

# Automating Distributed Cloud Infrastructures for AI-Driven Earth Observation Services

Thursday, 19 March 2026 14:30 (30 minutes)

The **European Centre for Medium-Range Weather Forecasts** (ECMWF) operates as both a world-leading provider of global numerical weather predictions and a major research organization advancing Earth system science.

Within its mission to deliver reliable data, forecasts, and insights for the benefit of society, ECMWF is actively involved in several **European initiatives** such as **EO4EU** [1], **MediTwin** [2], **CLIMRES** [3], and **BUILDSpace** [4]. These projects aim to create advanced services and applications that simplify access to **Earth Observation** (EO) data and leverage **AI/ML techniques** to deliver high-level analytics, decision-support tools, and user-oriented services across multiple domains.

To support these projects, we have developed a **fully automated, cloud-agnostic infrastructure** capable of managing multiple **Kubernetes clusters** deployed across **geographically distributed cloud environments**. This setup ensures that the deployment of services and applications is **secure, reproducible** and **scalable**. Automation tools such as **Git, Terraform, Ansible** and **Fleet** are integrated into a **GitOps-driven workflow**, enabling consistent cluster management and streamlined application delivery.

The infrastructure also supports **AI/ML-oriented workloads**, including the automated deployment of **Jupyter-Hub environments with GPU-enabled nodes** managed through the **NVIDIA GPU Operator**, allowing for efficient resource partitioning and dynamic scaling of GPU resources.

Building on this foundation, we are now exploring the integration of **Cluster API, Crossplane**, and **Sveltos** to enable **declarative cluster provisioning** and **dynamic add-on management**, with the goal of making the platform even more automated, adaptive, and interoperable through **GitOps-based workflows**.

The oral contribution will provide implementation details of this approach and discuss how these technologies are being leveraged to support AI-driven scientific workflows across distributed cloud infrastructures.

## References:

- [1] <https://www.eo4eu.eu/>
- [2] <https://meditwin-project.eu/>
- [3] <https://climres.eu/>
- [4] <https://buildspaceproject.eu/>

**Primary authors:** ANTONACCI, Marica (ECMWF); ALBUGHDADI, Mohanad (ECMWF); BAOUSIS, Vasileios (ECMWF); FORNARI, Federico (ECMWF); KAPROL, Tolga (ECMWF); PISA, Claudio

**Presenter:** ANTONACCI, Marica (ECMWF)

**Session Classification:** Infrastructural Clouds and Virtualisation - II

**Track Classification:** Track 8: Infrastructure Clouds and Virtualizations