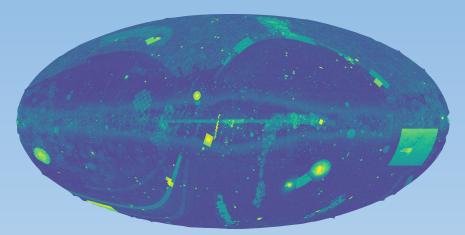


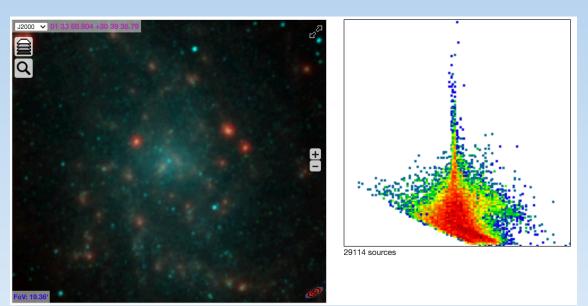
Generic data container

HiPS tiles have been used to store:

- flux
- count (density maps)
- 2D histograms
- polarization data



Density HiPS of sources published in A&A papers



Dynamic color-magnitude diagram, stored in HiPS tiles http://alasky.unistra.fr/DtU17-hack/

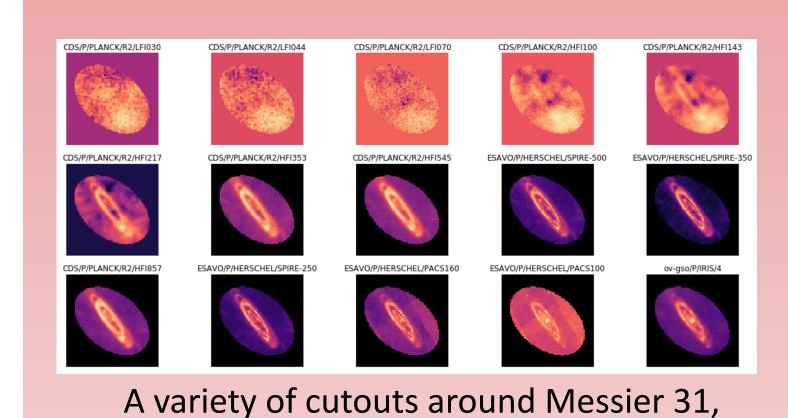
hips2fits

—> cutouts from HiPS

- input: *HiPS ID + WCS*
- output: FITS cutout
- powered by *Astropy*,

 cdshealpix, accelerated by *Rust*and numba
- performance: 500k pixels per second
- easy access from astroquery
- available for any public HiPS

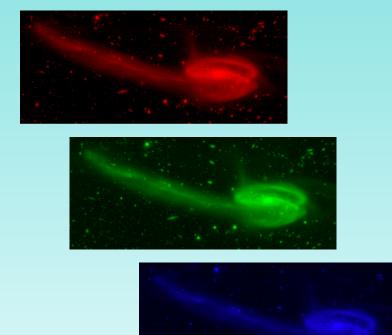
—> this code has been used to generate millions of training data cutouts for machine learning purposes



generated by hips2fits

On-the-fly color HiPS generation

Tiles from different HiPS datasets can be mixed together in order to create a new color HiPS, allowing easy color combination and multi-wavelength comparison.





Color HiPS created from individual Hyper Suprime-Cam (HSC) Subary HiPS

In 10 years, HiPS (Hierarchical Progressive Survey - https://ivoa.net/documents/HiPS/) has evolved from a prototype experiment led by CDS to a real ecosystem, supported by more than 20 data centers exposing their own HiPS node. This trend has been pushed by advanced and simple clients (Aladin Desktop, Aladin Lite) or portals (ESASky, ESO Science Portal) and thanks to Hipsgen.

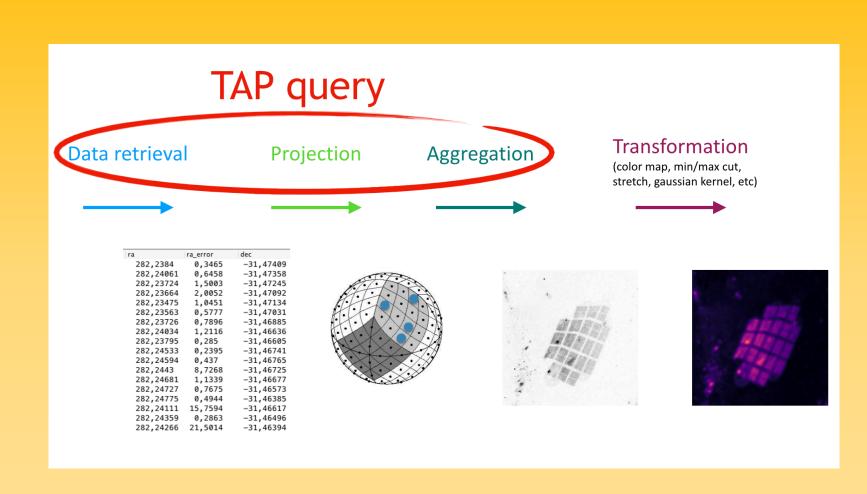
Today the HiPS ecosystem gathers 900 HiPS datasets

published by 20+ HiPS nodes

We describe in this poster different tools and services that benefit from having a large collection of multi-wavelength datasets available in the same format: hips2fits, on-the-fly generation of RGB tiles from pre-existing HiPS, HiPS as a container for 1d and 2d histograms, CatTile, computation on the HiPS grid, generation of Spectral Energy Distribution from FITS tiles.

Most of these tools are either already available in production or as prototypes.

CatTiler



We take advantage of the HEALPix User Defined Function available in some TAP services to generate HiPS density tiles from ADQL queries, possibly weighted by a given column and with additional constraints. This allows for interactive exploration of large catalogues.

SELECT HEALPIX(RAJ2000, DEJ2000, 10)
AS ipix, COUNT(*) as cnt
 FROM "II/246/out"
 WHERE HEALPIX(RAJ2000, DEJ2000,
3)=528 AND Kmag-Jmag>1
 GROUP BY ipix

Computation on the HiPS grid

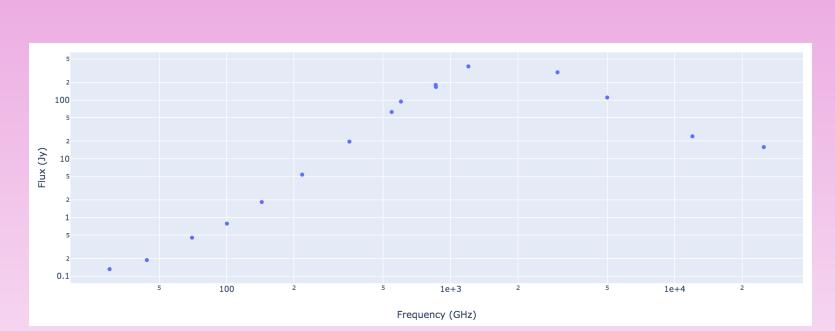
As the HiPS datasets in the same coordinates system are in the exact same grid, it is straightforward to make some computations between different HiPS datasets.

This can be used for instance to provide moment-0, moment-1 and moment-2 of HiPS data cubes.

SED from FITS tiles

We have developed an early-stage prototype to extract a Spectral Energy Distribution for an arbitrary region, from FITS tiles.

The first results are promising and pinpoint the need for an accurate characterization and description of the flux unit in the HiPS metadata.



Messier 33 SED, extracted from Planck, Herschel, Spitzer and IRIS HiPS FITS tiles

