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The Second Global Open Science Cloud (GOSC) workshop

Incoherent scatter radar data fusion and computation case study

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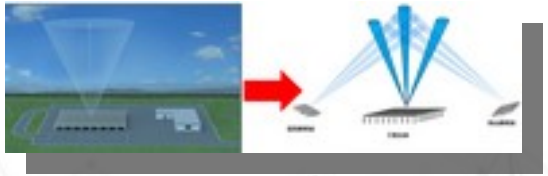
Team EGI/CAS/CNIC/CoData
22 October 2021

The work of the EGI Foundation
is partly funded by the European Commission under H2020 Framework Programme

GOSC Case 1 Space Physics

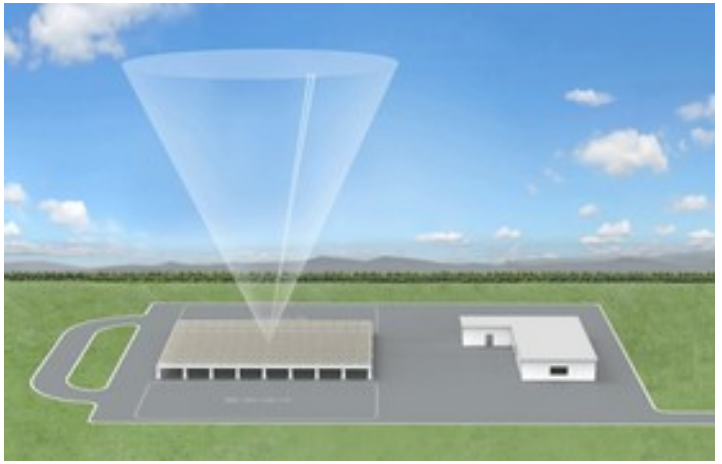
Incoherent scatter radar data fusion and computation

EISCAT-3D radar, EISCAT Scientific association.
Sanya Incoherent Scatter radar (SYISR), Institute of Geology and Geophysics.



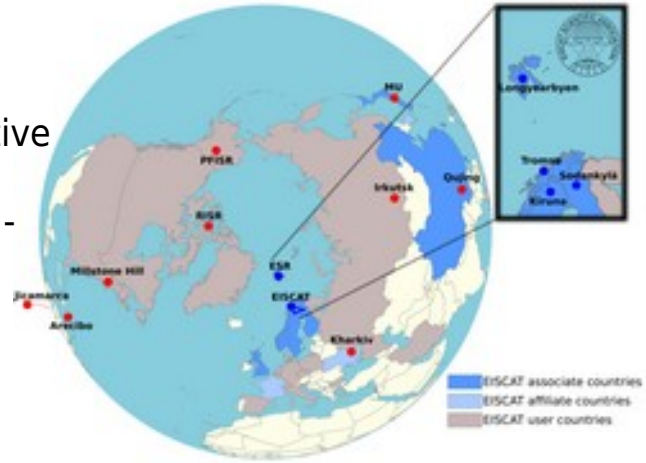
EISCAT/CAS use case

- Next generation of incoherent scatter radar systems
  - HPLA HighPowerLargeAperture
- Similar hardware
  - Systems of distributed phased array radars
    - Enable comprehensive three-dimensional observations of the atmosphere and ionosphere.
  - Increased temporal and spatial resolution
  - Continuous measurement capabilities
    - Inclusion of detailed incoherent scatter radar data into climate and Earth system modeling.
  - Large VVVV
    - Velocity, Volume, Versatility, Variability



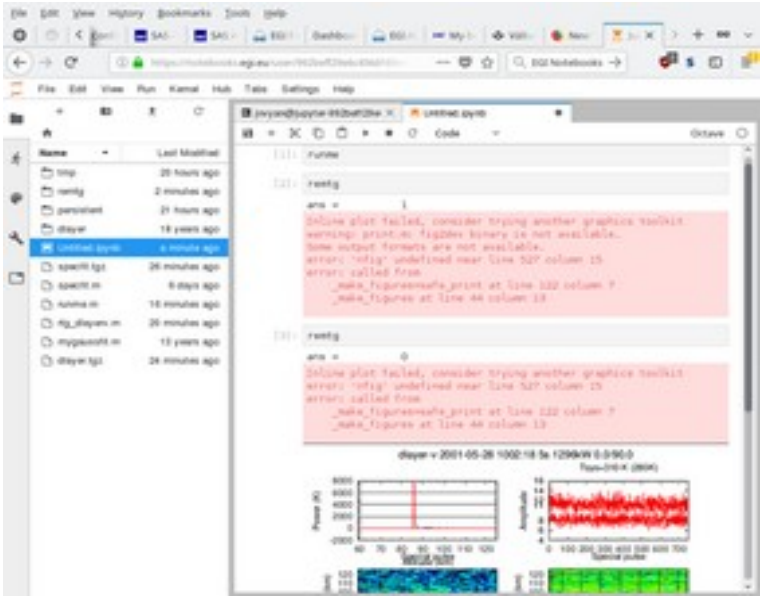
Use Case Mission

- Objectives
  - To explore data and metadata models for collaborative production and sharing.
  - To develop enhanced algorithms, methods for cloud-based radar data processing and federated data learning.
  - Other issues to address for data interoperability.
-
- Key deliverables
  - Exploration of technical solutions for EISCAT and SYISR (Meta)data federation.
  - Deployment of GOSC technical solutions supporting the cloud federated data processing and on-demand data movement.
  - Lessons and good practices for analogous research infrastructures in OSCs.



EISCAT/CAS use case tasks

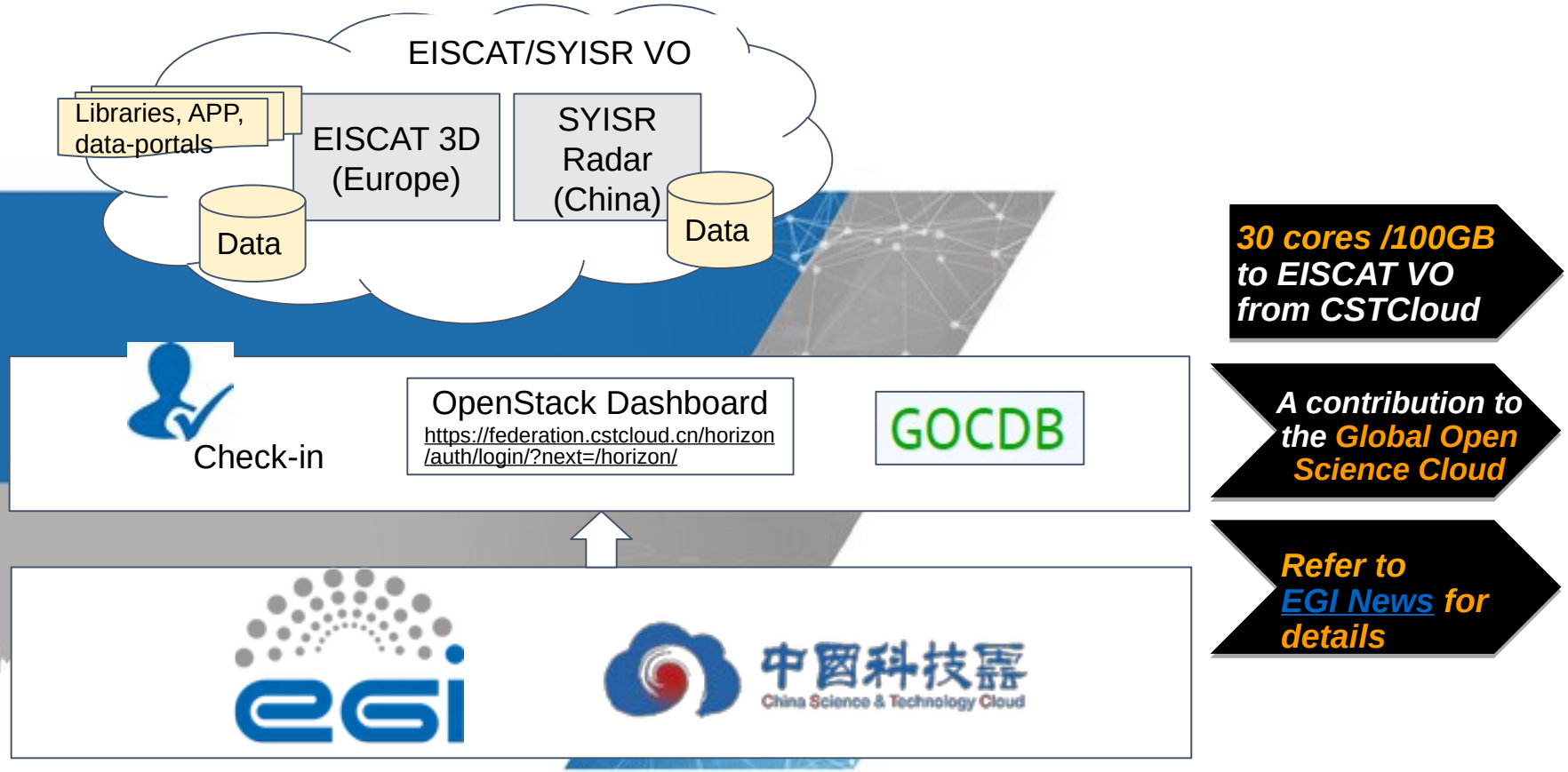
- Metadata and data federation based on radar data production
  - Real-time radar data sharing policies and techniques.
  - Metadata and data standards for radar data production.
- A joint radar data campaign
  - Carry out joint a data campaign with cross-domain radar data as byproducts.
  - Carry out tests for data quality validation and the technical performance of large-scale data movement between regions.
  - Workflow specification that is adaptive to multiple sources of data capture, real-time data sharing, and federated data learning.
- Monthly WG meetings, regular science communication, training, other social activities for publicity and potential alignment.



Job definition file

```
[
        Executable = "run_rtg_docker.sh";
        Arguments = "";
        JobName = "my_job_name";
        Site = "Cloud.CSC.fi";
        CPUTime = 86400;
        InputSandbox = {
                "run_rtg_docker.sh",
                "LFN:/eiscat.se/archive/
2016/...
        }
        OutputSandbox = {"output/*"};
```

Integration Chinese CSTCloud with EGI



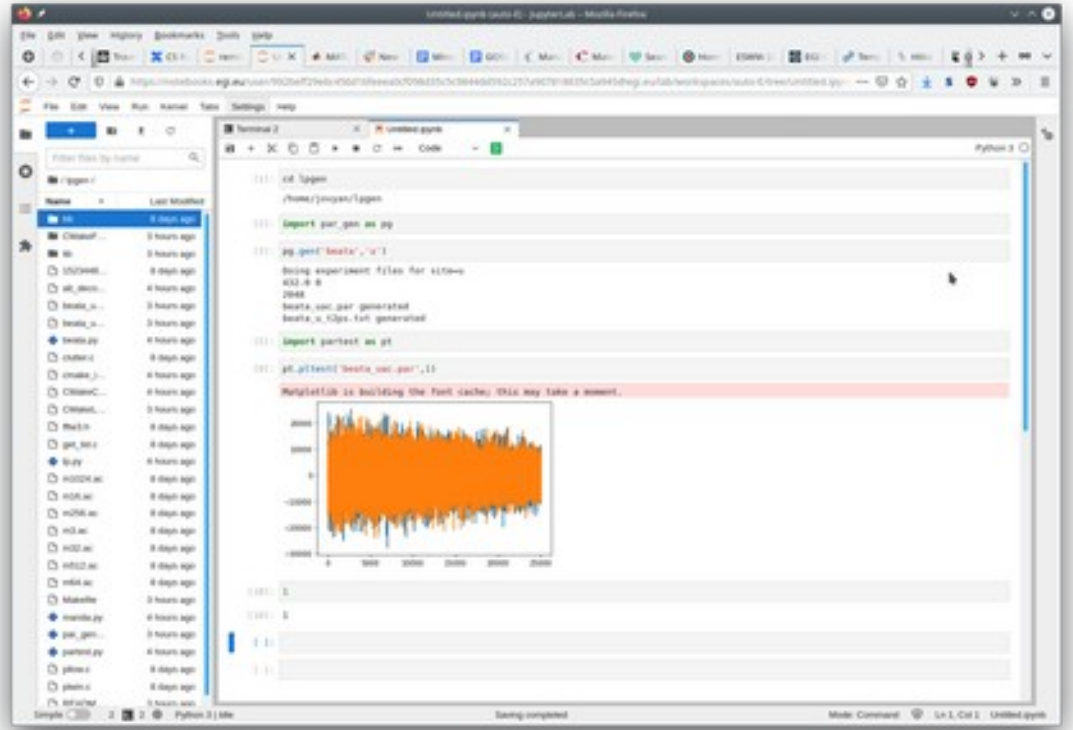
30 cores /100GB to EISCAT VO from CSTCloud

A contribution to the Global Open Science Cloud

Refer to EGI News for details

Task 1 Harmonisation work…

- Data levels
  - L1, Amplitude data
  - L2, Spectral data
  - L3, Data products
- Processing
  - L1→L2
    - **Lag profiling**
  - L2
    - Visualisation
  - L2→L3
    - Analysis
- Tools
    - **Jupyter**
    - Matlab for jupyter
    - HDF
      - Metadata



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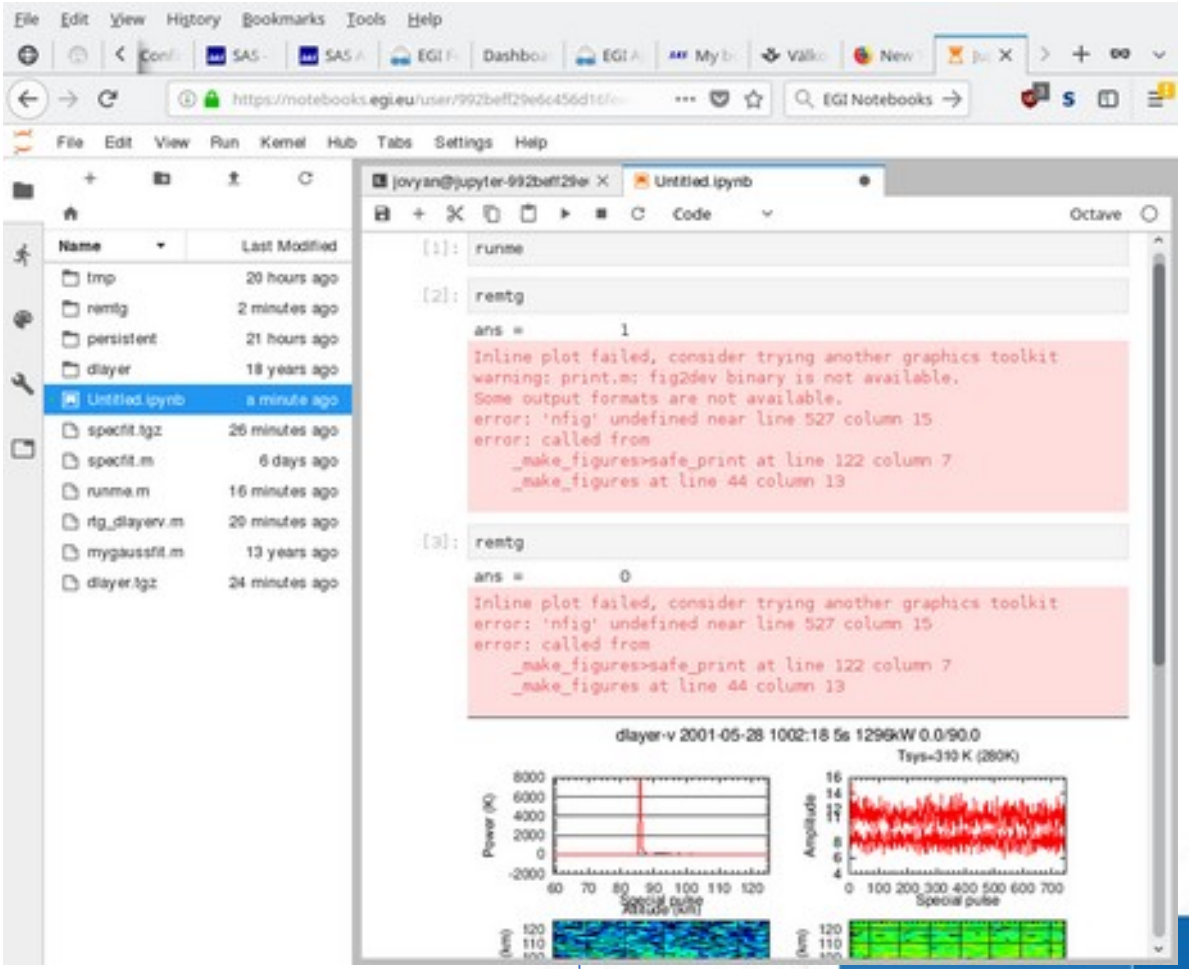

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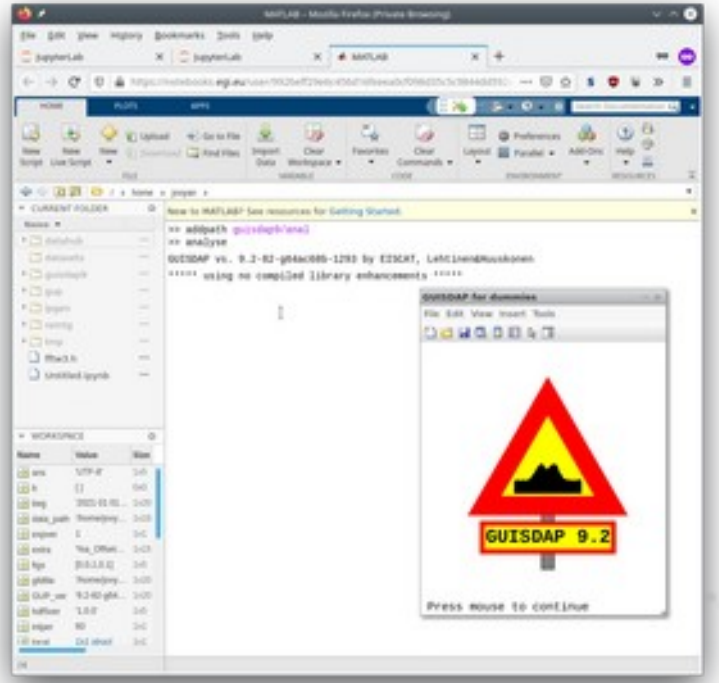

Timescales

- **Oct21 – Mar22**
  - Elaborated radar data campaign plan, and study on data and metadata sharing policies and **techniques**.
- Apr22 – Sep22
  - Fulfill the joint radar data campaign plan, and carry out the two experimental tests for data quality validation and large-scale data movement between regions.
- Oct22 – Mar23
  - Exploration of interoperable data standards and workflows.
- Apr23 – Sep23
  - Training, workshops, and community outreach for larger engagement and impacts

- Meetings/Reporting
  - Monthly co-chair calls
  - Quarterly CS member calls
  - **Annual EGI Conference,19 – 21 October 2021**
  - SciDataCon 2021, 18 – 28 October 2021. GOSC work plans presentation on 27 October
  - International Data Week 2022, 20 – 23 June 2022, Seoul.
  - FDO Conference and the FAIR Convergence Symposium, October, 2022. Leiden.
  - International Data Week 2023, October, Salzburg.