Field Trip Report - Copernicus Hubs and Institutions

Arunima Sen (s1109433)

June 10, 2025

Contents

1 Introduction

This report reflects on the field trip to two key institutions in Vienna, Austria as part of the *Copernicus Hubs and Institutions* seminar. We visited the Earth Observation Data Centre (EODC) and the Environment Agency Austria, both of which play an important role in the European Earth Observation landscape. The following sections describe what I learned during the visit and how it connected to the broader frameworks of the EU INSPIRE Directive and the Copernicus Data Space Ecosystem!

2 Earth Observation Data Centre (EODC)

We first visited the Earth Observation Data Centre (EODC) in Vienna, located at Technische Universität Wien (TU Wien). We began with a presentation by Christian Briese, the Managing Director of EODC, who introduced the center's mission and technical setup. EODC provides IT infrastructure for storing, processing, and analyzing Earth Observation data, working across different sectors.

EODC plays an important role in supporting several Copernicus operational services, including the Copernicus Global Land Service (via Copernicus Global Land Operations, i.e. C-GLOPS), the Climate Change Service (Lot 4, focusing on land hydrology and cryosphere), and the Global Flood Monitoring service under the Copernicus Emergency Management stream. These services go far beyond passive data storage as they also generate analysis-ready products that enable decision-making in areas like flood forecasting, drought monitoring, and snow cover analysis. I found myself thinking about the kinds of questions I could explore in my own field, for example in my thesis, using these datasets. Could satellite-derived flood maps or soil moisture time series be integrated into coupled Earth system models to better capture land-atmosphere feedbacks?

We were then taken on a tour of the Vienna Scientific Cluster (VSC), including both VSC-4 and VSC-5, and visited the operational Vienna node of the Multi-Site Computer Austria (MUSICA) cluster, which is Austria's distributed high-performance computing system. MUSICA is distributed across Vienna, Innsbruck, and Linz to combine High-performance computing (HPC)

and cloud-based architectures for large-scale, data-intensive applications. I also found the discussion around energy efficiency challenges and cooling technologies for the supercomputers quite interesting - EODC uses innovative liquid-based cooling systems that absorb processor heat, and in some cases, this heat is fed back into district heating systems. At the Innsbruck site, for example, waste heat from MUSICA will be integrated into the city's heating network. It raised an important point about sustainability: as our reliance on computational power continues to grow, how do we ensure that the infrastructure itself doesn't become a hidden contributor to environmental strain?

The visit also led to some really engaging discussions among us; one topic that came up was the possibility of relocating supercomputing infrastructure to naturally cooler regions, like the Austrian Alps, to reduce the energy burden of cooling, especially given how hot Vienna can get in the summer. Antarctica was brought up as a thought experiment too. As someone who previously studied computational social sciences, beyond the technical feasibility, I also thought the geopolitical implications of where such critical infrastructure is located. Would moving data centers to remote or cross-border areas introduce new risks? What happens when energy, climate, and digital infrastructure intersect in politically sensitive contexts?

To sum up, the visit to EODC gave me a much clearer sense of what it takes to manage and operationalize EO data at scale. Seeing the physical infrastructure added a new dimension to my understanding of the data I usually engage with through computer screens. The visit helped me connect the dots between data infrastructure and real-world applications in a way that feels much more grounded.

3 Environment Agency Austria

The second part of our trip took us to the Environment Agency Austria (Umweltbundesamt) where we met with Gebhard Banko and Roland Grillmayer from the Remote Sensing Spatial Analysis team. They introduced us to a wide range of the agency's projects in remote sensing, environmental monitoring, and geospatial data infrastructure. It was a valuable opportunity to see how a national institution supports both Austrian and EU-wide

environmental goals using Earth Observation and spatial data technologies.

One of the main topics was land take and soil sealing. The agency is currently working on a 1 by 1 meter soil sealing product that integrates satellite imagery with administrative GIS data. This includes forest inventories, building registries, spatial planning zones, IACS data, and OpenStreetMap. The goal is to operationally track the development of settlement areas, transportation networks, leisure infrastructure, and renewable energy installations. This work showed how different data layers can be combined to provide a reliable picture of urban expansion and land use pressure. The agency is also responsible for Austria's contribution to the CORINE Land Cover 2024 update. Their team performs visual interpretation of Sentinel-2 and Landsat-8 and 9 imagery using established European guidelines. With CORINE's history reaching back to 1990, the dataset enables valuable land cover change analysis across decades. Understanding how the agency handles its part of this process gave a clear sense of the national expertise feeding into this long-term European initiative. Another focus of the presentation was ecological connectivity - the agency is working to assess whether landscape corridors are functionally usable by target animal species, not just whether they exist in a structural sense. This means determining how animals interact with the landscape and whether current land use allows for safe and continuous movement. They are using this information to make targeted suggestions for ecological restoration. It was a strong example of how spatial analysis supports applied conservation planning.

Beyond monitoring and ecological modeling, the agency plays an active role in building environmental data infrastructure. As part of the EU GreenData4All initiative, they contribute to open-source, standard-compliant systems that improve access to and reuse of environmental data. They are involved in shaping ISO geographic standards and in designing data spaces that help public institutions share geospatial information in more effective and interoperable ways. The presentation also explored how the agency is working with semantic web technologies and artificial intelligence. By using controlled vocabularies and developing semantic mappings between different classification systems, they help make environmental data more integrable and machine-readable. Their knowledge graph work feeds into digital twin applications that allow users to query spatial and time series data for planning and decision support. The agency's technical contributions in this space

help make complex data structures navigable and usable across different user groups.

Throughout the session, I appreciated how the agency combines geospatial science with real-world applications. The work they do is highly technical but grounded in public relevance; they bridge the gap between satellite data and environmental policy, research and implementation. It is the kind of institution I could imagine myself working at one day, where data infrastructure and environmental values come together in practice!

4 EU INSPIRE and Copernicus Data Space Ecosystem

During our seminar sessions with Martin Sudmanns and Manfred Mittlböck, we were introduced to the EU INSPIRE Directive and the Copernicus Data Space Ecosystem (CDSE). Visiting EODC and the Environment Agency Austria helped me understand how these systems are applied in practice. INSPIRE was set up to make spatial data across Europe easier to find, use and combine. By applying shared standards for metadata, classification and web services, it creates a common language that supports interoperability, something that's especially important for environmental monitoring across borders.

The CDSE builds on this foundation by offering open, immediate access to Copernicus Sentinel data and cloud-based processing tools. It was interesting to see how institutions like EODC and the agency rely on this ecosystem not just for accessing data but also for contributing to its services and infrastructure.

Seeing both the policy framework and its implementation helped me appreciate how large-scale data systems support real-world applications in earth observation

5 Conclusion

I'm grateful to the teams at both institutions for their time and for sharing their work with us. A sincere thank you to Christian Briese at the EODC and to Gebhard Banko and Roland Grillmayer at the Environment Agency Austria for their presentations and openness during discussions. I also want to thank our instructors Manfred Mittlböck, Martin Sudmanns, Karima Hadj-Rabah and Barbara Brunner-Maresch for making this seminar and excursion possible. The visit gave me not only a clearer picture of Europe's spatial data infrastructure but also a glimpse into the kind of work I could see myself doing in the future.

6 Gallery of Images

Quantum Austria

Tape room

Tape

Figure 1: Gallery of images from the field trip