



ESCAPE

European Science Cluster of Astronomy &
Particle physics ESFRI research Infrastructures

The VO-service at ESO

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ESO, The European Southern Observatory

What we do

- Develop ground-based astronomical telescopes and observatories that are not individually achievable by single Member States
- Secure science community access to high quality data
- Founded in 1962 (60th anniversary!)
- 16 Member States; host state: Chile; strategic partner: Australia



The ESO Science Archive as an essential component to ESO's operations

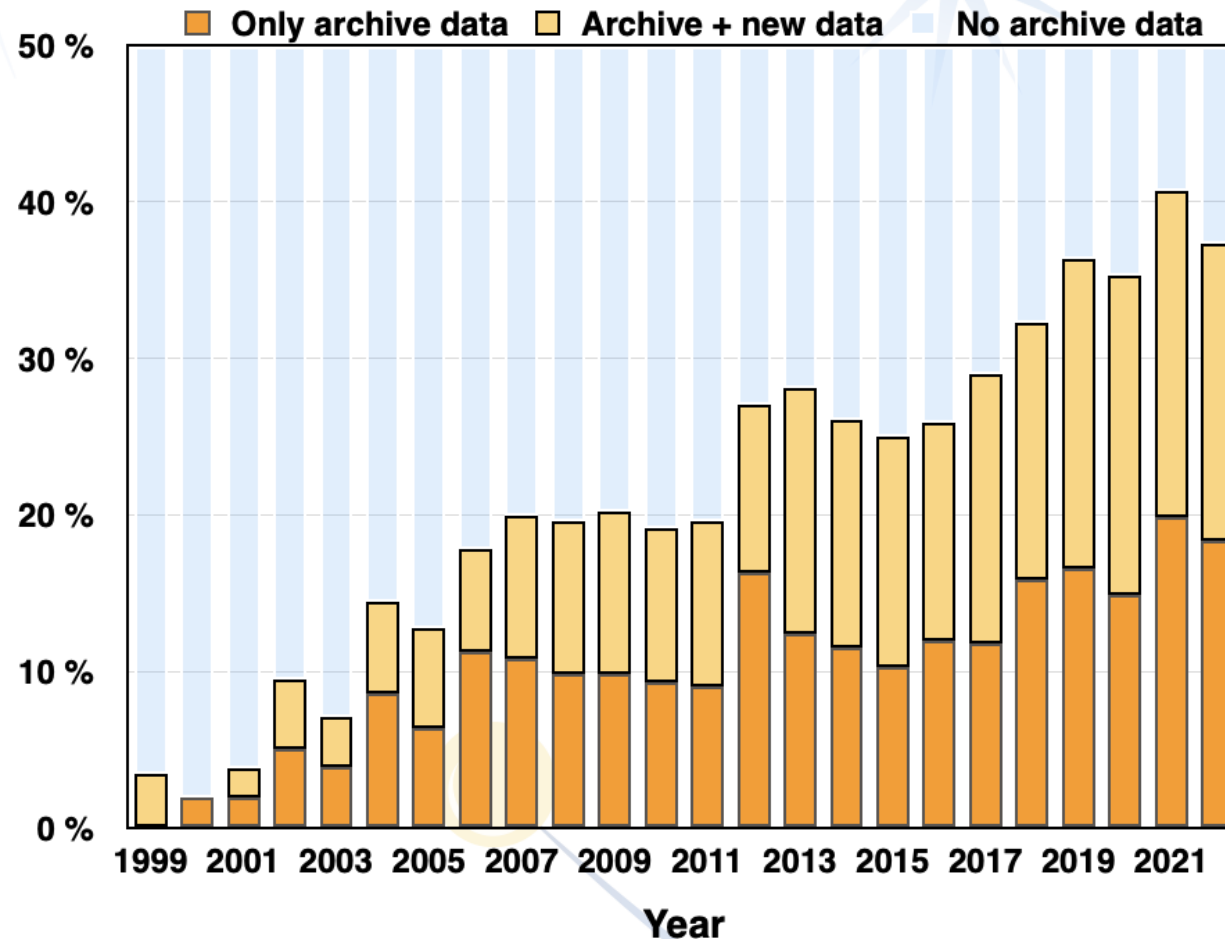
“The telescopes are operated to optimise scientific excellence, to maximise the scientific return of ESO by undertaking observations that have the potential to yield significant scientific advancements, and to exploit synergies between them as well as with other facilities. **The telescopes are operated within an end-to-end process which starts with proposal solicitation and ends with data preservation and publication [...] ESO supports an open data policy**”

ESO Optical/Infrared Telescopes Science Operations Policies, 2020, Cou-1847



The ESO Science Archive as science machine

● About 40% of the science publications with ESO data use the archive



Source: ESO Telescope Bibliography (telbib.eso.org)



The impact of the ESO Science Archive

- It allows to scrutinize published results: a staple of the scientific method
- It fosters a culture of cooperation and open data in Astronomy and science in general
 - Astronomy has been leading open data
- It broadens ESO's user community
 - Rather large community: ~ 60% of professional astronomers worldwide
 - One third of archive users are new to ESO
 - Larger fraction of early-career scientists than as Principal Investigators
 - Reaches out beyond the ESO Member States
 - Brings in new communities, e.g. earth atmosphere



Data interoperability: the Virtual Observatory

- About 50% of the ESO science results also use data from other observatories (source: ESO Telescope Bibliography + NASA ADS)
- Exchanging data is, then, necessary to make the most out of it
- The Virtual Observatory is the de-facto standard for data interoperability in astronomy ...
 - Standards, protocol, tools
- ... and it needs to keep evolving to keep up with new data types and science cases
- CEVO is instrumental in doing so
 - For ESO data itself and to connect it globally



The Virtual Observatory and the ESO Science Archive

- The ESO Science Archive heavily relies on the Virtual Observatory

- For internal operations, e.g. internal communications
- For user access and services



- ADQL

- Aladin Lite

- DataLink

- HiPS

- ObsCore

- SAMP

- SODA

- SSA

- STC-S (point, circle, multi-polygon)

- TAP (DALI, VOSI, UWS, UCD, UTYPE, ...)

- TOPCAT

- VOTable

- pyvo

- ...

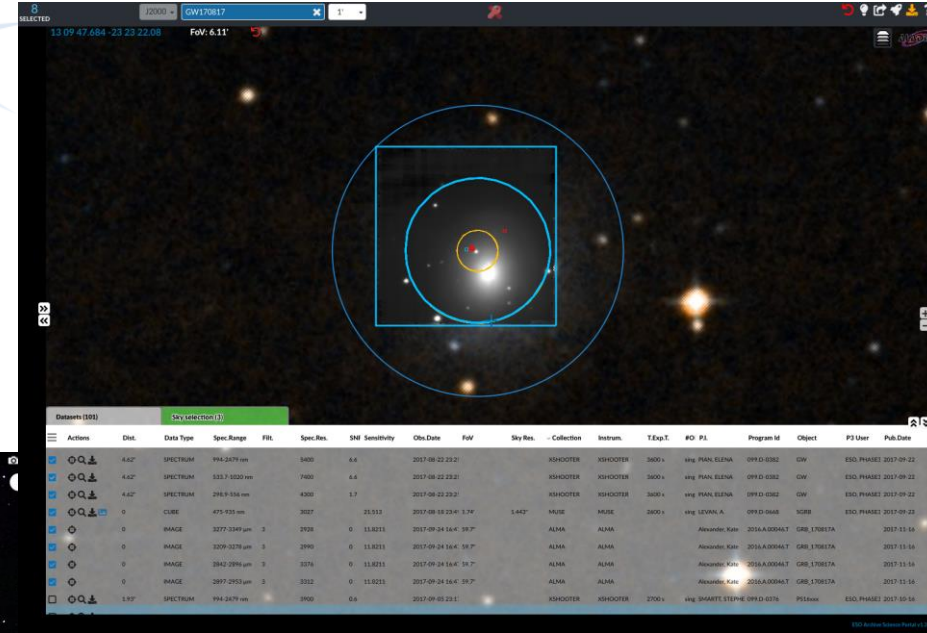


Multi-messenger, multi-wavelength view of neutron star merger GW170817

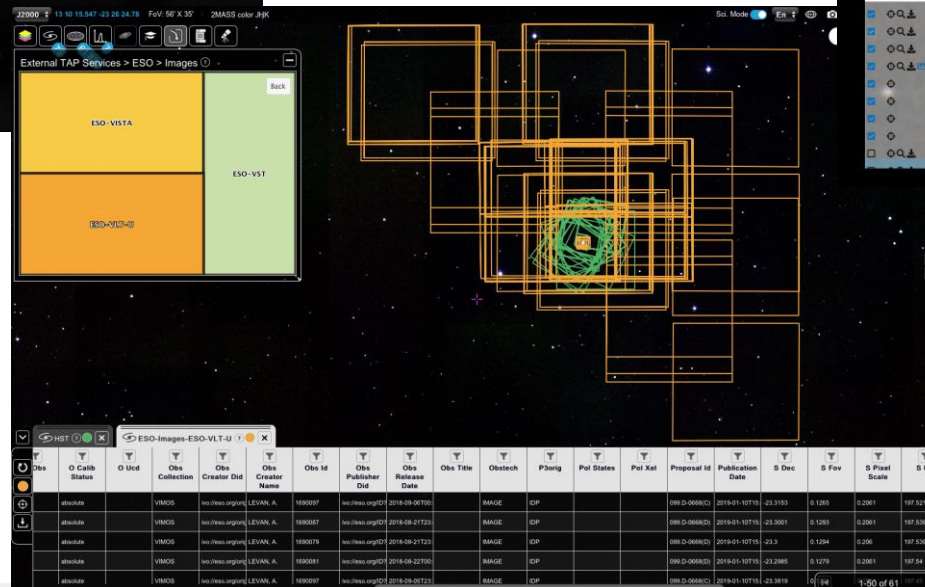


ESO + LIGO/Virgo

ESO + HST (ESASky)



ESO La Silla Paranal + ALMA



In summary: ESO and CEVO

- The Virtual Observatory is central to the success of the ESO Science Archive
- CEVO provided crucial support to the ESO Science Archive
 - Continued support and development of tools, protocols and standard
 - Coordinated involvement and expansion of the astronomical community
 - Connection to the EOSC, the common framework for European Open Science



