

# Experimenting with HiPS: going beyond static image tiles

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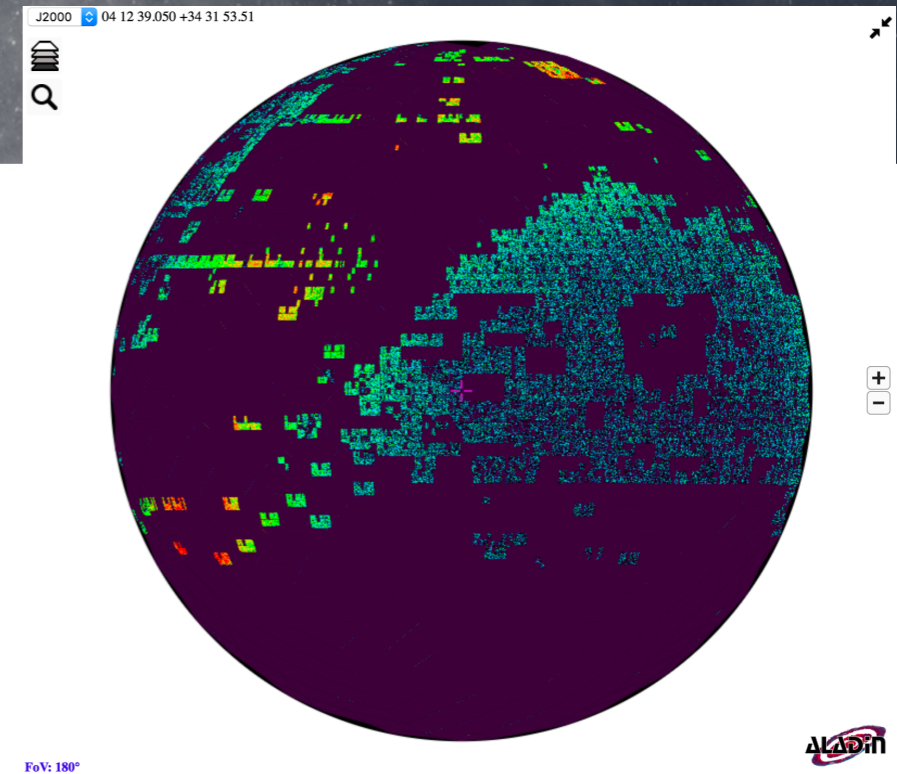
**Thomas Boch**  
& the CDS *HiPS* Team



# □ Outline

- Density HiPS for VizieR tables
- Tile generation from catalogue attributes
- Computation on the HEALPix grid
  - example: 3-channel HiPS mixer
- HiPS for polarisation data
- HiPS structure for parameter space exploration
  - dynamic color-magnitude diagram
- Other HiPS news
  - GSoC project
  - Pan-STARRS HiPS

# □ Density HiPS



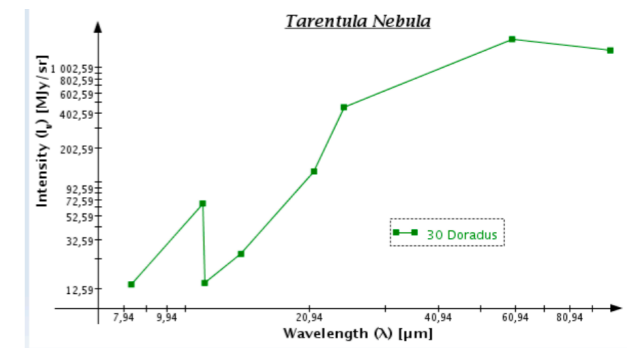
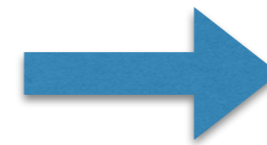
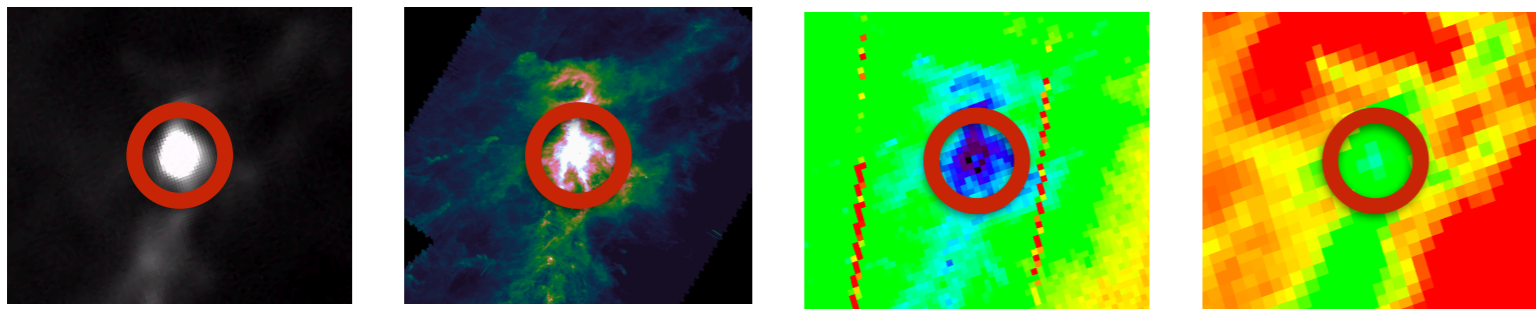
- In addition to MOCs:
  - Density HiPS created for all VizieR tables
- Status: to be integrated in HiPS clients (Aladin Desktop, Aladin Lite, ...)
- Hybrid density-catalogue HiPS
  - Client-driven

# □ Tile generation from catalogues

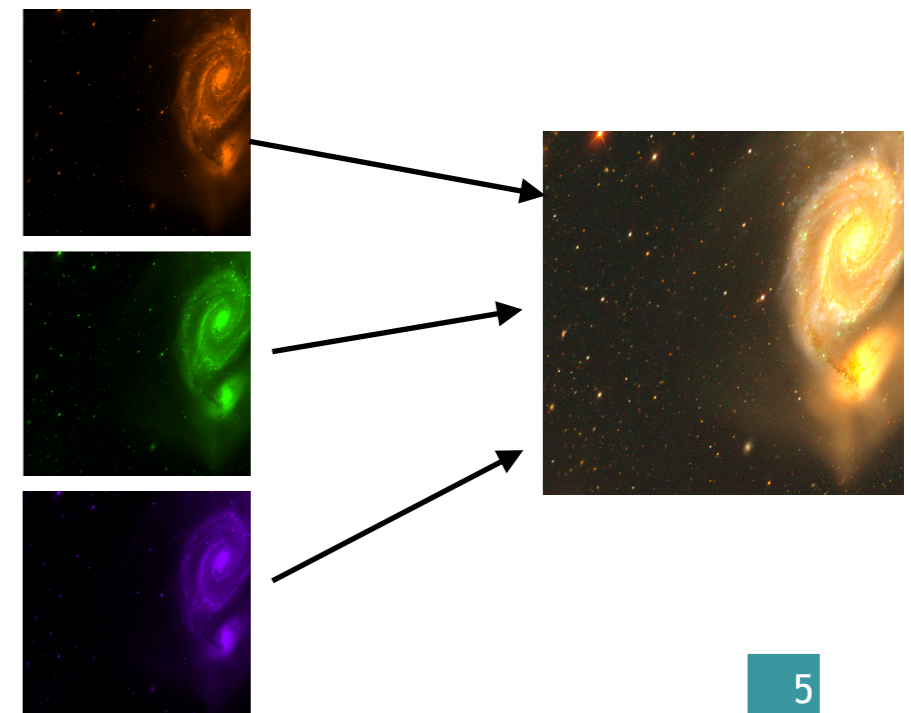
- How can HiPS help exploration of large catalogues?
  - too many sources to download, overplotting issue
  - need to summarize information
- output HiPS tiles depicting spatial distribution of sources matching some constraints (density might be weighted according to some other parameters)
  - extension of the idea explored with JNanocubes (Boch/Pineau, ADASS 2014)
- Easy to generate from TAP services with a HEALPix UDF
  - `SELECT HEALPIX(ra, dec, 11) as hpx, count(*) FROM t WHERE HEALPIX(RAJ2000, DEJ2000, 3)=490 AND Jmag<14 GROUP BY hpx`
    - slow for large tables/tiles with many sources
  - similar to Taylor, Mantelet & Demleitner poster ADASS 2016 *All of the Sky: HEALPix density maps of Gaia-scale datasets from the database to the desktop*
- Demo

# □ Computation on the HEALPix grid

- Structure of HiPS images makes it easy to combine data/perform computation, eg:
  - pixel operation (difference, convolution, etc)
  - SED extraction on the fly for a set of HiPS

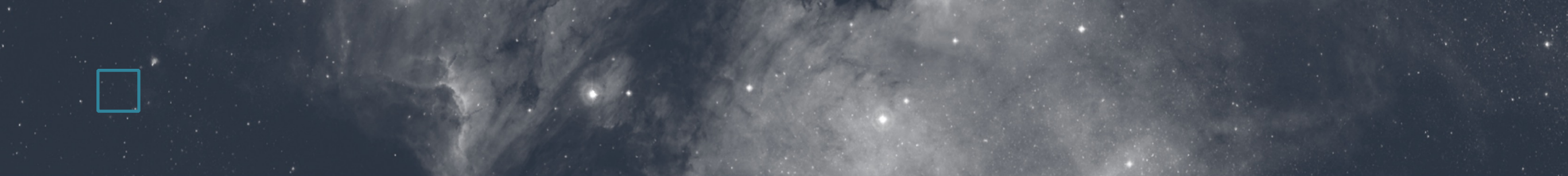


- HiPS mixer
  - generate RGB tiles from 3 HiPS
  - status: prototype
  - demo

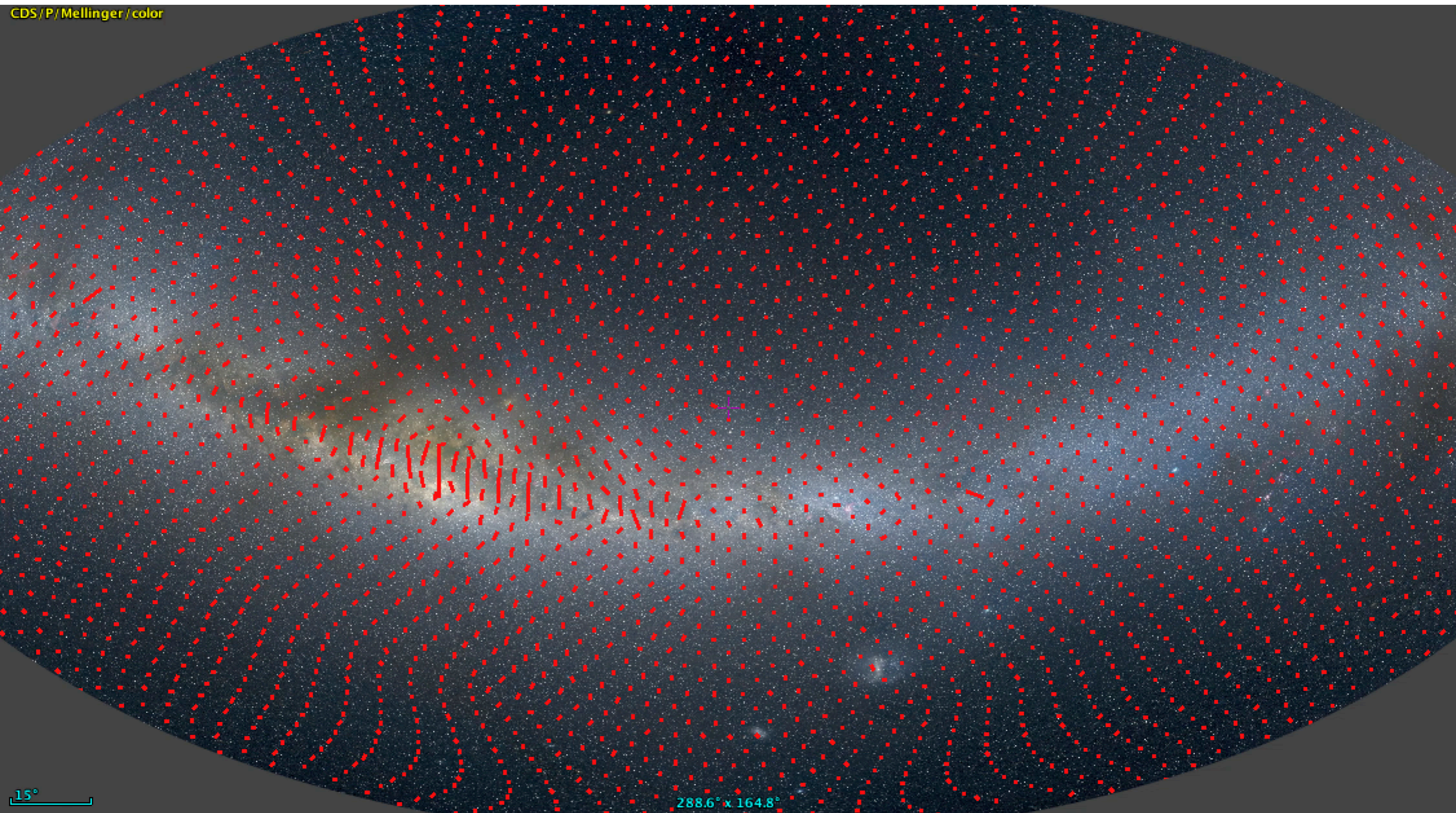


# □ HiPS for polarisation data

- Need: visualize Planck polarisation in HiPS clients (Aladin Lite/Desktop)
  - request from Planck team
- Image tiles: a tile is a 2D image, each pixel encodes the image intensity
- Polarisation tiles: a tile has 2 extensions (Q, U).  
Each extension pixel encodes the corresponding Stokes parameter (mean) value for the given HEALPix cell
- Status:
  - *Hipsgen* to be updated to generate these specialized tiles from HEALPix maps
  - Clients to be updated



CDS/P/Mellinger/color



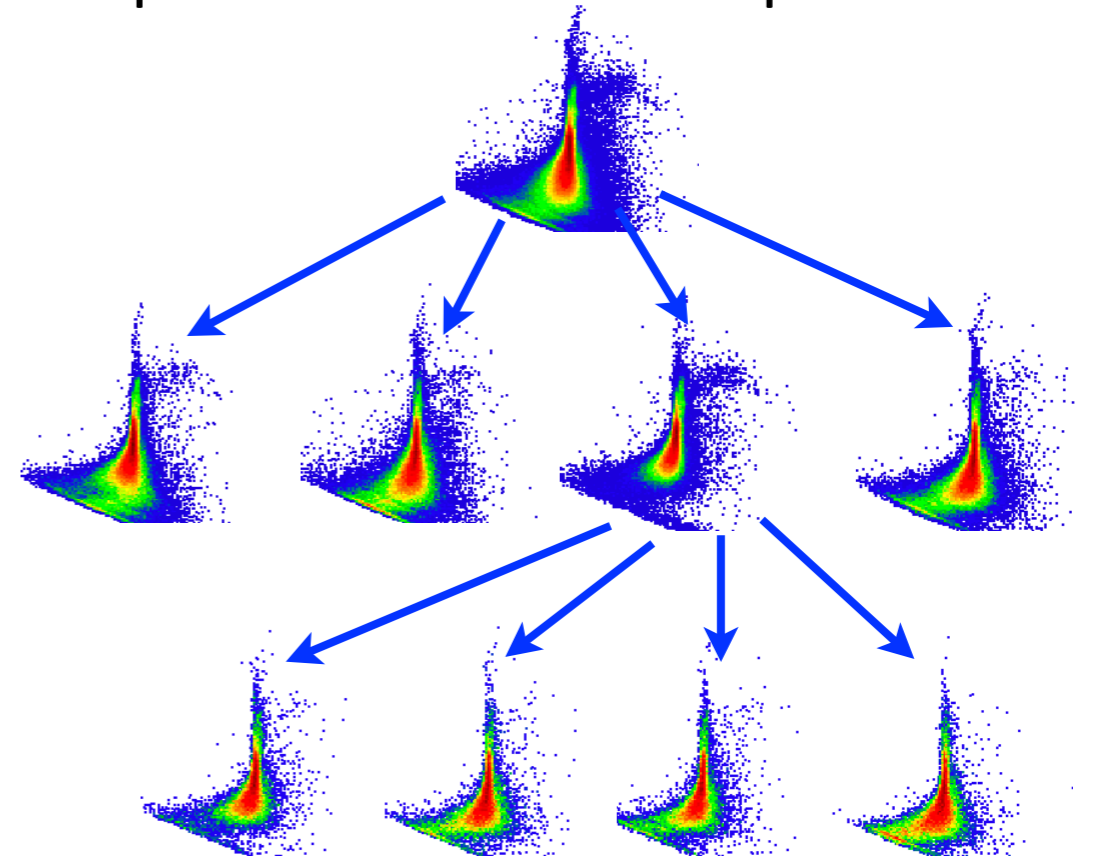
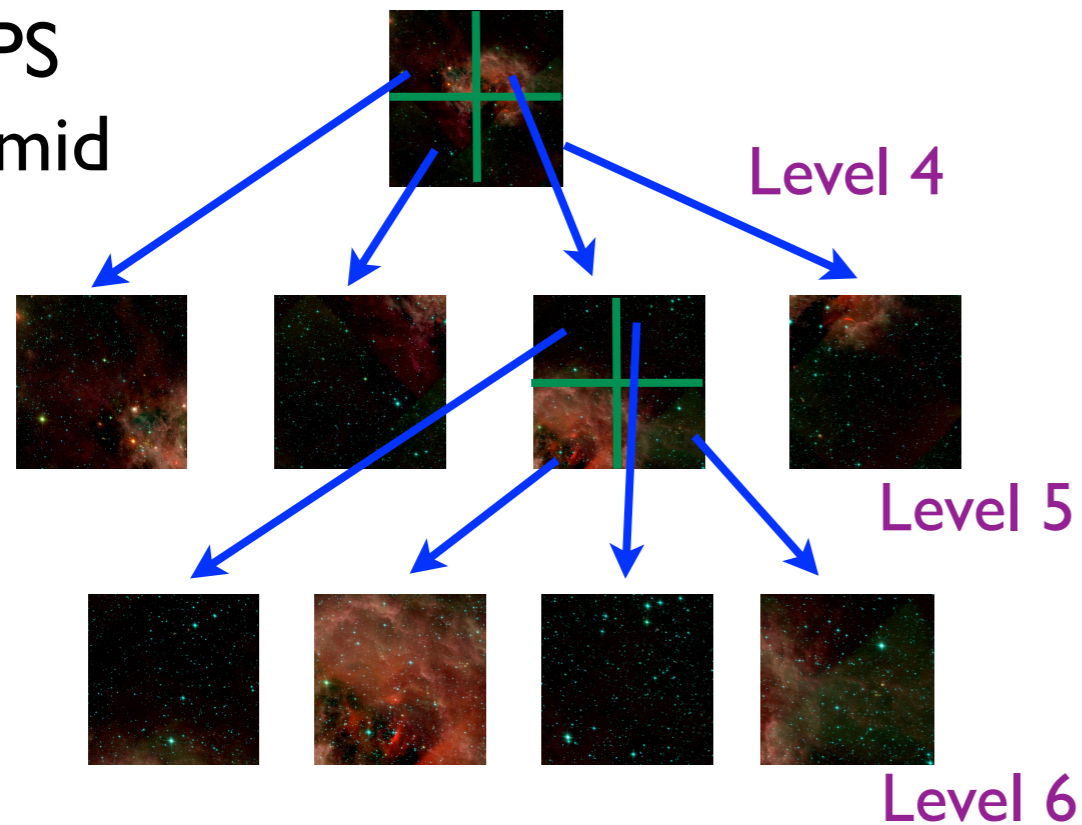
15°

288.6° x 164.8°

# □ Parameter space exploration

- Idea: use HiPS structure to store pre-computed 2D density maps

HiPS  
pyramid



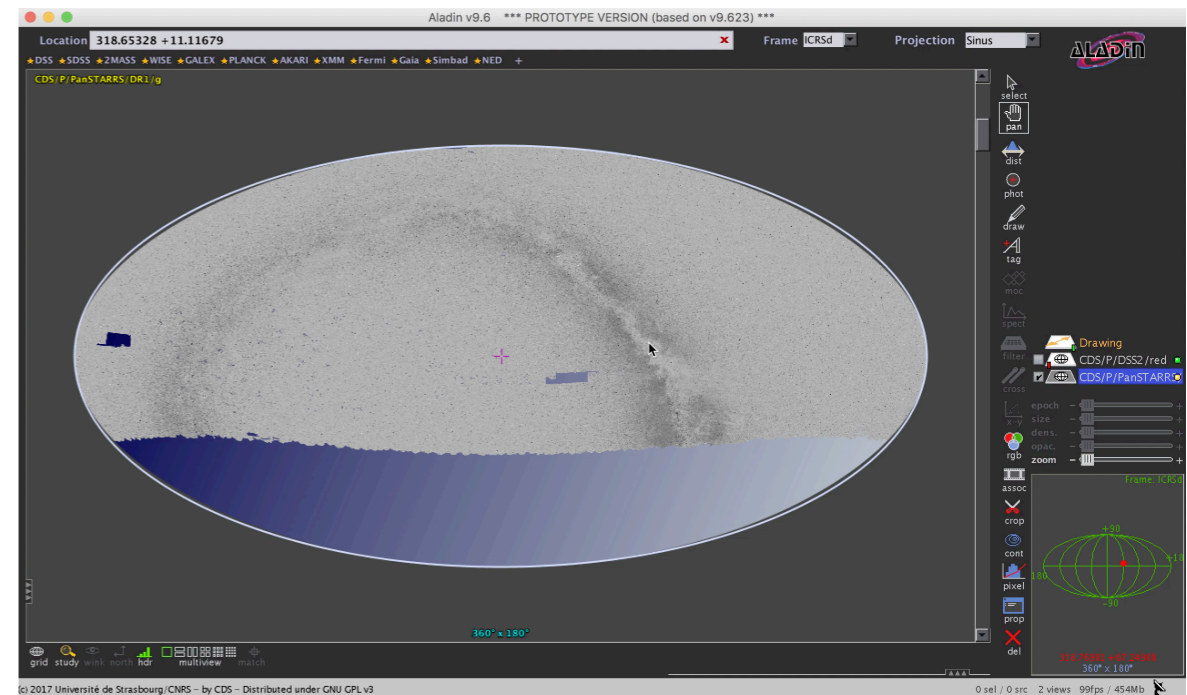
- status: working prototype
- Demo: dynamic Color-Magnitude Diagram (AllWISE W2-W1 vs W1)
  - 200k 2D density maps pre-computed and stored as JSON files (deepest HEALPix order: 7)



# □ Other news

- Google Summer of Code student (*Adeel Ahmad*) will develop a HiPS client for Python (*mentors: C. Deil, T. Boch*)
  - May to August
  - longer-term goal: integration in Astropy
  - <https://summerofcode.withgoogle.com/projects/#4552088395710464>

- Pan-STARRS HiPS
  - one band (*g*) processed
  - largest HiPS produced
    - 20+ TB per band
    - original images: 250 mas/pix
  - all 5 bands (*g,r,i,z,y*) will be available as HiPS





Thank you!