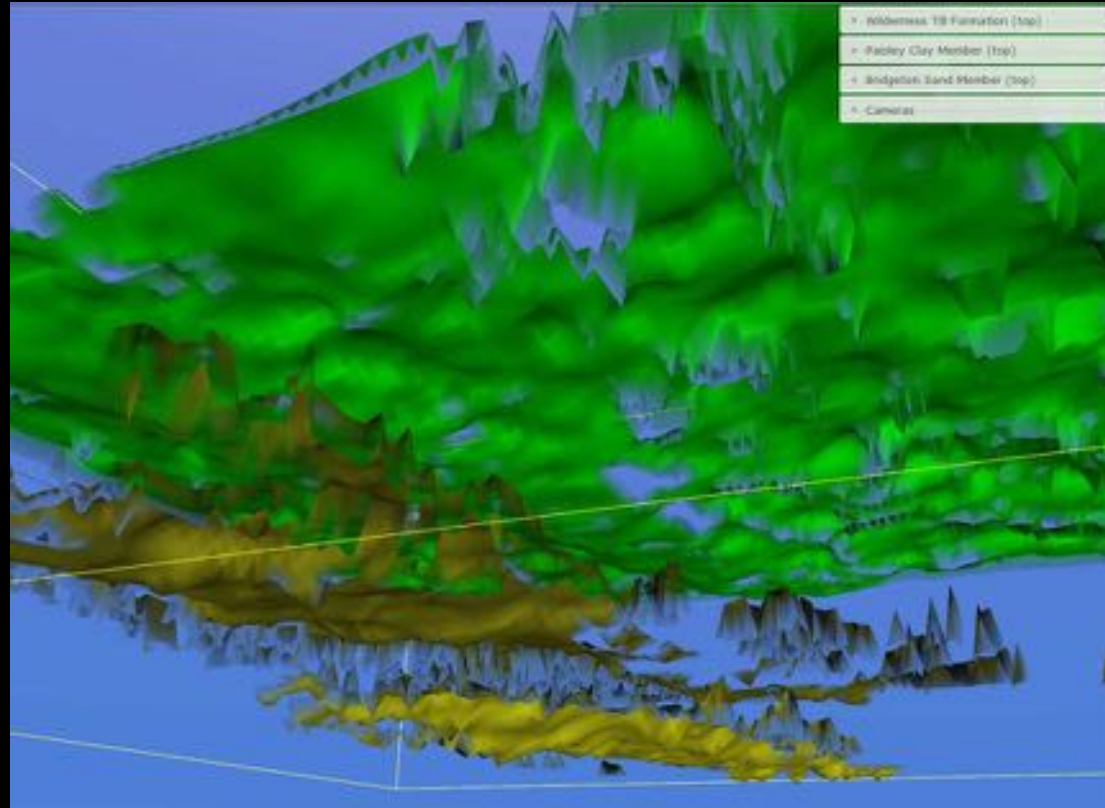
Footprint of geo-referenced coverages ⌵

Coverage Id: CS8_DU_NBART_9E_29S
Coverage Id: LS7_ETM_NBART_9E_29S
Coverage Extent: lat_min=-25.07359, lon_min=141.14454, lat_max=-25.51725, lon_max=142.07660

25.57°S 141.53°E 151 m Eye 10,000 km

[data: NASA;
service: NCI;
running rasdaman]

BGS: Geophysical Datacubes



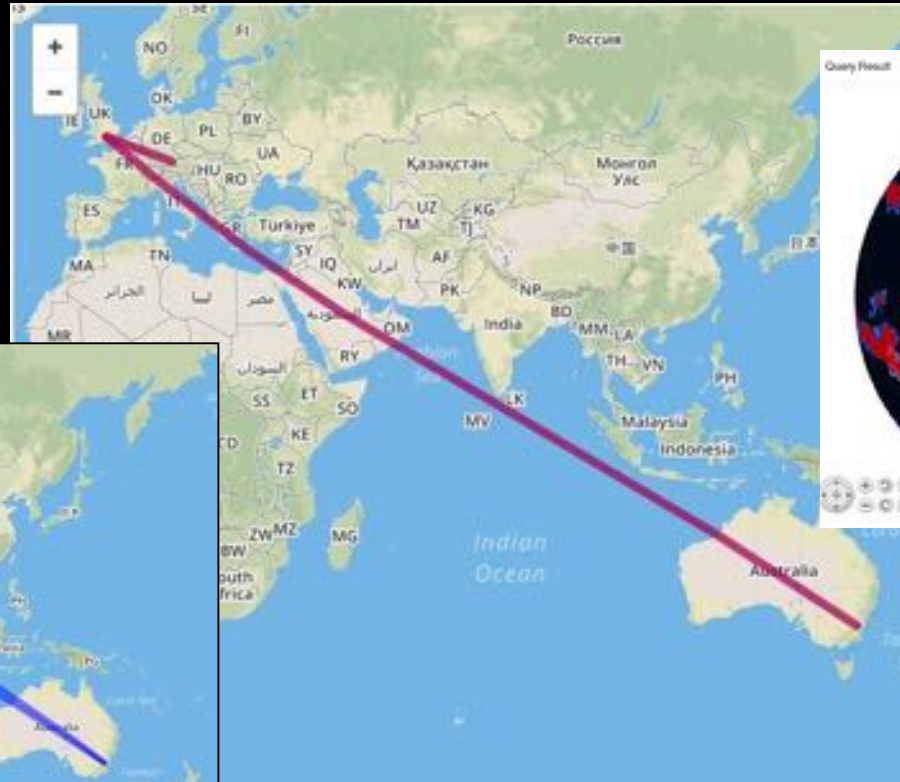
[data & service: BGS;
running rasdaman]

PlanetServer.eu

The screenshot displays the PlanetServer.eu web interface. On the left, a dark blue sidebar contains a 'PROJECTIONS' dropdown set to '3D'. Below it, the 'AVAILABLE BASE MAPS' section shows 'SOCA Colors' selected. The 'SEARCH LOCATION' section includes input fields for 'Region', 'Product ID', 'Latitude', and 'Longitude', each with a search icon. A 'RDS CONNECTION' section features buttons for 'Download Coverage', 'Coverage Search', and 'RDS Custom Queries'. At the bottom of the sidebar are three rows of 'Add New' buttons with 'Change' links. The main area shows a large globe with a colorful, semi-transparent overlay. An inset window shows a zoomed-in satellite image of a square area with a blue border. To the right of the inset is a line graph titled 'Additional data retrieved from product' with a red line and a blue line. At the bottom right, another inset shows a satellite image with yellow and red annotations and a legend.

[data: NASA; service: JacobsU;
running rasdaman]

Intercontinental Federation with rasdaman



[running rasdaman]

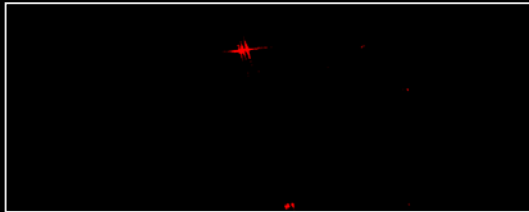
BigDataCube: Public/Private Datacube Partnership

- Datacube **Federation** of
 - public CODE-DE
 - commercial cloudeo AG services
- Security + billing
 - configurable down to pixel level

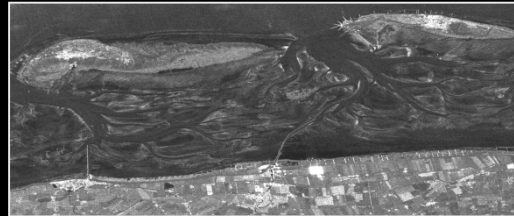


rasdaman @ CODE-DE

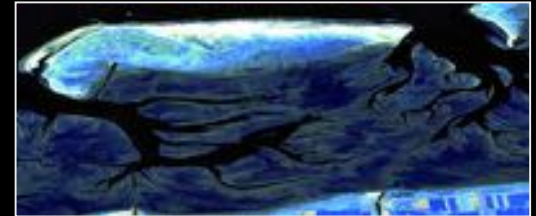
- Complement batch-oriented CODE-DE Hadoop interface with interactive spatio-temporal viewing, fusion, and analytics services on Sentinel EO imagery
 - Using European Datacube engine, rasdaman
- Examples:



ship detection



time-avg'ed S1A timeseries



S2 atmospheric penetration



Summary

- Datacubes = next-gen spatio-temporal services
 - Analytics & visualization, flexibility, user-friendliness
- rasdaman team pioneered Datacubes, Array Databases
 - Now becoming mainstream, increasing number of epigons
 - Still new insights every other day
- SMEs pick rasdaman for ease-of-use, flexibility, ...and speed
 - EOfarm, CropMaps, SBI, ...
- **Exciting perspectives – let's team up & put all our expertise together!**
- *Visit our booth for live demos!*

