How to Motivate Scientists to Get Involved in Destination Earth?

Wolfgang Wagner

Department of Geodesy and Geoinformation
Technische Universität Wien

Earth Observation Data Centre for Water Resources Monitoring

Destination Earth

- Develop a digital model of the Earth to monitor and simulate natural and human activity

http://www.esa.int/ESA_Multimedia/Images/2020/09/Register_for_ESA_s_Ph-Week_event

European Commission

ECMWF

esa

EUMETSAT

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Bringing the Expertise together

- Involvement of a wide scientific community essential to cover all expertise necessary to create high-precision digital twins

> "**At the heart of DestinE will be a federated cloud-based modelling and simulation platform**. This platform will provide access to data, advanced computing infrastructure including HPC, software, AI applications and analytics. It will integrate digital twins — digital replicas of various aspects of the Earth's system …. The platform will enable application development and the integration of users' own data." https://digital-strategy.ec.europa.eu/en/policies/destination-earth

- How to ensure that scientists embrace this concept?
  - There must be reasons that go beyond the incentive stemming from the involvement in DestineE projects
- Learning from the experiences with the
  - ESA Thematic Exploitation Platforms (TEPs)
  - Copernicus Data and Information Access Services (DIAS) platforms

H SAF Soil Moisture Services: First Steps onto the EUMETSAT Cloud

- Within the H SAF, EUMETSAT, ZAMG, ECMWF and TU Wien provide several soil moisture data products derived from METOP ASCAT data
  - All four organisations use their own hardware ⇒ distributed data processing system

EUMETSAT H SAF
SUPPORT TO OPERATIONAL HYDROLOGY AND WATER MANAGEMENT

- It would make sense to keep the ASCAT data at one place
  - Avoid sending data back and forth
  - Co-working on one platform

} **EUMETSAT Cloud**

- Why moving onto the EUMETSAT Cloud is not frightening us (TU Wien)
  - More than being an agency, EUMETSAT has acted as a trusted partner since many years
  - No fears that know-how of TU Wien is handed over to another organisation without our consent
  - EUMETSAT has the mission & expertise to work towards the same goals
  - Even in case that the EUMETSAT Cloud programme would be stopped, we are confident that our work (data and software) can be saved without unduly costs

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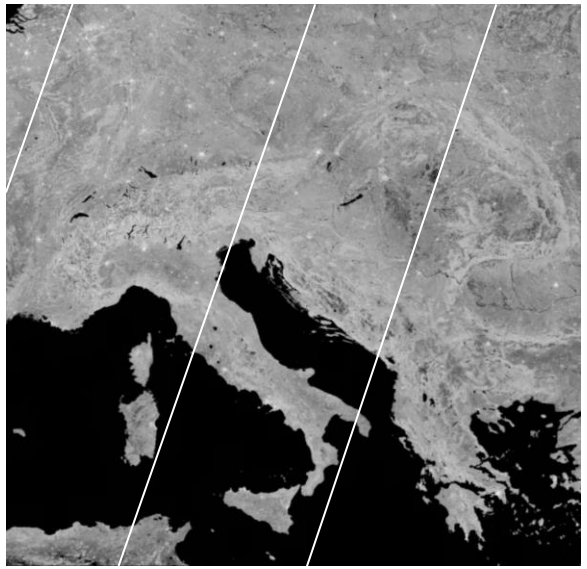
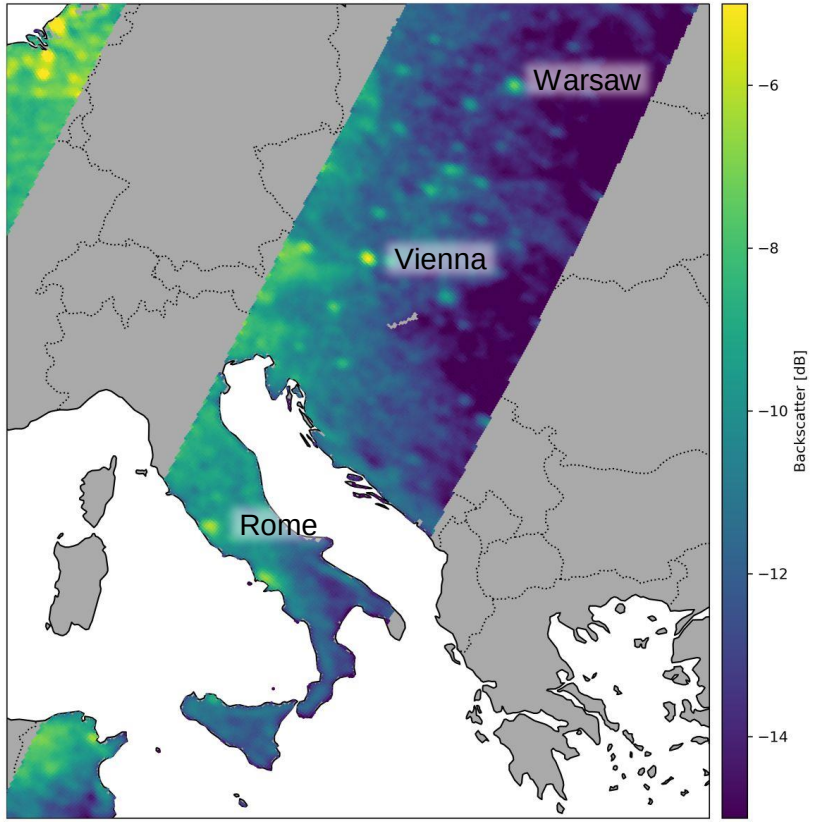
First Tests at EUMETSAT Cloud by TU Wien

- Processing of full-resolution ASCAT data to produce a new 6.25 km gridded backscatter data product

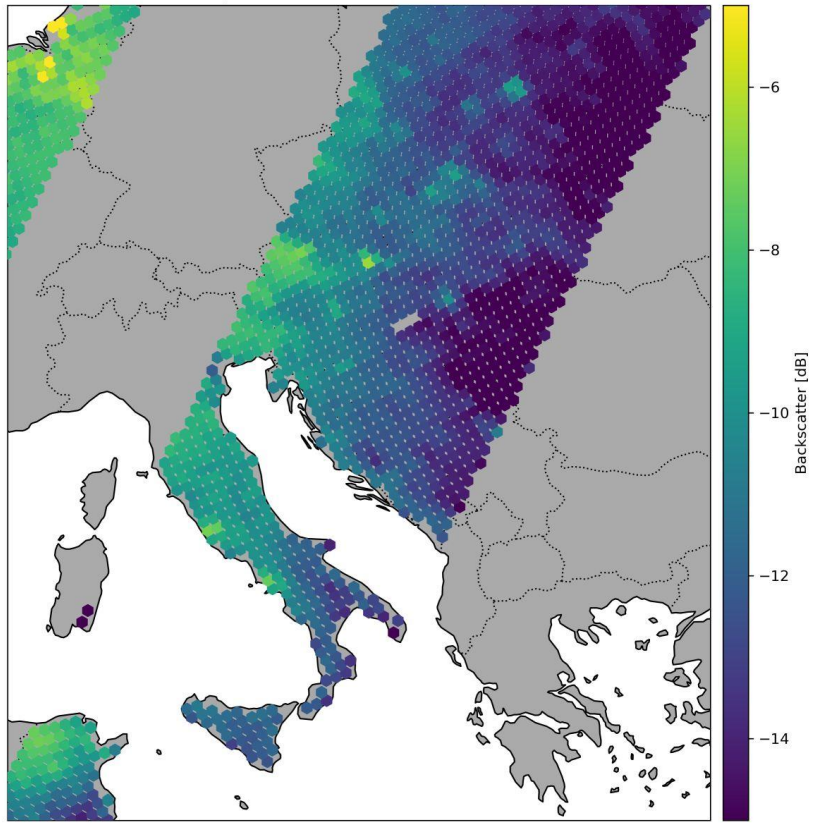
Sentinel-1 Mean Backscatter



METOP-A ASCAT Fore Beam @ 6.25km Grid



METOP-A ASCAT Fore Beam @ 25km Grid



ASCAT Images by Sebastian Hahn

Worldwide Sentinel-1 Data Processing @ EODC

- Instead of taking the easy way on the Google Earth Engine, TU Wien has taken the more difficult route to co-found the EODC to realise a public-private collaboration
  - Create a governance structure where partners and users can have a voice in the decision making
  - Reach a critical size to be able to make
    - own choices on how data are processed and analysed (e.g. choice of grid, pre-processing, data cube system, etc.)
    - visible contributions to European programmes
    - operational data streams compliant with European laws and regulations

- Copernicus Services
  - Land Monitoring Services: soil moisture
  - Emergency Management Service: flood monitoring

Land Monitoring

Emergency Management

opernicus
The European Earth Observation Programme

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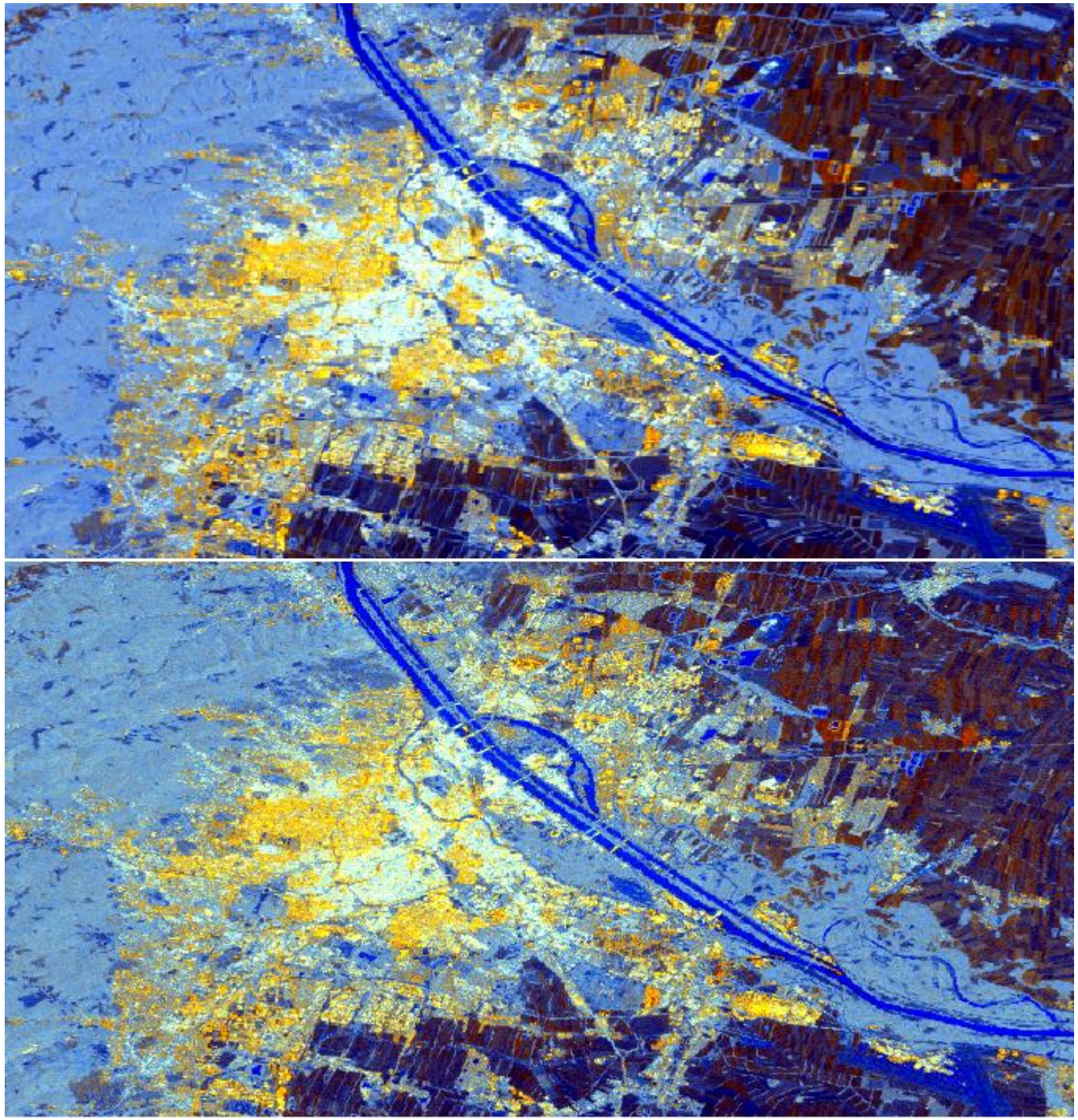

Sentinel-1 Data Analysis at GEE and EODC

- Sentinel-1 polarisation composite (R=Mean of VV, G=Mean of VH and B=VH/VV) showing Vienna in March 2017, created at the Google Earth Engine (top) and EODC back-end (bottom) using openEO

openEO

open API to connect R, Python, JavaScript and other clients to big Earth observation cloud back-ends

Wagner et al. (2021) A Sentinel-1 data cube for global land monitoring applications, Proceedings BiDS'21 Conference, 49-52.

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Final Thoughts

- Making one's own scientific work dependent on an external organisation is risky
  - "Will I and my team be able to access the data and compute resources needed not just now, but also after the end of this project?"
  - "Can I also count on continuity as regards the strategy, governance, costs etc.?
  - "Can I trust that nobody takes advantage of our work without our explicit consent?"
  - "Is working on the external platform at least as efficient as on one's own infrastructure?"

- Potential benefits (for scientists) that may outweigh the risks and extra work needed to make the transition
  - Do things that would not be possible on one's own infrastructure
  - Be part of a larger scientific community
  - Achieve more scientific impact
  - Improve changes for continued funding

Acknowledgements

ESA: Gamma2Cloud ⁄ Copernicus: Global Land Service & Emergency Management Service ⁄ H2020: openEO, C-SCALE ⁄ EUMETSAT: H SAF ⁄ BMBFW: GEOCLIM