PhiWeek 2019

09-13 September | ESA-ESRIN

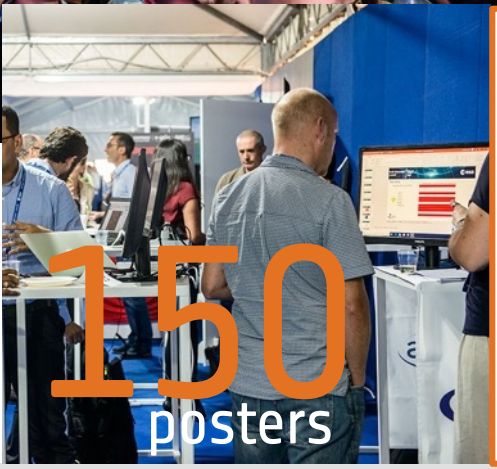
Summary

The week in numbers

~600

38 countries

Side events 20+



150 posters

25 Keynotes

~80 oral presentations

exhibitors 40+

Sessions Summary

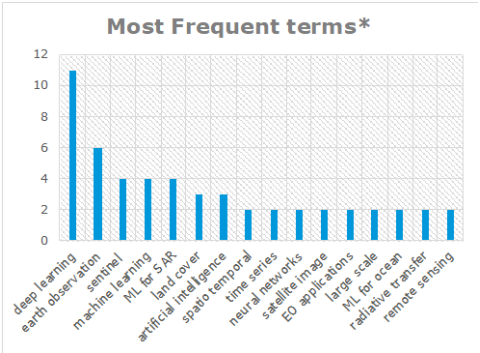
Opening Day	AI4EO	EONext	Research Infrastrucutures
13 Keynotes and Panelists	8 Sessions	2 Sessions	4 Sessions

12 Keynote Speakers

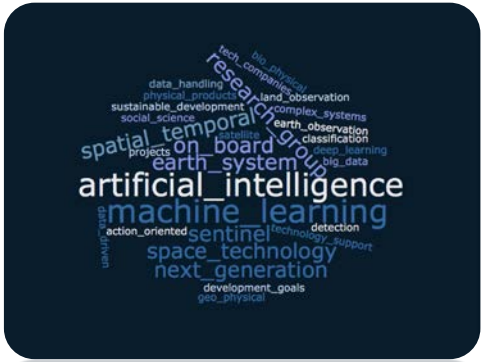
AI4EO – Most frequent words

Keynotes:

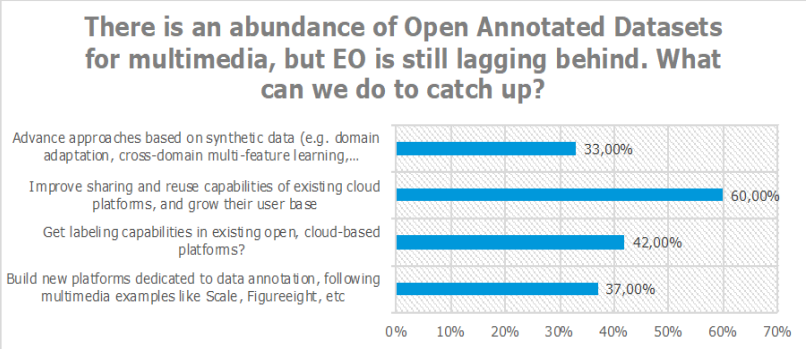
- Artificial Intelligence @ESA – Game Changer for Space
- Understanding the Earth System with machine learning and system-based modelling
- Obtaining & accelerating insight from downstream data with GPUs
- Global Climate and Air Quality Research for Services and Operations
- The Role of Space Technology to Support Sustainable Development
- Sentinel-2, Big Data in Space
- Artificial Intelligence for at-scale Monitoring of Human Rights and Environment
- Startup Experience Within The AI Sector

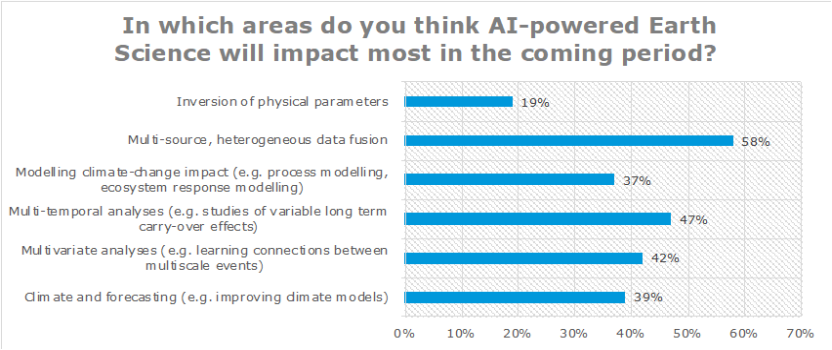


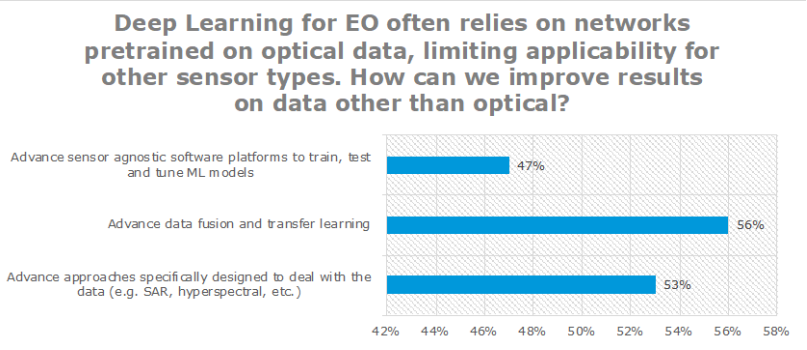
*based on titles of oral presentations

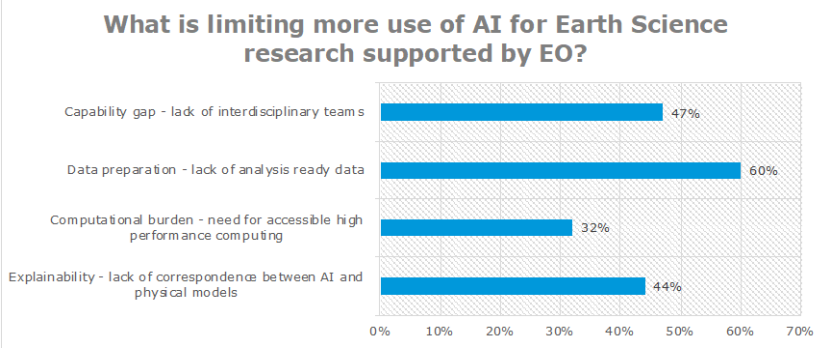


AI4EO – Poll Results









Recommendations via Sli.do

Data

Large Open Annotated Datasets

- For diverse scenarios and sensors, including upcoming missions (e.g. hyperspectral)
- Enable sharing labeled data integrating Citizen science, gamification, incentives, competitions

Open Science

Earth Science

Focus on Big Unknowns

- To tackle big challenges: forecasting, extremes, climate resilience, anomaly detection, health, safety & security
- Fusion of EO and IoT
- Contextual analyses compound events

Physics Aware AI

Deep Learning

Benchmarks and Standards

- Consolidate vocabularies between communities
- EO data benchmarks
- Multi-input multi-channel tools
- Collaboration between successful projects

DL Protocols

Break Barriers

Need to enable:

- Easy access to ARD
- Standardized and tested algorithms
- Quality control
- Cross-capacity (GIS, EO,AI)
- Frameworks for explainable AI
- Data agnostic DL

Consolidated tools

Final Messages – AI4EO

Conclusions	Recommendations
AI for EO science and applications is currently in a stage where it's triggering innovation. The domain requires further investment to push the development, attain mature utilization of AI in Earth System Sciences and generate novel downstream value-added services.	ESA needs to contribute to **enhance the scientific and technological position of Europe in AI research** and development for EO through dedicated actions on science, applications and future missions and a long-term R&D strategy.
A wider adoption of AI for Earth System Science requires firstly a formalism for addressing fundamental sciences in Deep Learning, and secondly the availability of large, open, expert-annotated datasets, as well as analysis-ready data.	To accelerate adoption of AI for Earth System Science, ESA needs to **promote the advancement of these elements through dedicated actions.**
Complex Earth science topics (e.g. compound processes, causal inference) are domains where AI could bring most benefits in terms of scientific advancement. This is supported also by the **advances towards explainable AI**.	**ESA needs to support AI-based research in Earth Science**, especially for grand **global topics with societal impact**, where poorly resolved models are in place, or interactions are too complex to be modelled with traditional approaches.

Final Messages – AI4EO

Conclusions	Recommendations
A critical gap in Machine Learning for EO is the availability of **Benchmark and Control Datasets** to enable performance evaluation and model validation. The insufficiency of in-situ measurements is another challenge to be addressed.	**ESA needs to support and enable the creation of EO data benchmarks for a variety of scientific problems**, sensing systems (e.g. multispectral, SAR, hyperspectral), and data characteristics (e.g. spatial and temporal resolutions).
Automatic Data quality management and error handling in multi-source systems remains a challenge. This puts a weight on data curation, where expert knowledge is needed for the harmonisation of data streams coming from different providers.	**ESA should support the access to high-quality and fully traceable data**, **Analysis Ready Data (ARD),** in-situ data and computing resources to support R&D on AI for EO.

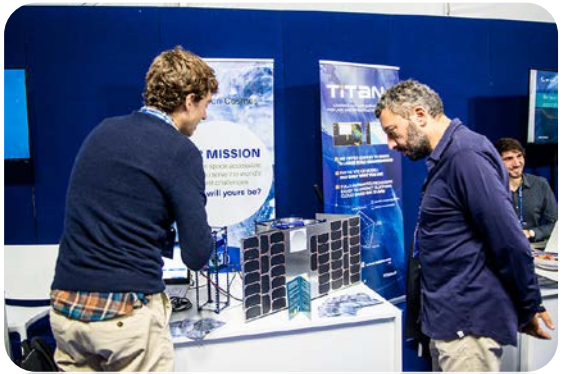
Final Messages – AI4EO

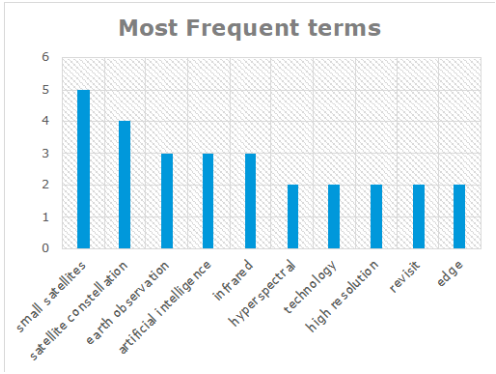
Conclusions	Recommendations
Open Science practices are effective tools to advance AI in Earth Science. However, in spite of increased availability of tools, there is still a knowledge gap in problem definition and data understanding, as data and technology are still far away from the non-technical user-base. There is a strong need for a coherent approach to EO Open Science, to truly facilitate **exploitation and growth of open code bases, labeled data, documentation and results**.	ESA needs to support EO Open Science through dedicated actions aimed to enable scientific collaboration, knowledge diffusion and advancement of ML/AI for EO and Earth Science to where **designed AI solutions are truly fit for purpose**.
Novel integrated interdisciplinary approaches combining Citizen science with gamification, incentive-based systems and open competitions are effective tools for citizens' and experts' engagement.	ESA should support the formation of **cross-capacity** teams, combining Computer science, GIS, EO and Earth Science.

EONext – Most Frequent Words

Keynotes:

- HyperScout-2: high integration of hyperspectral and thermal sensing for breakthrough in-space applications
- Spire's Terraflop Brain in Space for In-situ AI





Recommendations via Sli.do

New Products

Derived from new EO data

- Delivered or driven by new constellations with high rate of data acquisition and delivery
- Imagine new ways to exploit current data

→ Constellations

New Missions

With On-board processing

- Imagine new European initiatives and projects to design and exploit systems with on-board AI capabilities
- Data transmission optimization

→ Trustable AI

Small Satellites

Deliver innovative EO applications

- Directly to the users, through new generations of agile small satellites and alternative imaging systems

→ Agile Delivery

Break Barriers

Need to support

- Actions to enhance integration of the observing systems:
  - data fusion,
  - constellations,
  - coordination

→ Coordination

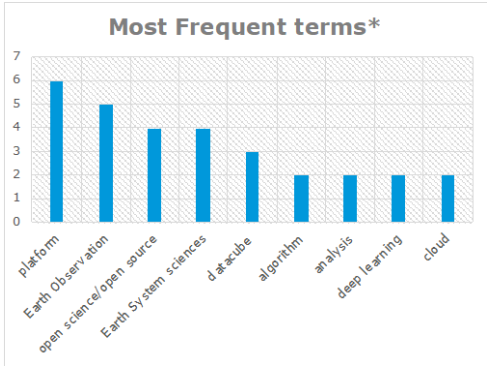
Final Messages - EONext

Conclusions	Recommendations
A number of emerging technologies and trends with disruptive potential are carving their way into EO science and applications. Among these, **Blockchain is seen as a valid enabling technology** in support of data and information management, and an enabler of AI for EO.	**Decentralised AI** based on **blockchain** could be regarded as an innovative method for developing distributed and scalable learning methods with strong privacy protocols for data providers (e.g., training) and model providers.
There have been several reports of effective use of EO linked with **Internet of Things (IoT)**, especially for fusion of EO with in-situ sensors for agriculture.	ESA should support the development of integrated approaches maximising the complementarities of EO satellites, novel observing technologies such as **Unmanned Aerial Vehicles (UAVs), in-situ sensors and Information technologies.**
New sensing capabilities, **constellations** and new imaging systems such as **hyperspectral** capacity from space were discussed with respect to the growing amount of remote sensing information. The growing demands for **data transmission volumes** need to be accounted.	Novel approaches such as **AI in Orbit should be further explored and developed.** support for efforts in the connection between EO and **Edge Computing, Quantum Computing** is needed to ensure Europe competitiveness in the future

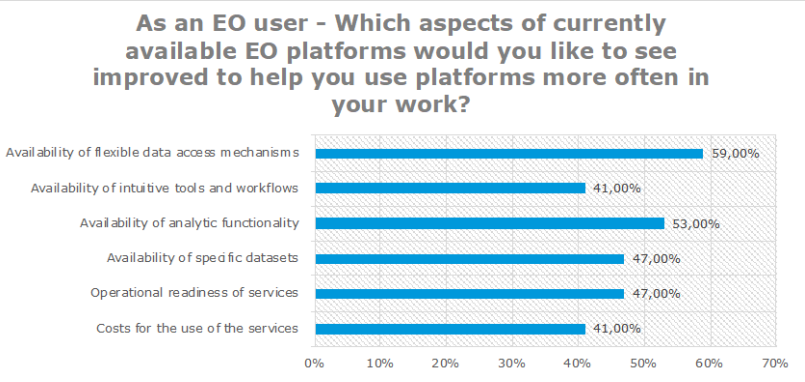
R.INFRA – Most frequent words

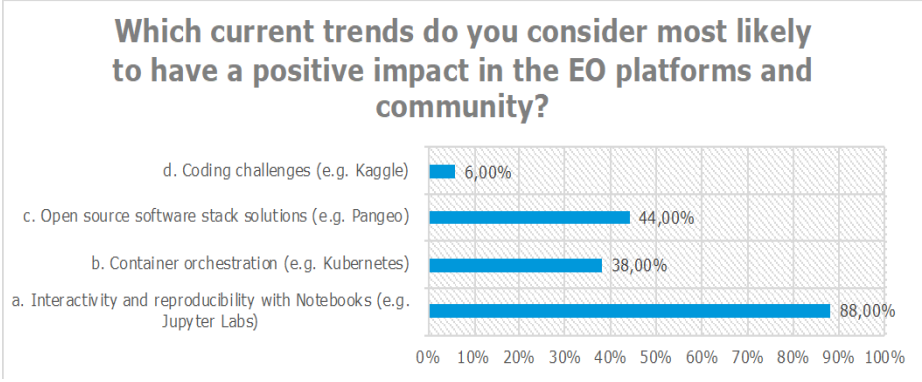
Keynotes:

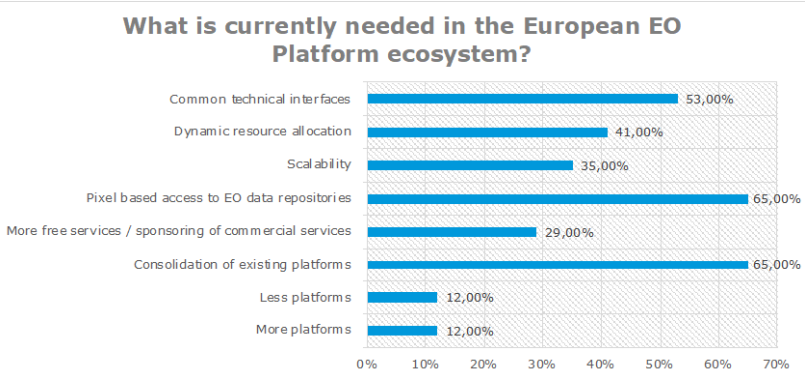
- From 15 years to 2 months of Mapping: How AI pushes the boundaries of image processing
- SWISS Data Cube

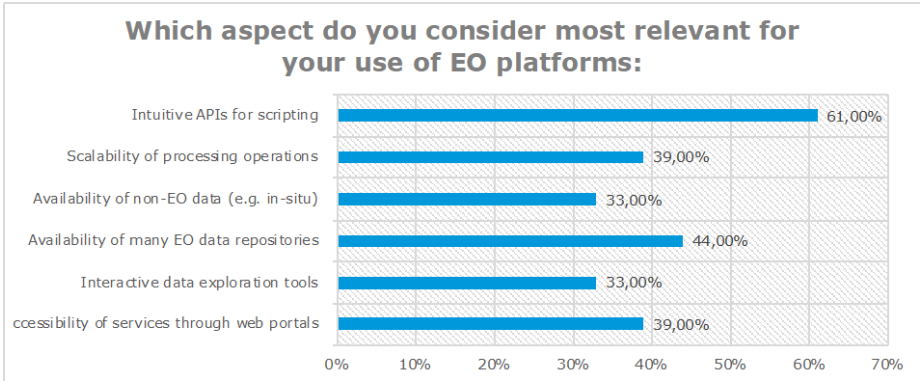


R.INFRA – Poll Results

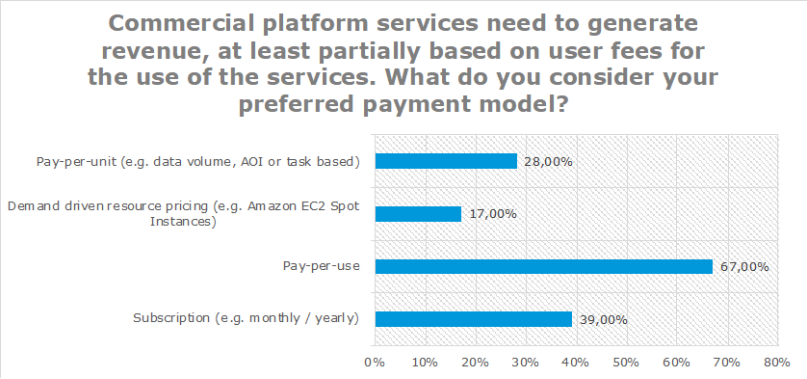


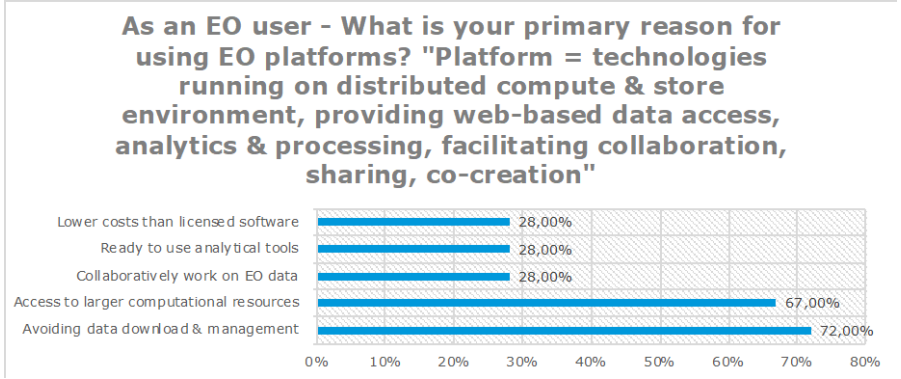


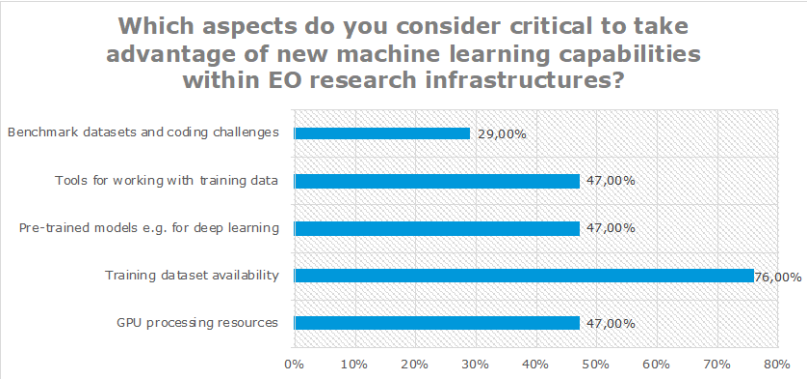


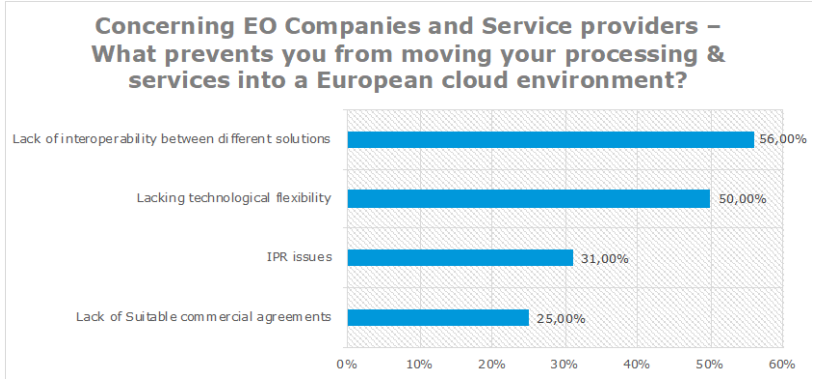


R.INFRA – Poll Results

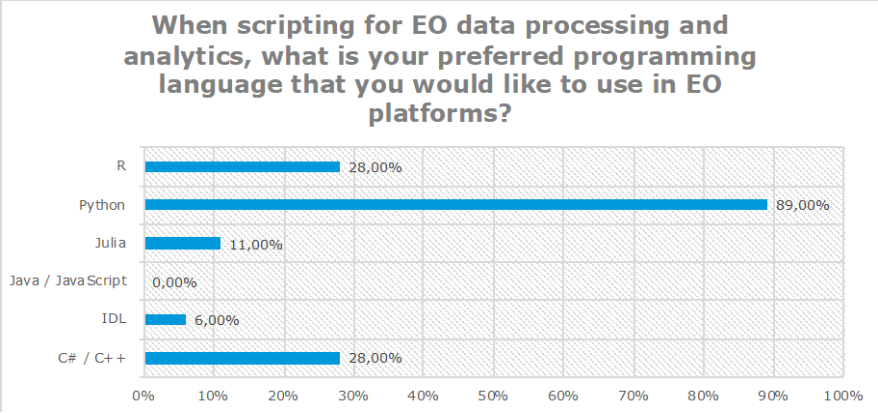








R.INFRA – Poll Results



Recommendations via Sli.do

Data Cubes

Derived from new EO data

- Further support for datacube development
- Datacube federations

ARD

Platforms

ESA as a Hub

- Easier switch between platforms (common TEP authorization and payment), easier access to all of the platforms through one ESA hub
- Enable easy transition to serverless for users

Federation

Deep Learning

On top of EO Platforms

- Accessible and scalable deep learning capabilities for users on top of existing EO platforms

Functionalities

Near Real Time

AI enabled

- NRT flexible and intelligent platforms capable to capture human analyst expertise and apply at the massive scale to analyse 100% of collected EOD in near real time

Processing at Scale

Final Messages – Research Infrastructures

Conclusions	Recommendations
Interactivity, Reproducibility, and **intuitive APIs** are the most relevant trends and features with positive impact on the use of **EO platforms.** A larger adoption of processing and services is needed in **European Cloud environments**	ESA should promote more technological flexibility and interoperability between solutions, and should **continue to support federation and standardization of existing platforms and services**.
A key aspect for achieving maximum impact of platform-based applications is their **capacity to scale at large**. New system implementations should consider scale from the design stage, both for models and infrastructure.	**ESA should support the consolidation and advancement of current implementations and platforms**, enabling the evolution beyond demonstration and prototyping.
Datacubes are suitable technologies for many applications where **spatially and temporally large EO data and products** are needed. **Datacubes also show clear benefits of for scientific research** (e.g., the Earth System Data Lab). There is a huge **burden for data curation** and error tracing.	**ESA should support the advancement of Datacubes through dedicated actions.** Further elements that should be developed are the provision of highly scalable distributed queries, access control, quotation and invoicing services on datacube architectures.

#phiweek #openscience #eo

143 k
Tweeter impressions

1.0 k
Youtube views

3990
Online views