

Copernicus Hubs and Institutions - 651031

PLUS Salzburg

SS 24

Excursion report

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The following report summarizes the Vienna excursion of course 651031 - Copernicus Hubs and Institutions that took place at the 21st May 2024. First, the excursion is put into the overall context of the course; followed by the individual reports for each of the two hosting institutions Earth Observation Data Center (EOCD) and the Federal Office of Metrology and Surveying (German: Bundesamt für Eich- und Vermessungswesen - BEV). Lastly, a conclusion of the excursion and the learning outcomes is drawn.

Course 651031: Copernicus Hubs and Institutions

The course Copernicus Hubs and Institutions aims at providing a better understanding of the EU space program, bringing students in contact with initiatives and institutions and discussing the implementation of Copernicus data with key players in Europe. To achieve these course objectives, it was planned to focus on EU space institutions, the EU space program, actors in the Copernicus domain, the launch of Copernicus Hubs in 2023 and the responsibility in and for the Copernicus domain. The following four learning outcomes have been stated:

1. Location of key institutions in the EO/Copernicus domain within Europe,
2. Remembering of key actors (individuals) and their contribution to the success of Copernicus,
3. Understanding the meaning of entrusted entities and other institutions in the uptake and mainstreaming of Copernicus,
4. Relating various Copernicus components (upstream, downstream, etc.) with relevant institutional settings.

Two lectures introduced the EODC and BEV, as well as selected topics that relate to the two institutions (e.g. open and big earth data, the European INSPIRE initiative) before the excursion took place. So, the core of the course is the excursion itself where the Copernicus program and the implications of big earth data could be linked to real world institutions. In this context, the EODC stands as an example for the paradigm shift in how to handle high volumes and velocities of satellite data fitted to specific user needs. The BEV can be seen as an additional contributor to in-situ data that is needed as trustworthy ground-truth data for machine learning and knowledge-based methods for the retrieval of information from earth observation data.

Excursion day - schedule and agenda

The excursion took place at the 21st May 2024, in Vienna. After individual journeys to Vienna, the excursion participants met at 09:45 in front of the EODC office which is located in the vicinity of Vienna's main station, in a shared complex with the Vienna University of Technology and several other companies. The excursion at the EODC took around 2 hours; ending with lunch at the universities canteen in the same building until 13:00. After that, the class arrived at the BEV by public transport. It is located close to the Augartenbrücke and the Danube Canal north of the city center. The presentation at the BEV took again 2 hours from 14:00 until 16:00; leading to the end of the excursion in Vienna.

Earth Observation Data Center

The EODC is a public-private company that emerged out of two feasibility studies that investigated the foundation of a data center for earth observation data and water resource monitoring. It was founded in 2014 by the Vienna University of Technology, Austria's Central Institution of Meteorology and Geodynamics and two private companies in the EO*GI domain as main founding partners. The mission of the EODC - in collaboration with its science, public and private partners - is to promote the use of earth observation data for the monitoring of global water resources.

To achieve this mission multiple technical and thematic goals of the EODC are defined. These include the creating of flooding and soilmoisture maps/products or establishing a distributing data center for earth observation data. Moreover, the EODC provides shared cloud IT infrastructure for its members.

Impressions of the stay

We were welcomed by the EODCs CEO Christian Briese, Benjamin Schuhmacher and an intern from Vienna University of Technology. All three hosted us during our stay at EODC. At the beginning, Benjamin Schumacher prepared a short questionnaire for the participants to get to know our knowledge in earth observation data and related storage formats. After that, all participants and hosts introduced themselves shortly to the group. The substantive visit started with an overview on the EODC and its history from Christian Briese; with a strong focus why a collaborative data center between private, public and science partners is important. In addition he provided general information and basic figures on the operation of a data center for EO data (e.g. number of employees, annual energy consumption and annual costs). After that the group was split; one part stayed with Benjamin Schuhmacher and the intern in the conference room, the other part was taken by the CEO to the data storages and the high performance computing clusters, the Vienna Scientific cluster (VSC), in the lower levels of the building.

In the conference room Benjamin Schumacher sent commands to the tape drive robot of the 'cold' data storage (in order for the the second group to see the robot working). After that he presented in detail how the near real time data processing of the EODC and the main thematic products the EODC derives from Sentinel 1 and 2, and additional meteorological data.

Being in the various rooms of the EODC, at the first floor, we could observe the tape drive robot in the cold tape drive storage (which holds the whole Sentinel 2 archive) grabbing and reading tape drives to make archived data available to the EODC users. In the basement of the building we saw two super computers VSC-4 and VSC-5 of the Vienna Scientific Cluster. Next to the VSC we were shown the server racks of the hot storage and the the cloud computing resources.

What I learned - What I'll remember

- A 'local' collaborative data center does not only store data. Because it's direct connection to the VSC it can serve as producer of global thematic maps that are delivered to Copernicus Services. In addition such a data center can be more dynamic in what data is stored and it can play a key role for testing new algorithms that shall be deployed on global scales.

The collaborative thought really comes into play at investments. The scaling factor of hardware procurements make it necessary to collaborate to reduce the intial and consecutive energy costs.

- The rooms of the hot and cold storage types feel very different. But unfortunately, the question if the name for the storage types only comes from the difference in temperature or from the availability status of the data, is - at least for me - still unanswered.
- Different to my imagination, a tape drive archive can be small in its physical dimensions. It was astonishing to see that the whole Sentinel 2 archive can be stored in a box of approximately four cubic meters.
- As expected, a data center consumes high quantities of energy. The total costs two maintain a data center are very high (from memory/notes: around 700-800K euro per year). But the staff is relatively small (from memory/notes: the EODC has around 24 staff members).
- When storing big earth data - data with high velocity and volume - projections matter. The EODC has to transform the incoming data from ESA's Data Hub to reduce the overlapping of UTM tiles in order to reduce the needed storage size.
- The logging of data access is not possible. Cloud user access data comparable as 'from a local drive'. Which means that the selection of what data is put into the cold storage is not automated. A subjective selction from the EODC staff is performed.

Federal Office of Metrology and Surveying - BEV

The BEV is a federal office, so mandated by austrian law, that is in charge of Austria's surveying, geoinformation and metrology. Besides the headquarter in Vienna there are 57 regional offices spread around Austria. The two relevant departments for EO*GI data are the Surveying and Cadastre Services. Their products form the spatial base for building the Austrian geodata infrastructure. The BEV offers multiple WMS servies and direct download of geodata from their platforms; basic visualization platforms for geodata. In addition the BEV is commissioned with the implementation of the European INSIRE initiative.

Impressions of the stay

We arrived at the BEV some minutes before 2 p.m. Since we visited the headquarter of a federal office our first contact was the receptionist at the ground floor. Different to the EODC we took the elevator to the 8th floor where the big conference rooms of seem to be located. There we got welcomed by our host the CIO of the BEV Markus Jobst. After a short time for coffee preparations his presentation on the BEV and began. First Markus Jobst introduced the BEV and its main mission. The presentation then focus mainly on the EO*GI relevant services the BEV has to offer. A strong focus was given on the trustworthiness of the data which, in the context of Machine Learning for Earth Observation data could be used as ground truth data. In addition, he showed the cadastre and geodata platforms of the BEV and data fusion dataset of buildings in Austria that incorporates dimensionality information with heights and information and ownership. During the presentation the head of the Surveying Service joined the presentation who helped to answer related to the products of the Surveying Service. Unfortunately, the participants were already tired after lunch, so questions were rare and no greater discussion emerged from the presentation.

What I learned - What I'll remember

- Federal surveying offices still play a crucial role for high quality topography data sets.
- The BEV is not only in charge of the cadastre and topographic surveying, it also creates datasets that share enhanced information from multiple of their sources.
- The office's EO*GI related IT is significantly understaffed. There will therefore be more vacancies to fill in the future.
- The timeliness of the LiDAR data depends on the regions of Austria. If I want to work with DSM data from the BEV I have to check again if the annual DSM is based solely on ortho images.
- Since there is minimum requirement for point cloud density, the costs of LiDAR surveying is higher in high altitudes and mountainous regions. The budget to spend for it depends on the regions in Austria.

Conclusion

The excursion was planned as the central event of the course. Both hosting institutions made a significant contribution to my knowledge on storage of EO data, surveying based geodata products and in general institutions within the EO*GI sector and the Copernicus domain. The excursion and the course addressed the stated learning outcomes, but with a focus on austrian institutions. In my opinion these are especially learning outcomes 3 and 4. The excursion allowed the participants to be introduced to entrusted institutions in downstream sector of Copernicus (EODC) and geodata contributors (BEV) within the domain of remote sensing and earth observation. Unfortunately, the excursion could not contribute much to the learning outcomes 1 and 2 (as I understood them at the beginning of the course). Nevertheless, the excursion in Vienna was a special opportunity for me to get to know the ground segments in the EO complex for the first time.