



# Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY  
WASHINGTON DC, MARCH 20-24, 2017



**Walking Spatio-Temporal Datacubes - Seamlessly from Laptop to Cloud to Federations  
- Innovation Fair Contribution -**

**Peter Baumann**

Jacobs University, Germany | rasdaman GmbH  
baumann@rasdaman.com

**Paper prepared for presentation at the  
“2017 WORLD BANK CONFERENCE ON LAND AND POVERTY”  
The World Bank - Washington DC, March 20-24, 2017**



# Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY  
WASHINGTON DC, MARCH 20-24, 2017



*Copyright 2017 by author(s). All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

## **Abstract**

rasdaman (“raster data manager”) enables agile analytics on massive spatio-temporal datacubes, including sensor, imagery, image timeseries, simulation, and statistics data. For land & poverty tasks rasdaman provides simple, integrated access and mix&match of satellite, weather, and further data dynamically. Working equally well in networked and standalone (e.g., rural) settings rasdaman supports intelligent farming, land use and environmental monitoring, disaster management, etc.

Flexibility, performance, scalability, and open standards set multi-award winning rasdaman apart, together with its adaptive mass data ingest. A plethora of open clients attaches itself to rasdaman, including OpenLayers, QGIS, NASA WorldWind, python, etc. Innovative enablers such as adaptive distributed storage, cloud parallelization/distribution, and use of heterogeneous hardware make rasdaman excel over, e.g., Spark in independent benchmarks. Laptops, clouds, and datacenters federate easily through their rasdaman installations offering a common single information space to users.

Open-source rasdaman is Reference Implementation for OGC & INSPIRE WCS and the blueprint for ISO Array SQL and OGC WCPS. Installed at leading data centers, such as NASA/US, ECMWF/Europe, and NCI/Australia, datacubes are exceeding 250 TB, growing towards PB. Hitechs utilize rasdaman for value-adding geo services.

Demos will include realtime federation, TB datacube queries, and on-the-fly addition of new datasets.

## **Key Words:**

**rasdaman, datacube, array database, Big Data**



**BIG EARTH DATACUBES WITH RASDAMAN**

rasdaman (“raster data manager”) enables agile analytics on massive spatio-temporal datacubes, including sensor, imagery, image timeseries, simulation, and statistics data. For land & poverty tasks rasdaman provides simple, integrated access and mix & match of satellite, weather, and further data dynamically. Working equally well in networked and standalone (e.g., rural) settings rasdaman supports intelligent farming, land use and environmental monitoring, disaster management, etc.

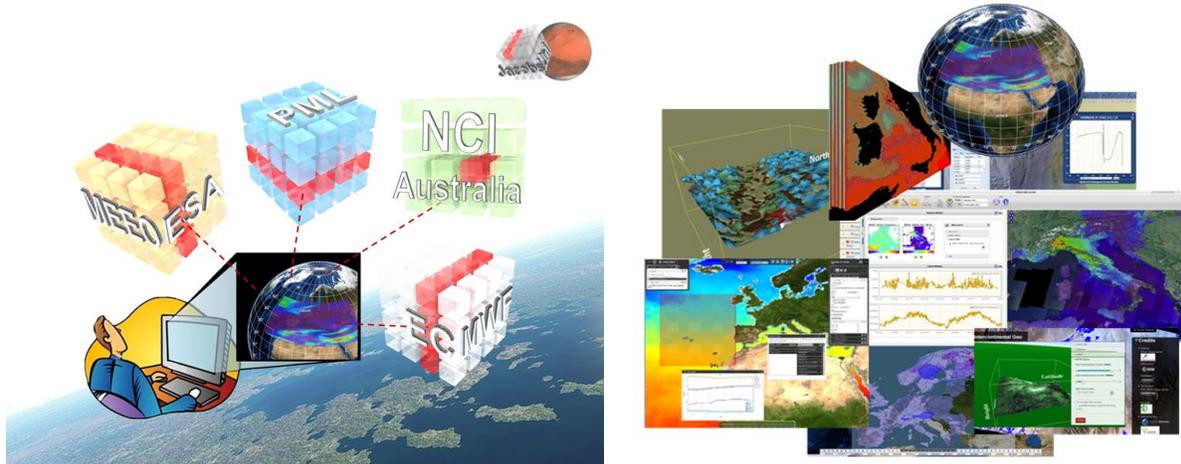


Fig. 1: Intercontinental datacube mix and match in the EarthServer initiative (left; source: EarthServer) and collection of rasdaman-based datacube portals (left; source: Jacobs University)

Flexibility, performance, scalability, and open standards set multi-award winning rasdaman apart, together with its adaptive mass data ingest. A plethora of open clients attaches itself to rasdaman, including OpenLayers, QGIS, NASA WorldWind, python, etc. Innovative enablers such as adaptive distributed storage, cloud parallelization/distribution, and use of heterogeneous hardware make rasdaman excel over, e.g., Spark in independent benchmarks. Laptops, clouds, and datacenters federate easily through their rasdaman installations offering a common single information space to users.

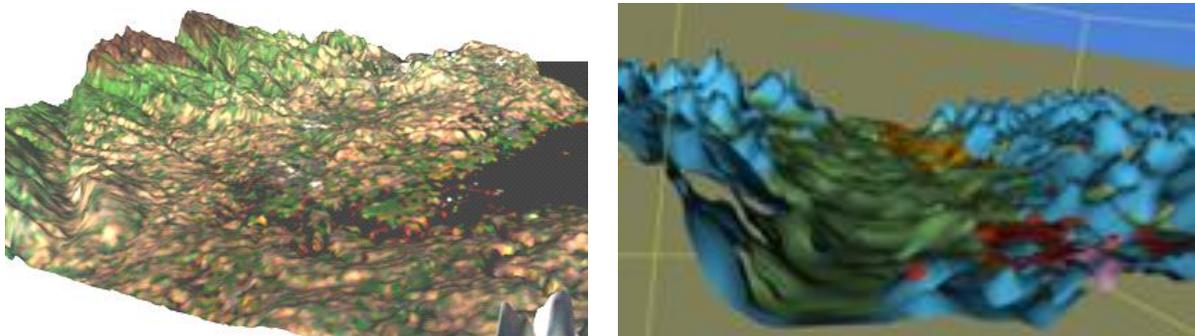


Fig. 2: 3-D rendering of geological query results (data: BGS, database: rasdaman)



# Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY  
WASHINGTON DC, MARCH 20-24, 2017



Open-source rasdaman is Reference Implementation for OGC & INSPIRE WCS and the blueprint for ISO Array SQL and OGC WCPS. Installed at leading data centers, such as NASA/US, ECMWF/Europe, and NCI/Australia, datacubes are exceeding 250 TB, growing towards PB. Hitechs utilize rasdaman for value-adding geo services.

Demos will include realtime federation, TB datacube queries, and on-the-fly addition of new datasets.

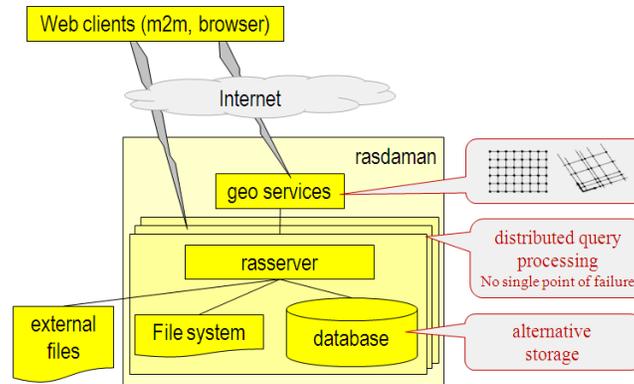


Fig. 5: rasdaman overall architecture (source: rasdaman)

## CV

Peter Baumann is Professor at Jacobs University [1], hitech founder, and CEO. With his research on flexible, scalable multi-dimensional Big Datacubes he has coined the research field of Array Databases [2] and is Principal Architect of the worldwide first complete and operational Array DBMS, rasdaman [3].

Peter Baumann has authored and co-authored 130+ book chapters and papers on raster databases and related fields, and holds international patents on array databases. He is regularly invited to program committees of Big Data related conferences, and is on the board of several journals.

In RDA he is co-chairing the Big Data, Geospatial, and Array Database groups; in OGC he is co-chairing the Big Data, Coverages, and WCS group. Based on his 20 years of experience he is actively shaping Big Data standards, such as the OGC Big Geo Data suite, WCS, suite and ISO Array SQL. In recognition of his entrepreneurial work in the field he has received a series of national and international innovation awards, such as the renowned OGC Kenneth Gardels Award.

More information is available on [4].

[1] <https://www.jacobs-university.de/isis>

[2] [http://en.wikipedia.org/wiki/Array\\_DBMS](http://en.wikipedia.org/wiki/Array_DBMS)

[3] <http://www.rasdaman.org>

[4] <http://www.peter-baumann.org>