ESASky

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Reference: ESA Sky
Status: Issued
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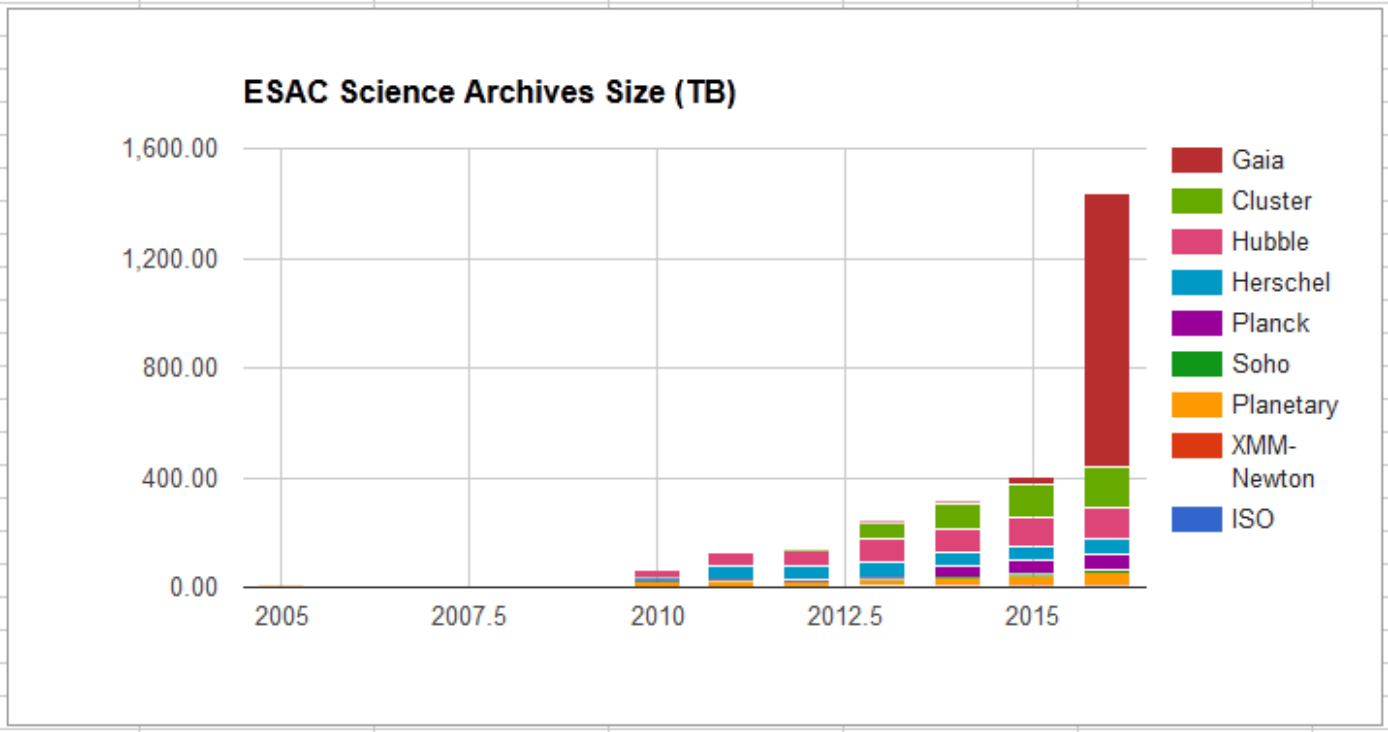
Astronomy evolving to a data-rich field

- While the amount of data is growing exponentially, the number of scientists working with it is growing linearly.
- This means that in the future data might compete to get users to look at them, and not viceversa as it happens now. (!)



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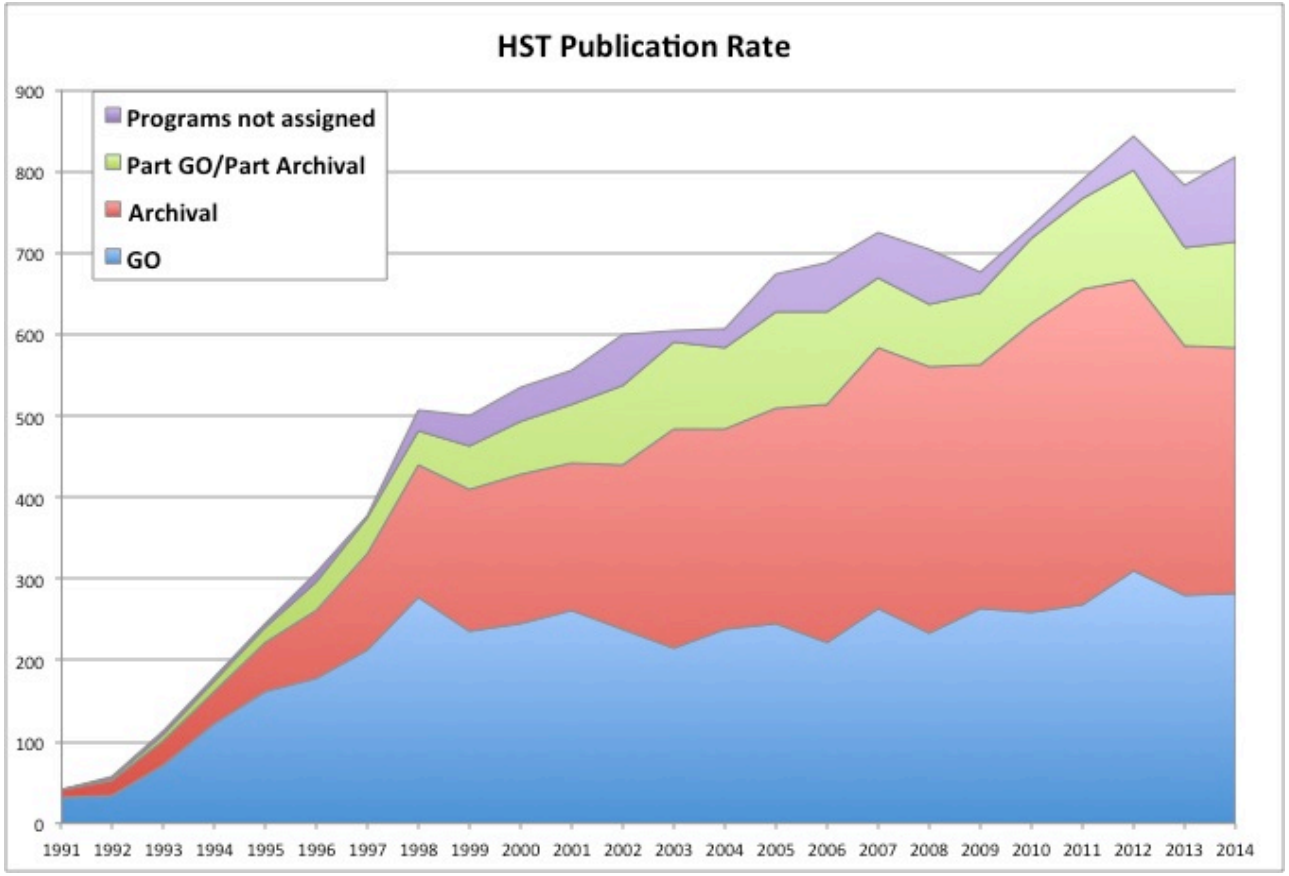
A growing number of archival papers

- Image from the HST 10,000 science publications press release in June 2011, showing the number of archival papers (AR) increasing whilst General Observer (GO) papers are around the same number from 1997 to 2010:



- One reason for the surge -> the telescope's longevity. Hubble has amassed almost 27 years of data, and astronomers are finding new uses for the data. Projects not imagined when observations were taken.

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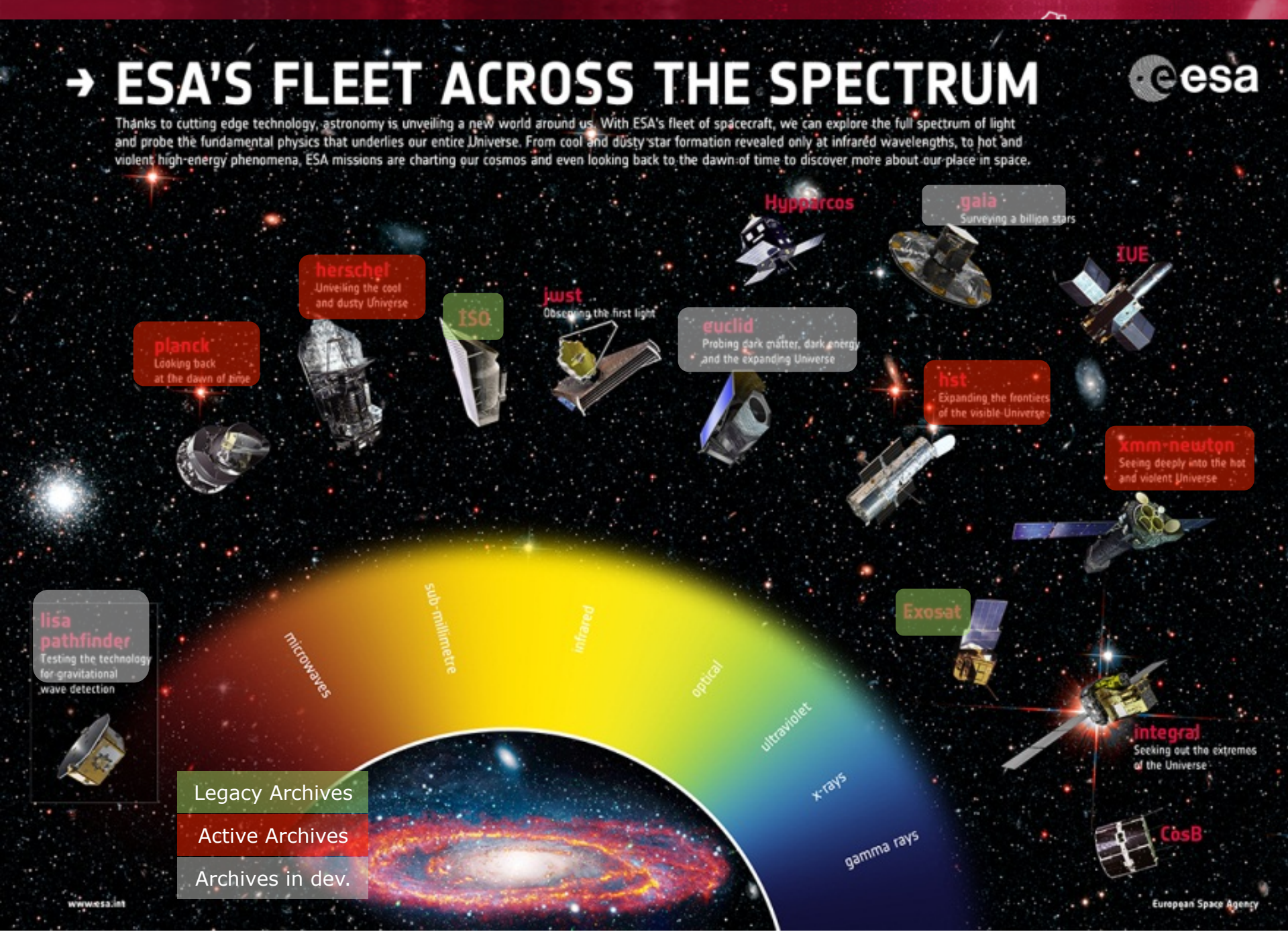
ESA'S FLEET ACROSS THE SPECTRUM
esa
Thanks to cutting edge technology, astronomy is unveiling a new world around us. With ESA's fleet of spacecraft, we can explore the full spectrum of light and probe the fundamental physics that underlies our entire Universe. From cool and dusty star formation revealed only at infrared wavelengths, to hot and violent high-energy phenomena, ESA missions are charting our cosmos and even looking back to the dawn of time to discover more about our place in space.
Hyppercos
gaia
Surveying a billion stars
IUE
herschel
Unveiling the cool and dusty Universe
ISO
Jwst
Observing the first light
planck
Looking back at the dawn of time
euclid
Probing dark matter, dark energy and the expanding Universe
hst
Expanding the frontiers of the visible Universe
xmm-newton
Seeing deeply into the hot and violent Universe
lisa pathfinder
Testing the technology for gravitational wave detection
Exosat
integral
Seeking out the extremes of the Universe
CosB
microwaves
sub-millimetre
infrared
optical
ultraviolet
x-rays
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ESASky concept

- **Goal**: to facilitate data discovery and archival science for ALL users
  - Multi-wavelength
  - Project agnostic
  - Exploration

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- **Goal**: to facilitate data discovery and archival science for ALL users
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- Interface to all astronomy archives

- First release in May 2016: **http://sky.esa.int**

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ESASky data contents roadmap

Prototype (summer 2014)

- **All-sky HiPS mosaics:**
  - XMM-Newton (CDS)
  - HST (CDS)
  - Planck (CDS)
  - Herschel-SPIRE (ESA)
- **Science ready data (imaging):**
  - XMM-Newton
  - HST (core)
  - Herschel-SPIRE
- **Catalogs:**
  - 3XMM-DR4
  - XMM Slew
  - XMM OM

First Release (May 2016)

- **All-sky HiPS mosaics:**
  - EXOSAT (ESA)
  - INTEGRAL (ESA)
  - XMM-Newton (ESA)
  - HST (ESA)
  - ISO (ESA)
  - AKARI (ESA)
  - Herschel (ESA)
  - Planck (ESA)
  - JAXA/SUZAKU
- **Science ready data (imaging):**
  - INTEGRAL
  - XMM-Newton
  - HST
  - ISOCAM
  - Herschel
  - JAXA/SUZAKU
- **Catalogs:**
  - 3XMM-DR5
  - XMM Slew
  - XMM OM
  - Hubble Source catalog
  - Hipparcos
  - AKARI catalogs
  - Planck catalogs

Second release (fall of 2017)

- **All-sky HiPS mosaics**
- **Science ready data (imaging and spectra):**
  - EXOSAT
  - INTEGRAL
  - XMM-Newton
  - IUE
  - HST
  - ISOCAM
  - Herschel
- **Catalogs:**
  - 3XMM-DR6
  - XMM Slew
  - XMM OM
  - Hubble Source catalog
  - Hipparcos
  - Gaia
  - AKARI catalogs
  - Herschel Point Source Catalogs
  - Planck catalogs

Aim: continuous integration, testing and releasing

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ESASky feature roadmap

Prototype (summer 2014)

- Web interface
- All-sky HiPS mosaics from CDS
- Detailed footprints (imaging)
- Multi-target functionality

First Release (May 2016)

- Scientific validation of footprints and ESA all-sky HiPS by ESA
- Download management
- Multi-target summary table
- Interoperability with VO tools
- Documentation
- Helpdesk Support
- Hardware scaling requirements
- Refactoring of prototype into robust and stable application

Second release (fall 2016)

- Link to Vizier/Simbad
- Generation of detailed footprints (spectra)
- Imaging and spectroscopic data
- Online visualization of data
- On demand overlaying of footprints for pre-planning

Third release (2017)

- Sample manipulation
- Time-series
- Observation planning
- State-fullness
- Massive data visualization
- Link to publications?
- Mobile app?

Aim: continuous integration, testing and releasing

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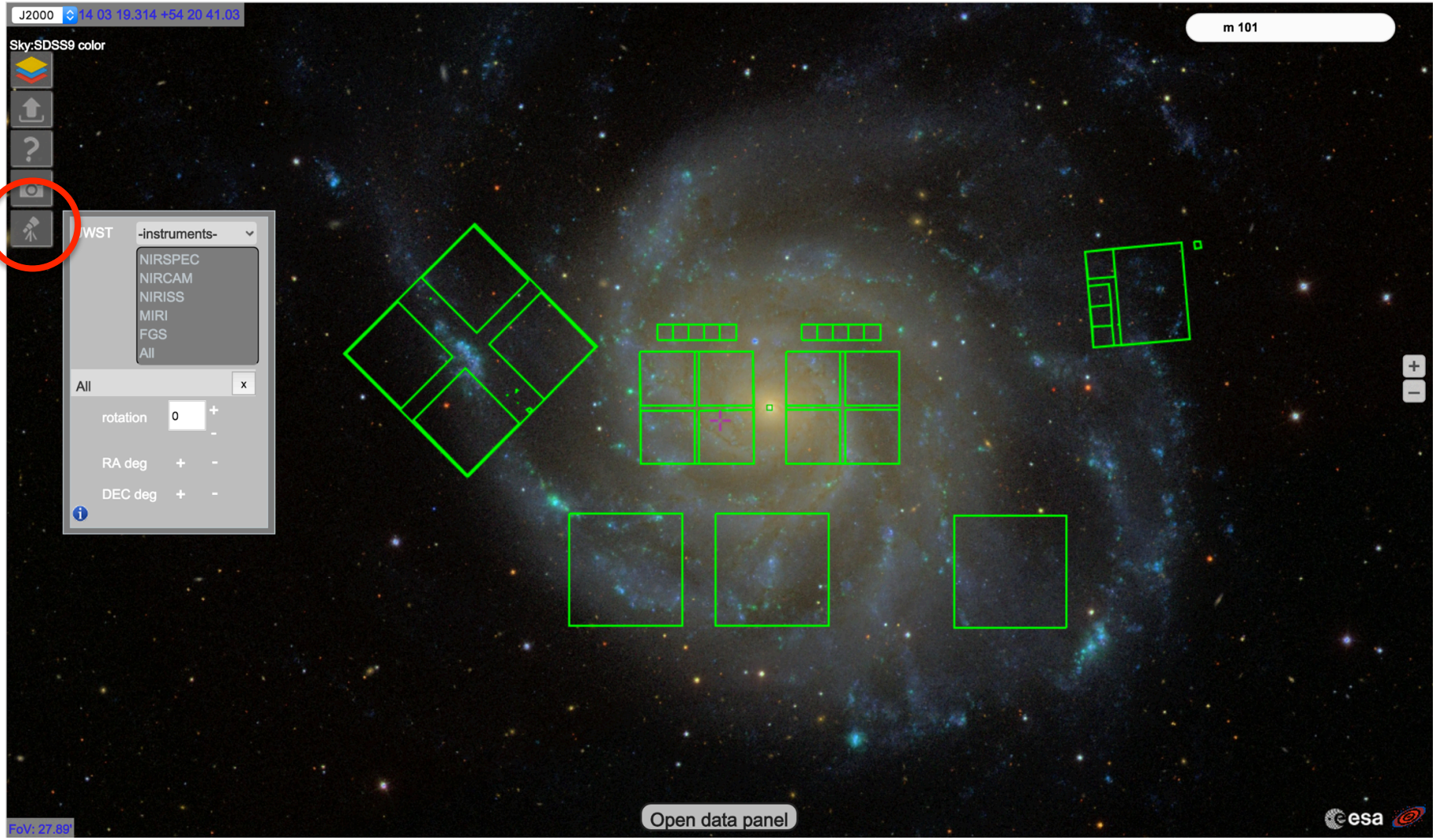
Try the ESASky yourself !

JWST observation quicklook planning tool



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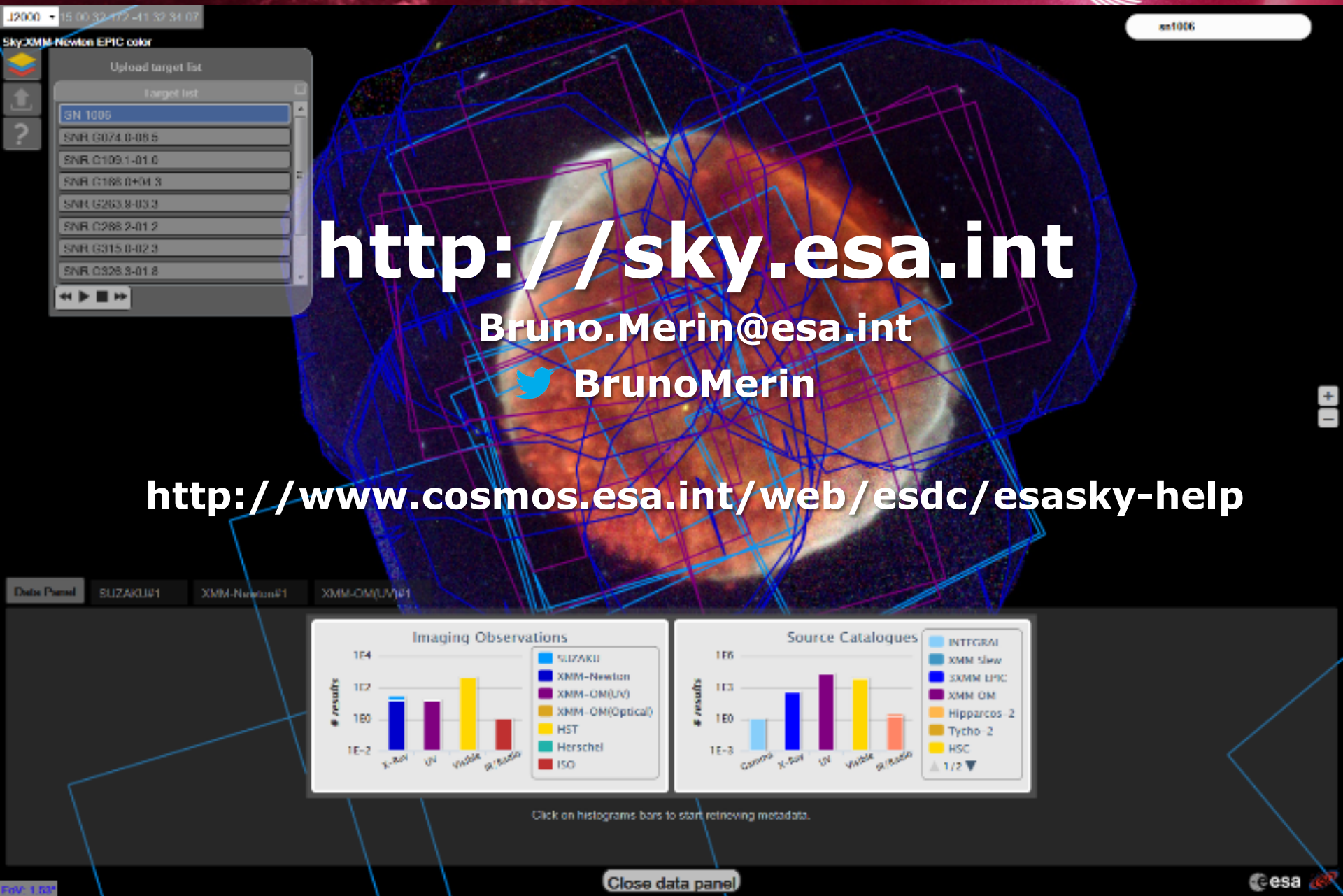
Thanks!



http://sky.esa.int

Bruno.Merin@esa.int

BrunoMerin

http://www.cosmos.esa.int/web/esdc/esasky-help

Additional slides

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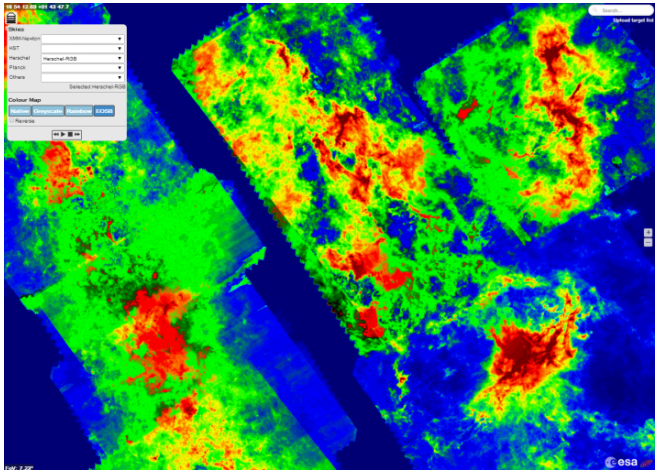
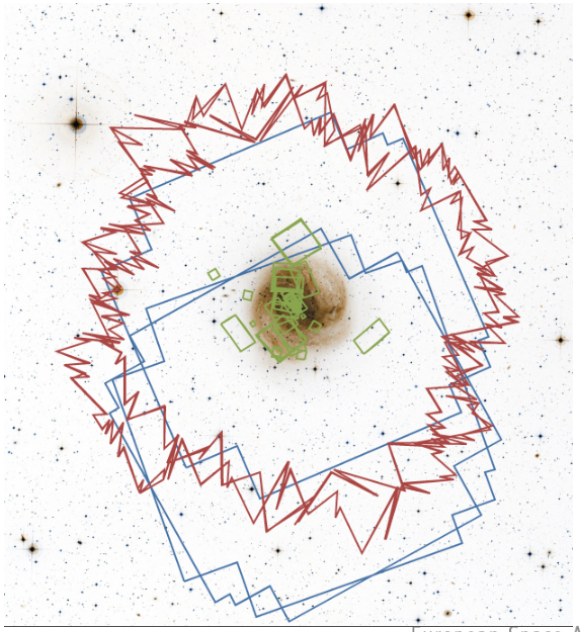
ESASky v1.0 - Backend Data Generation

- HiPS: Hierarchical Progressive Survey
  - HEALPix sky tessellation
  - Number of levels depend on pixel angular resolution
    - Planck (low) 3 levels
    - Herschel(medium) 7 levels
    - HST(high) 14 levels
- Footprints
  - HST: Provided by project
  - Herschel: Footprint Finder (ST-ECF)
  - XMM: Instrumental + pointing





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ESASky v1.0- Backend Data Access

- Apache HTTP Server
  - Serves HiPS requests
- Java Servlet container
  - Serves TAP & Target Resolver requests
- Database
  - PostgreSQL DB
  - Spherical data types library (PgSphere)
  - Footprints -> Spherical data types
- Usage of IVOA Protocols & Standards
  - TAP requests
  - ADQL translation to SQL + PgSphere
  - Storage of STC-S footprint information

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ESASky v1.0 - Frontend

- Running on a Web Browser (HTML5/ CSS3)
- Google Web Toolkit
  - Aladin Lite wrapper (JSNI)
  - Data Visualization (Highcharts)
- Usage of IVOA Protocols
  - TAP accessing archive metadata
  - ADQL describing complex FoVs
- Astronomical services access
  - Target coordinates resolver
  - Angular size resolver

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ESASky team

- Fabrizio Giordano (key person, full-time)
- Henrik Norman (full-time, GUI and astropy)
- María Henar Sarmiento (part-time, GUI)
- Elena Racero (part-time, HiPS and footprints)
- Belén López Martí (full-time EXPRO, HiPS development)
- Pilar de Teodoro (part-time, DB)
- Sara Nieto (part-time, DB ingestion)
- Raúl Gutiérrez (part-time, backend)
- Juan González (part-time, DB optimization)

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