

ESASky: A simple/performant interface on massive astronomical data

Jesus Salgado on behalf of ESDC team

17/10/2016

Issue/Revision: 1.0

Reference: ADASS 2016

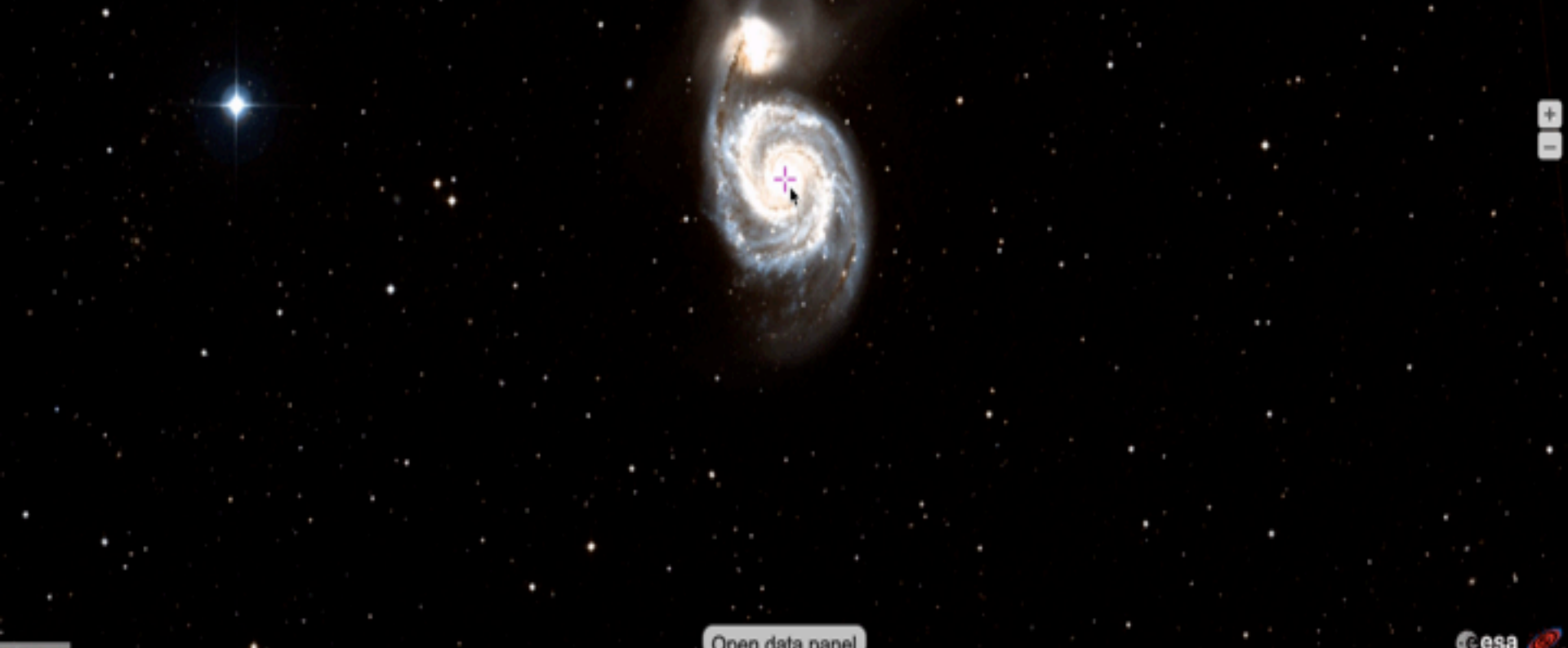
Status: Issued

ESA UNCLASSIFIED - Releasable to the Public

J2000 13 29 52.697 +47 11 45.43

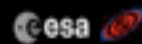
Search...

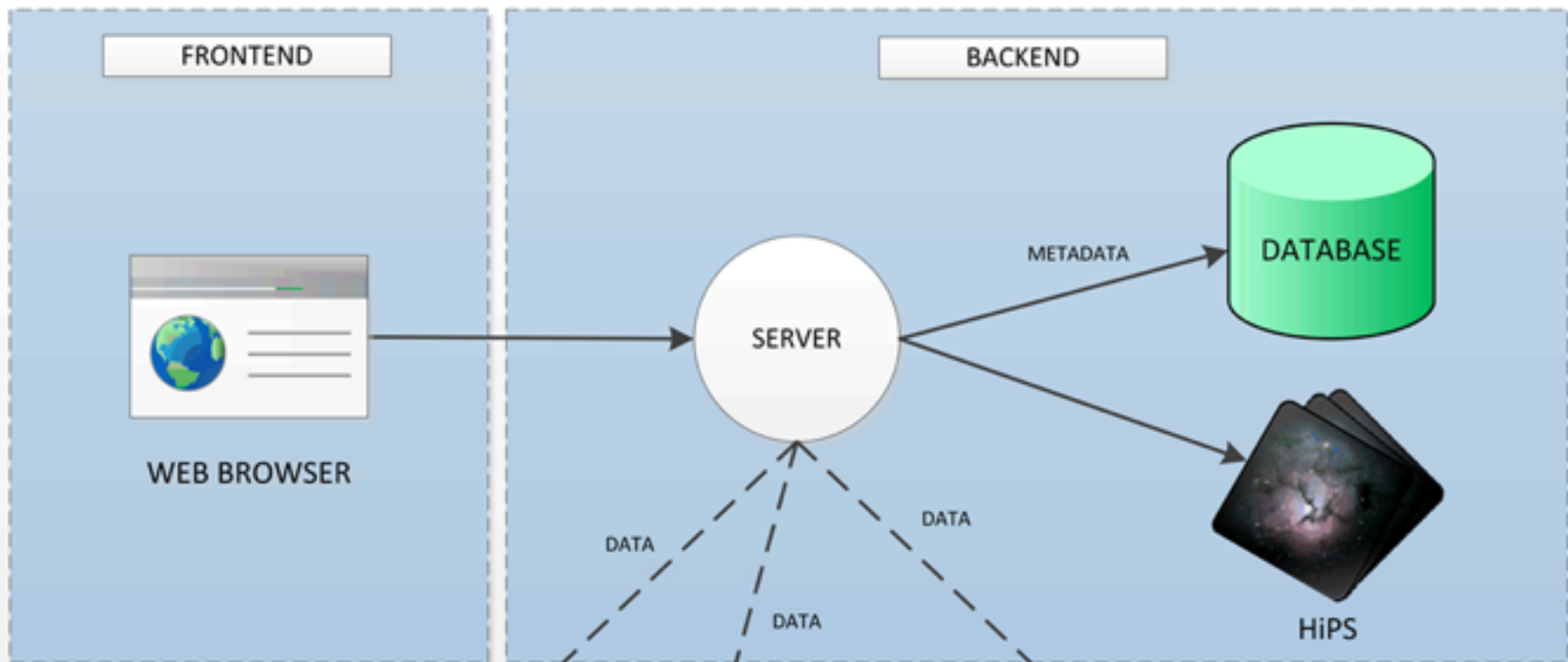
Sky OS2 color



Fov: 59.96'

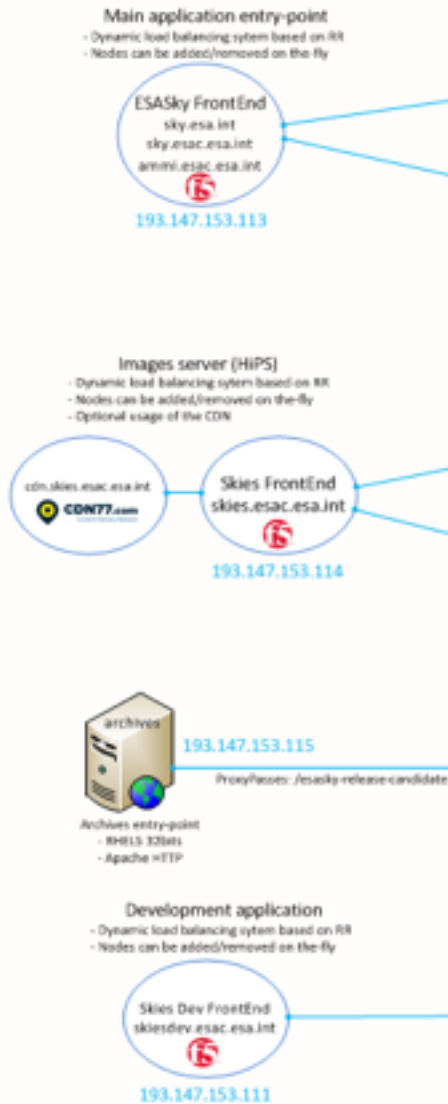
Open data panel



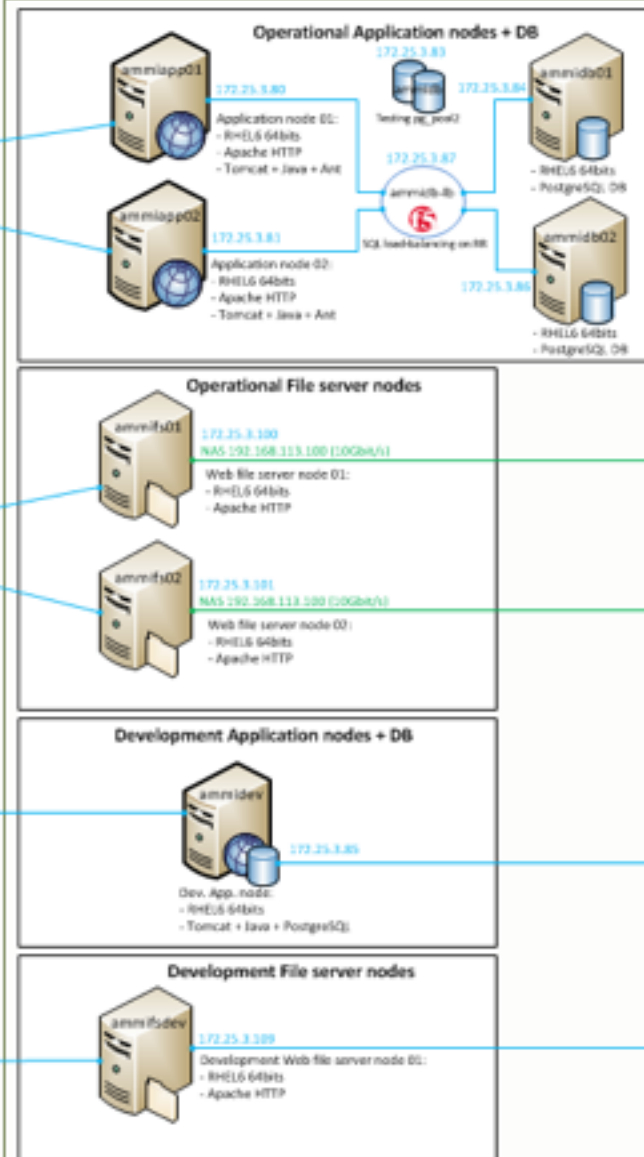


ESASky : scalable system architecture

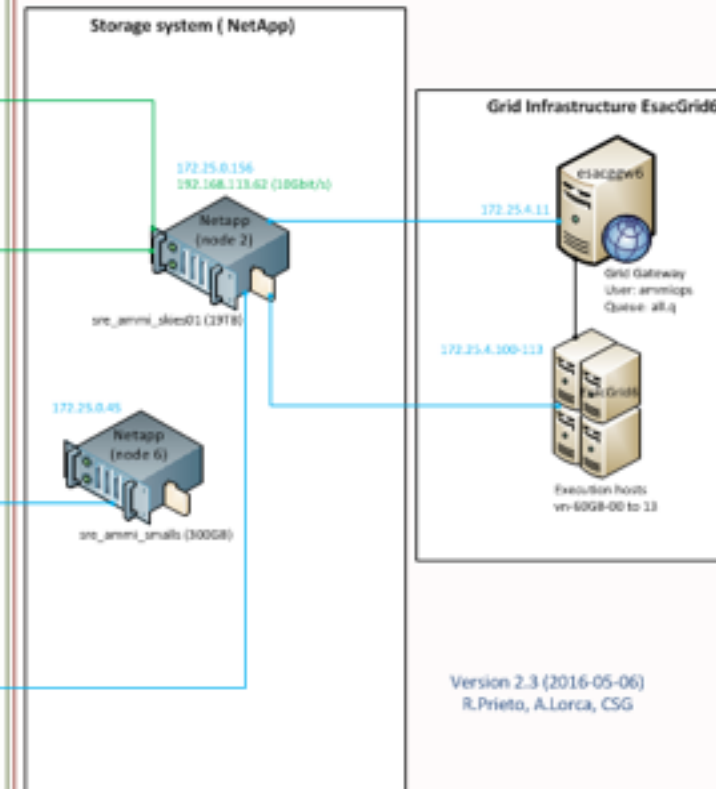
Public layer



Application layer



Data layer



HiPS: Hierarchical Progressive Survey



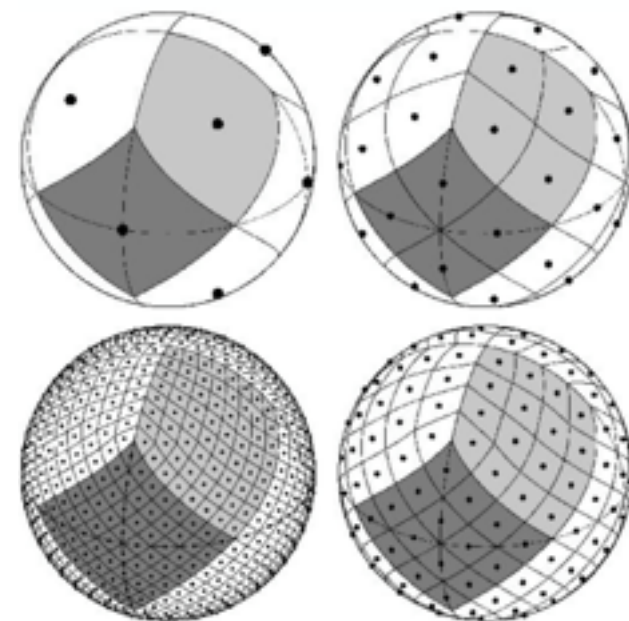
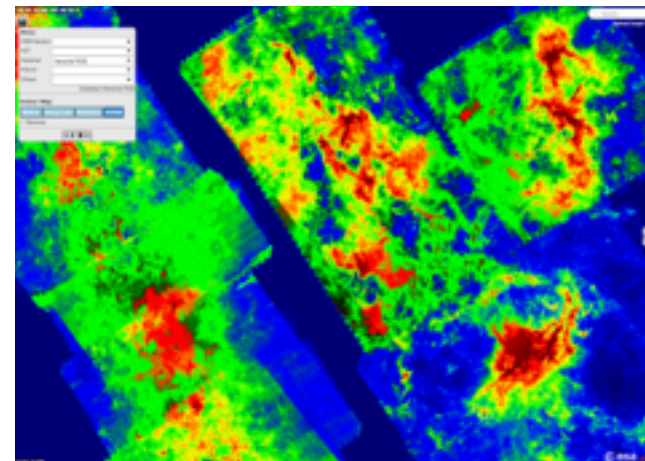
HEALPix (**H**ierarchical **E**qual **A**rea iso**L**atitude **P**ixelation)

[<http://healpix.sourceforge.net>]

Number of levels depend on pixel angular resolution

Mission/ Instrument	Angular resolution	#max hips levels
Planck/LFI & HFI	low	1
Herschel/SPIRE	medium	5
HST/ACS	high	11

[<http://ivoa.net/documents/Notes/HiPS/index.html>]



HiPS: Hierarchical Progressive Survey



Observations with
different calibration or
exposure time

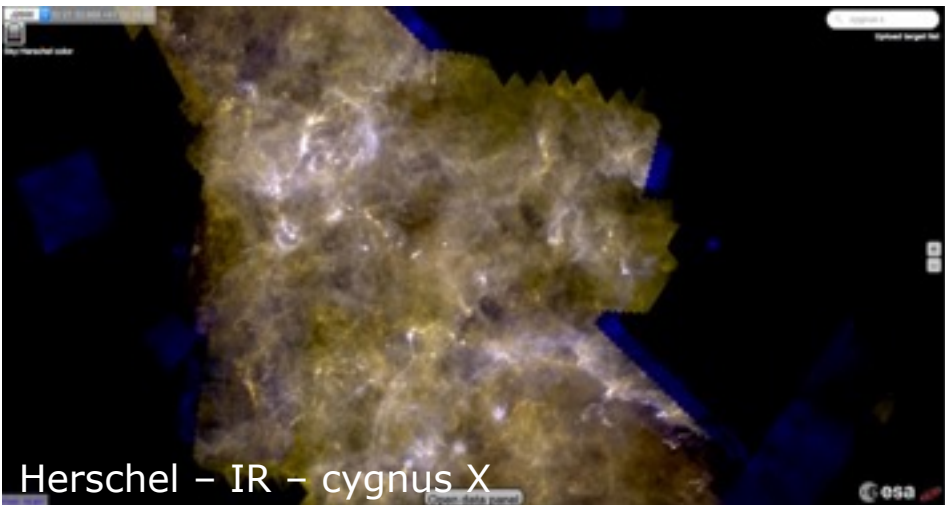
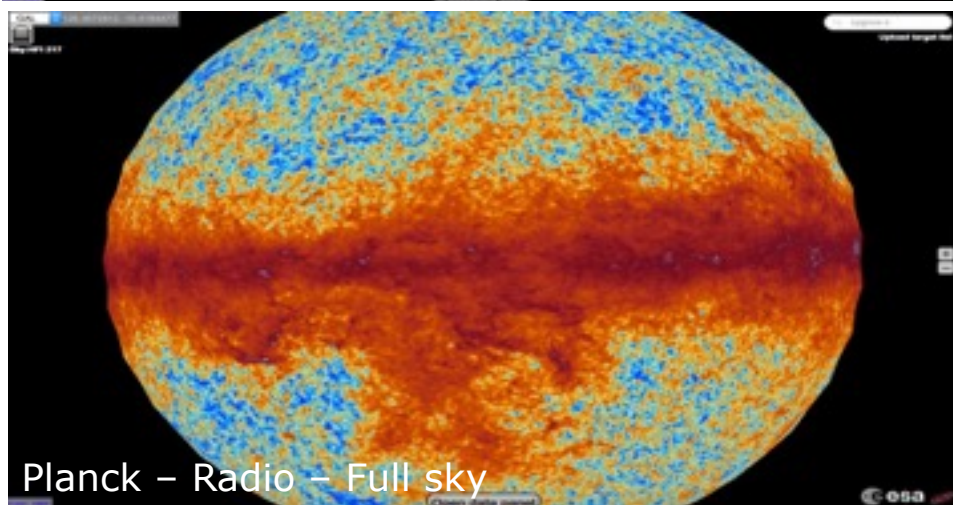
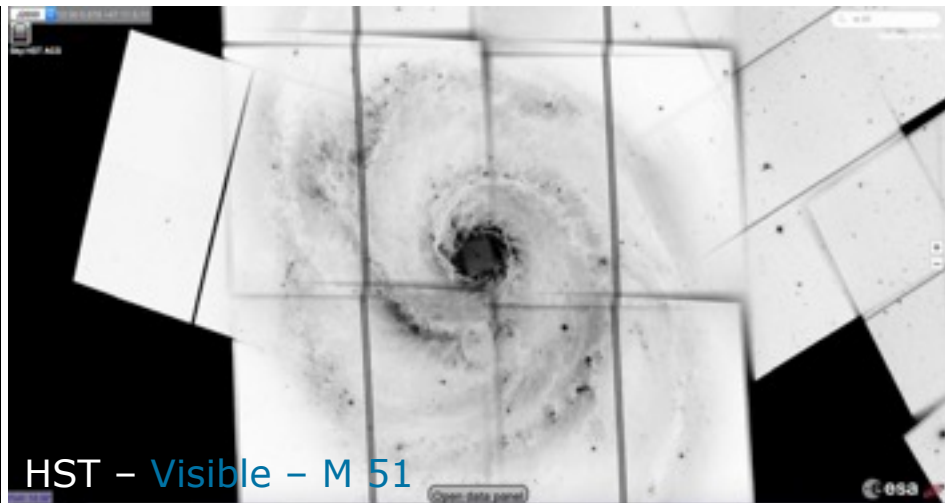
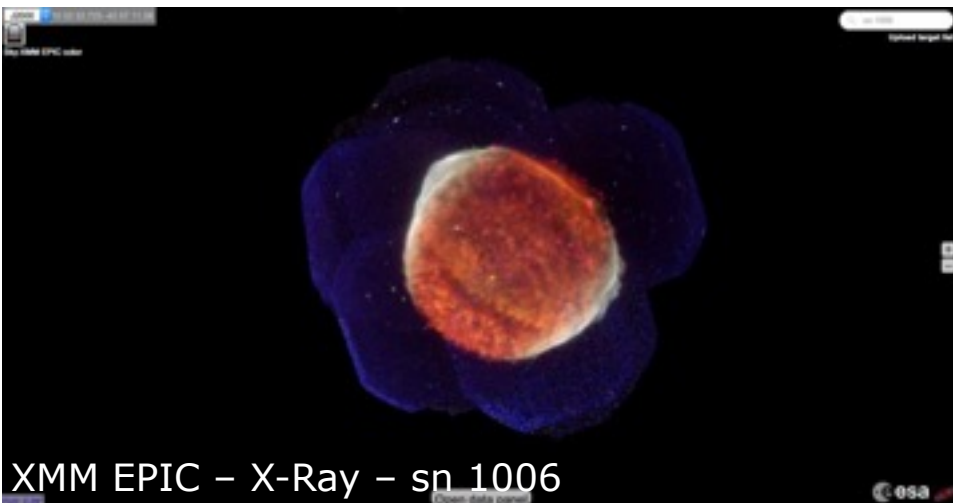


*HiPS
Don't Lie!*

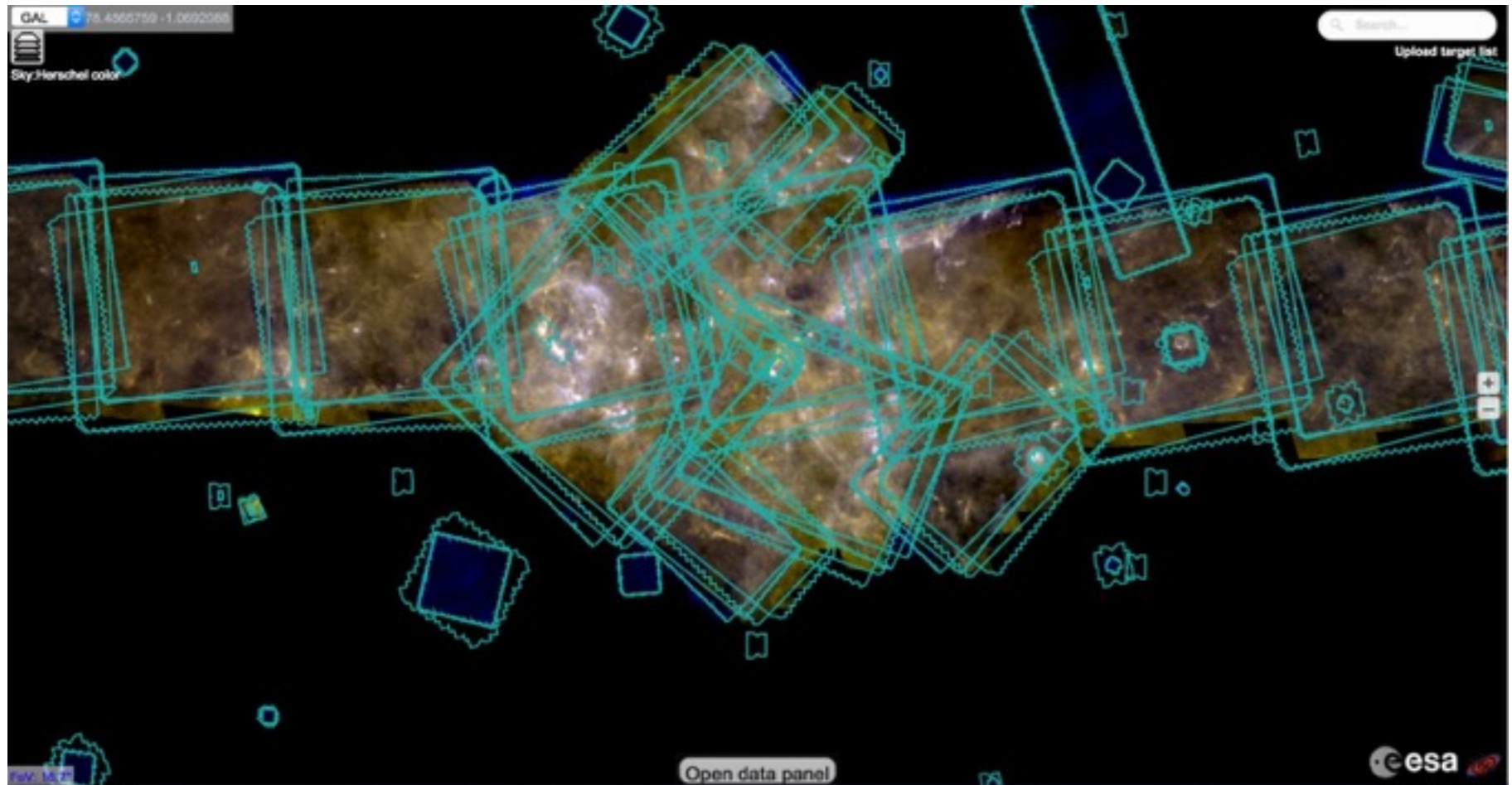
Duplicated sources

CCD borders

HiPS generation: Support from Projects



Connecting to Observations: Footprints



TAP and Data Base Geometrical Indexing

Apache HTTP Server

- Serves HiPS requests

Java Servlet container (Tomcat)

- Serves TAP & Target Resolver requests
- Data and metadata download request

Database

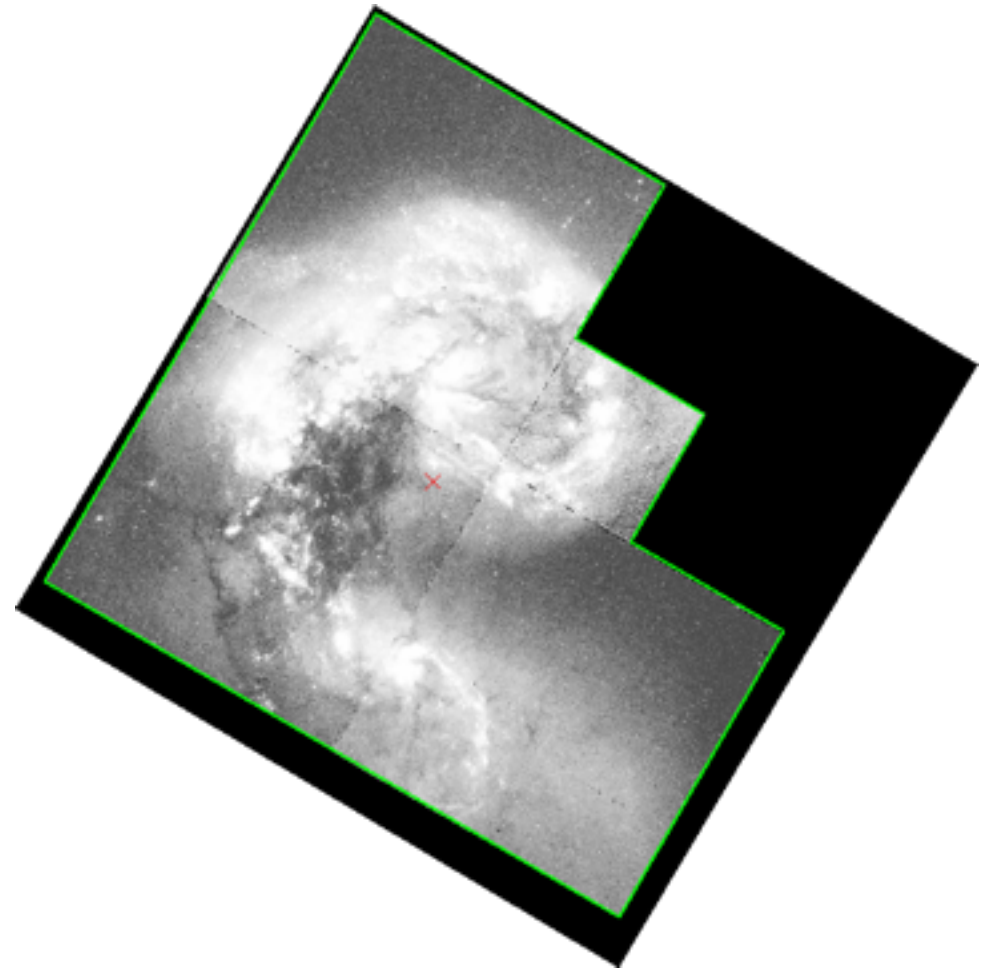
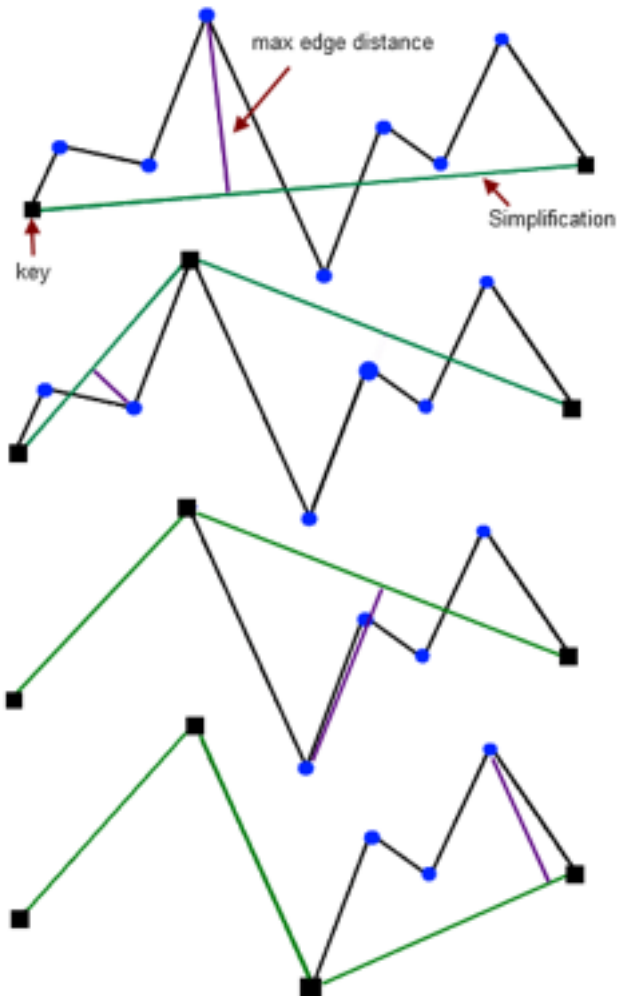
- PostgreSQL DB (FDW and MV)
- Spherical data types library (PgSphere)
- Footprints -> Spherical data types

Usage of IVOA Protocols & Standards

- TAP (Table Access Protocol) requests
- ADQL translation to SQL + PgSphere
- Storage of STC-S



Observational footprints



ST-ECF Footprint Finder, Felix Stoehr

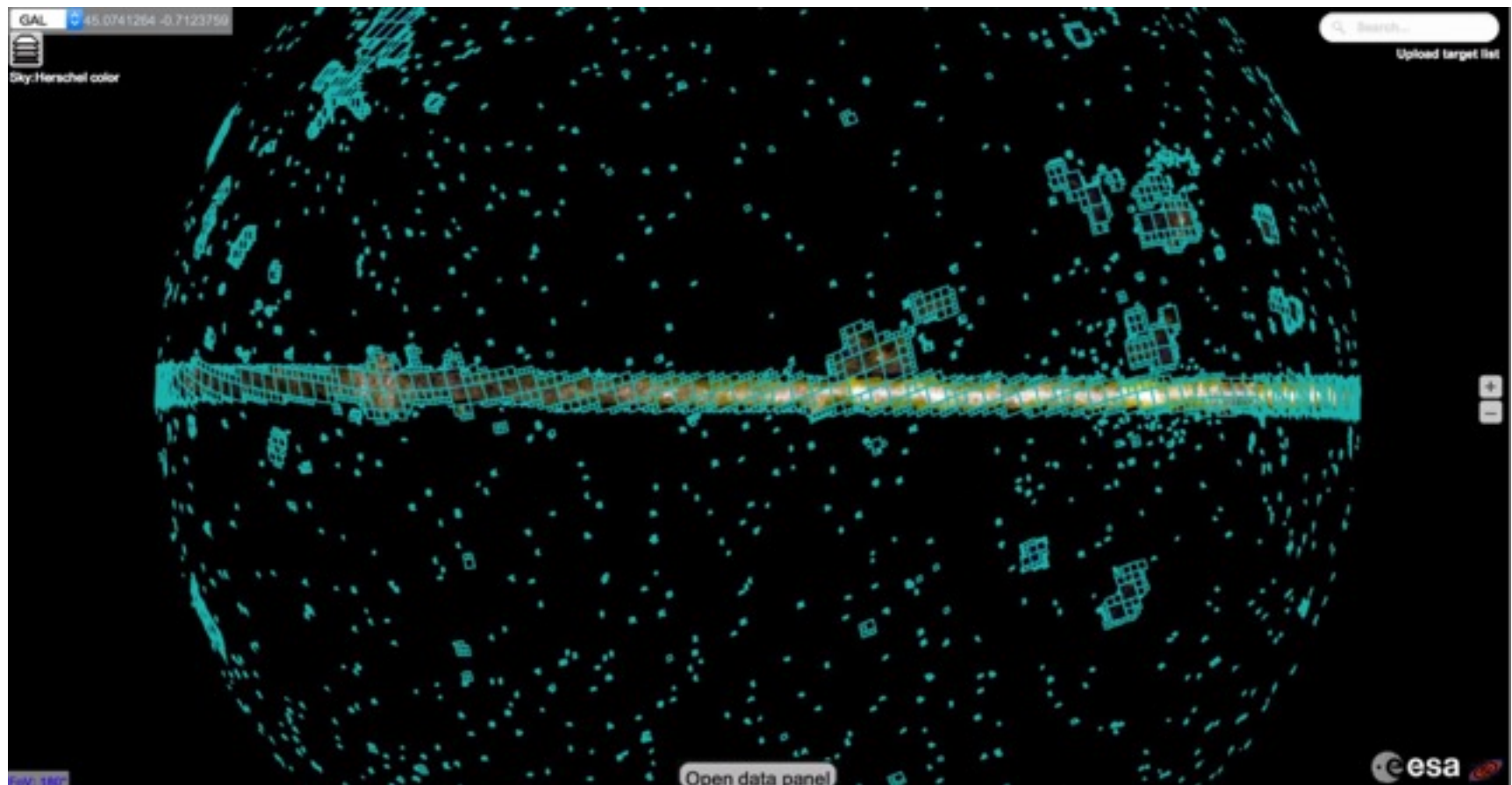
Footprints in numbers



Observation type	#footprints (#observation)	#total points
XMM-Newton	8.375	192.831
XMM-OM(UV)	9.211	38.462
XMM-OM(UVB)	3.379	76.925
HST	345.519	2.361.085
ISO	6.898	50.198
Herschel	23.172	1.076.667

Mission coverage using MOCs (Multi-Order Coverage)

IVOA standard [<http://ivoa.net/documents/MOC/index.html>]



MOC in numbers



Observation type	Total #polygons in MOC	Total #points in MOC (x4)	Total #points for footprints
XMM-Newton	12.848	51.392	192.831
XMM-OM(UV)	7.128	28.512	38.462
XMM-OM(UVB)	3.702	14.808	76.925
HST	34.795	139.180	2.361.085
ISO	9.103	36.412	50.198
Herschel	17.099	68.396	1.076.667

Source Catalogues



Catalogue	#sources
INTEGRAL	2.077
XMM Slew	41.423
3XMM EPIC	333.481
XMM OM	3.492.082
Tycho-2	2.539.913
Hubble SC	29.164.309
Planck SZ	1.653
Planck GSS	13.242
Planck CSS	138.247

In the process of supporting the Gaia Source Catalogue that contains 1.2 thousand million objects

Other clients and command Line Access



1. Server services based on IVOA protocols:
 - a. TAP
 - <http://sky.esa.int/esasky-tap/tap/>
 - b. HiPS
2. Clients can be implemented to access metadata and data from ESASky in command line
3. Standard clients can be used to consume ESASky resources:
 - a. Topcat for TAP
 - b. Aladin for HiPS
4. ESASky astroquery module merged
pip install <https://github.com/astropy/astroquery/archive/master.zip>

Thanks!



<http://sky.esa.int>



@ESAesdc

Team

Fabrizio Giordano (Software Engineer and Key Person), Jesús Salgado (Technical astro lead), Bruno Merín (Product Owner), Deborah Baines, Belén López Martí (HiPS generation), María H. Sarmiento (Software Engineer), Elena Racero (HiPS and footprints), Raúl Gutiérrez (Software Engineer), Pilar de Teodoro (DB administrator), Sara Nieto (Software Engineer)

Previous Collaborators (MMI prototype)

Iñaki Ortiz, Ignacio León, Andy Pollock, Michael Rosa

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