

# Innovative approaches to enable astronomical tools for inclusive and equitable education

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On behalf of larger group

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# Astronomy in Education and Science Communication

Astronomy is very publicly visible, and inspires learners.

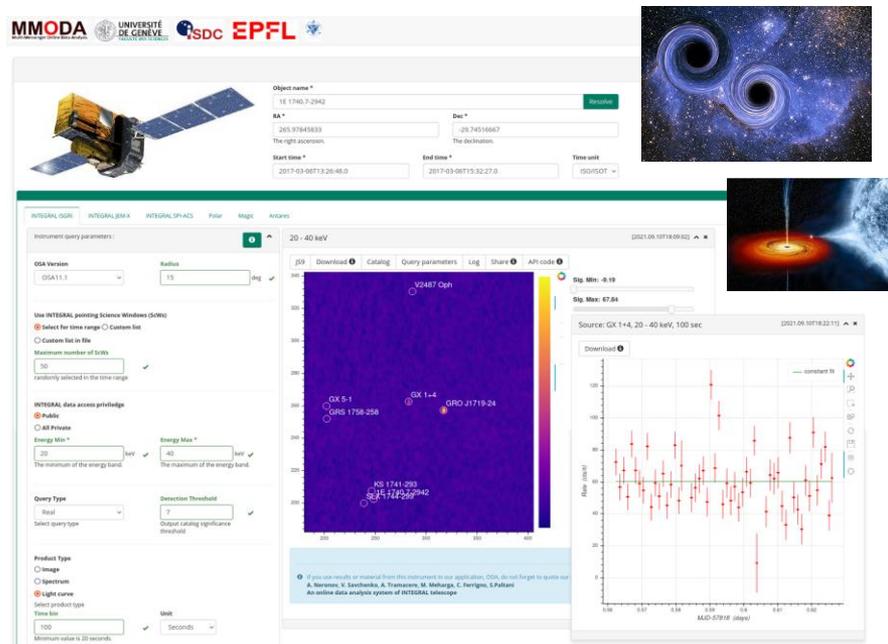
We built tools and services for cross-community data analysis, for INTEGRAL space observatory and more, ensuring many levels of access complexity. They are useful expert work as well as teaching.

Turns out **the majority of users** are not part of our community, and originate in **developing countries**. We got a lot of feedback, communications from general public, especially following press releases.

Free and easy world-wide access to state-of-the-art observatory tools facilitates **Equitable Education SDG4**

*Does it mean we teach less lucky people to depend on our service hosted in developed countries?*

To avoid hoarding technologies, we leverage open and transferable approaches. Multiple platform instances exist, also in a **developing country**, promoting of competence and **sustainable economic growth, full and productive employment** in developing countries. **SDG8**



<https://www.astro.unige.ch/mmoda>  
<https://github.com/oda-hub>

# Sustainable Astronomical Data Analysis Stewardship

In our traditional observatory data analysis pipeline, much of the computing **was repeated by each user**, as well as by ourselves for different settings.

We redesigned our data and build **workflow management frameworks** leveraging **provenance metadata** to enable **extensive reuse (recycling)** of elaborated data, **dramatically reducing computing costs (SDG12)**

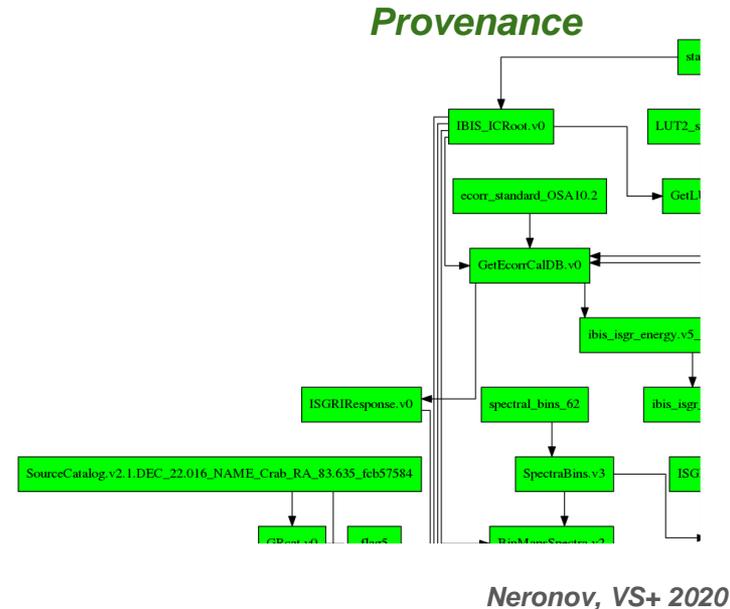
**Supporting reproducibility also promotes responsible resource consumption!**

We use provenance and workflow analysis to determine if repeating computing is preferred to storing and transferring.

We are working on generalizing this approach in other domains of astronomy and further working on facilitating data and workflow discovery based on **FAIR** and **Linked Data** principles.

We strive to share our findings as structured knowledge (e.g. in **RDF**).

**Provenance-based tracking** and **enhanced communication reuse** also facilitates evidence-based support for informed decision making (**SDG16**). Our astronomy knowledge is not often used to derive policies, but it can serve as one of the examples of scientific communication.



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