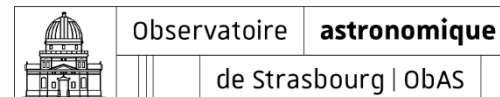# Do HiPS yourself!

ASTERICS European Data Provider Forum and Training Event
27 /28 June 2018 - Heidelberg

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de Strasbourg | ObAS

☐ The plan

1. HiPS ? What is it ?
2. State of the art
3. Recent news
4. Do HiPS yourself
   -> in live

HIPS

Short for *host-based intrusion prevention system*, HIPS is an IPS or *intrusion prevention syst___ ___ ___ity over host-based systems where i___ ___ and infecti___ ___ealt with at the individual worksta___ ___el to provide a more ___ ___e level of security.

See also *IPS*, int___ ___n preven___ ___stems.
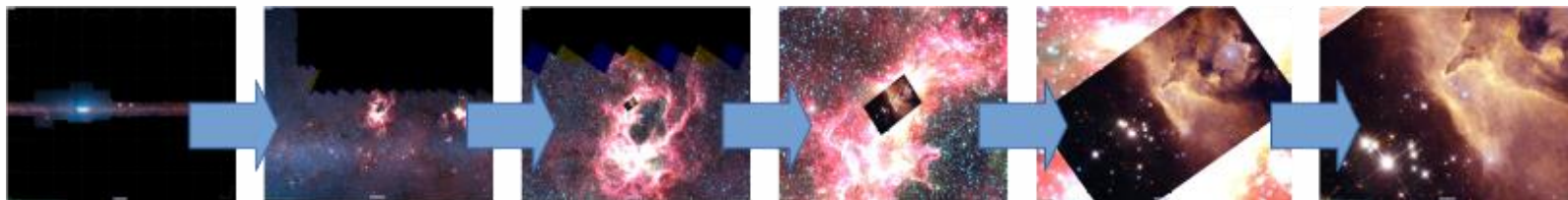
Hips

In vertebrate anatomy, hip___ an anatomical region or a joint. Plus sur Wikipedia

HiPS ? What is it ?

- **Hi**erachical **P**rogressive **S**urvey
  "The more you zoom in on a particular area,the more details show up"

- Multi-resolution **HEALPix** data structure

- for **Images**, **Catalogues**, 3-dimensional data **cubes**, …

- **Conserves scientific** data properties alongside visualisation considerations

- No databases or dedicated servers are required, just http
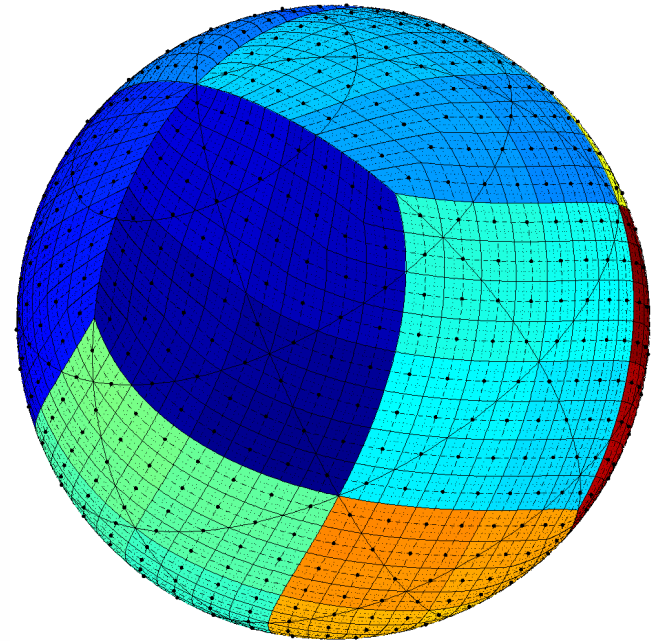
Aladin Desktop

Aladin Lite integration

Stellarium

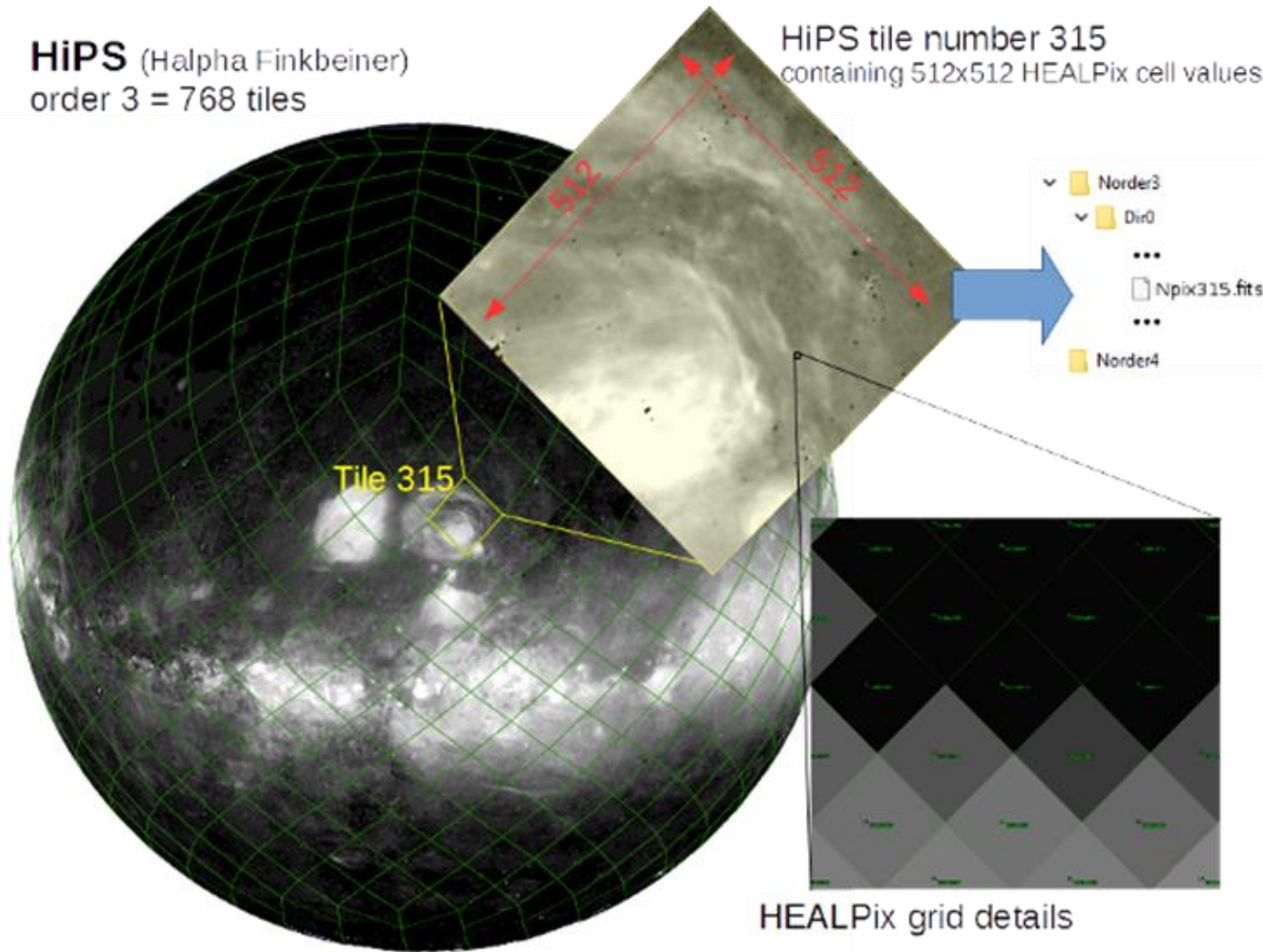Aladin Lite adaptation

HEALPix based (Gorski et al. 2005)

- **12 quadrilateral pixels**
- 2x2 division at each level
- **Equal area**
- Iso-latitude
- Libraries (order 29 = **400 μas**)
- HiPS = Mosaic of HEALPix (spherical) tiles stored in a hierarchy of files

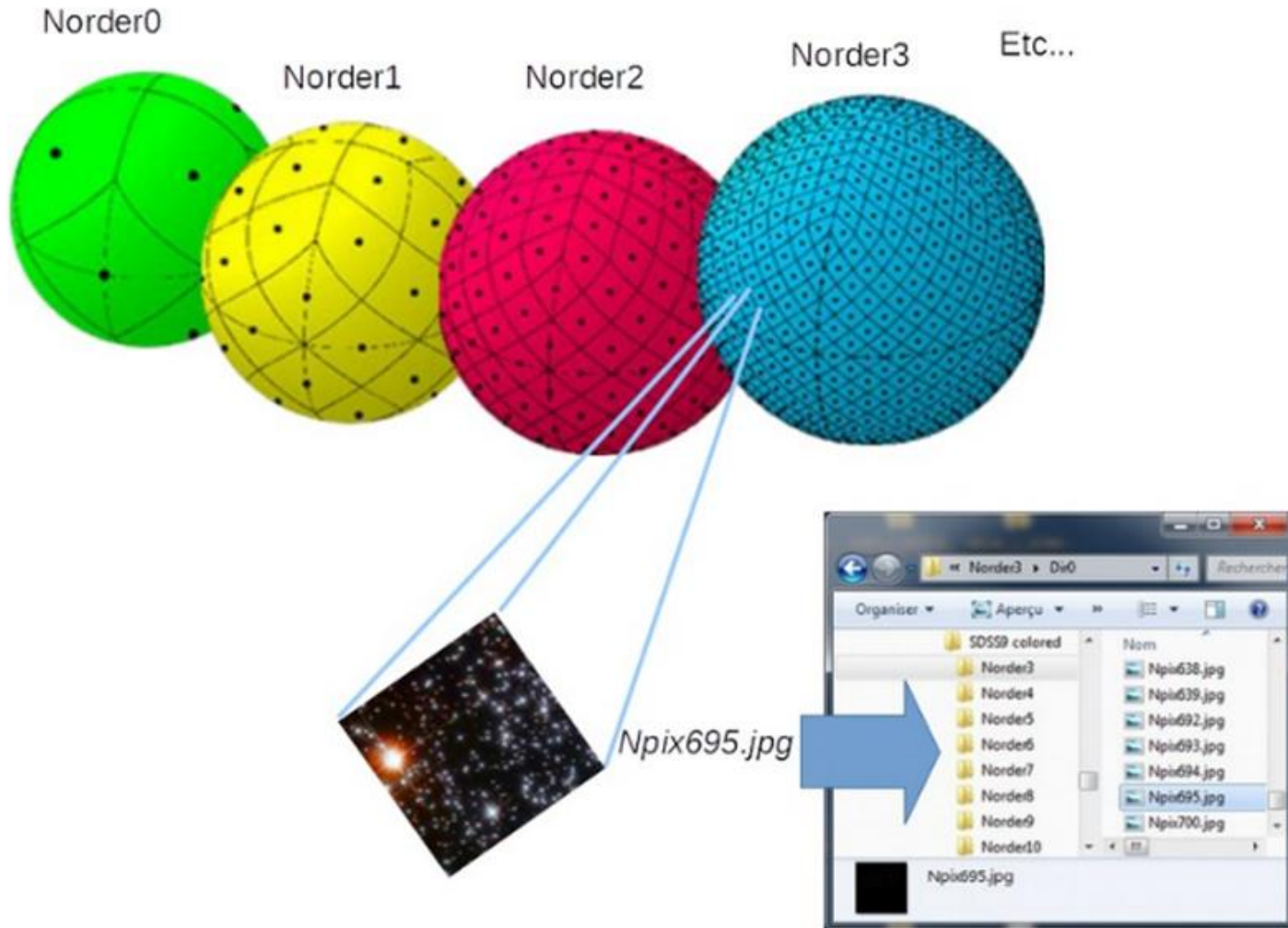# HiPS = Mosaic of HEALPix tiles (HEALPix pixel geometry)

HiPS (Halpha Finkbeiner)
order 3 = 768 tiles

Tile 315

HiPS tile number 315
containing 512x512 HEALPix cell values

512

512

Norder3
  Dir0
    ...
    Npix315.fits
    ...
Norder4

HEALPix grid details

HiPS = collection of tiles as files
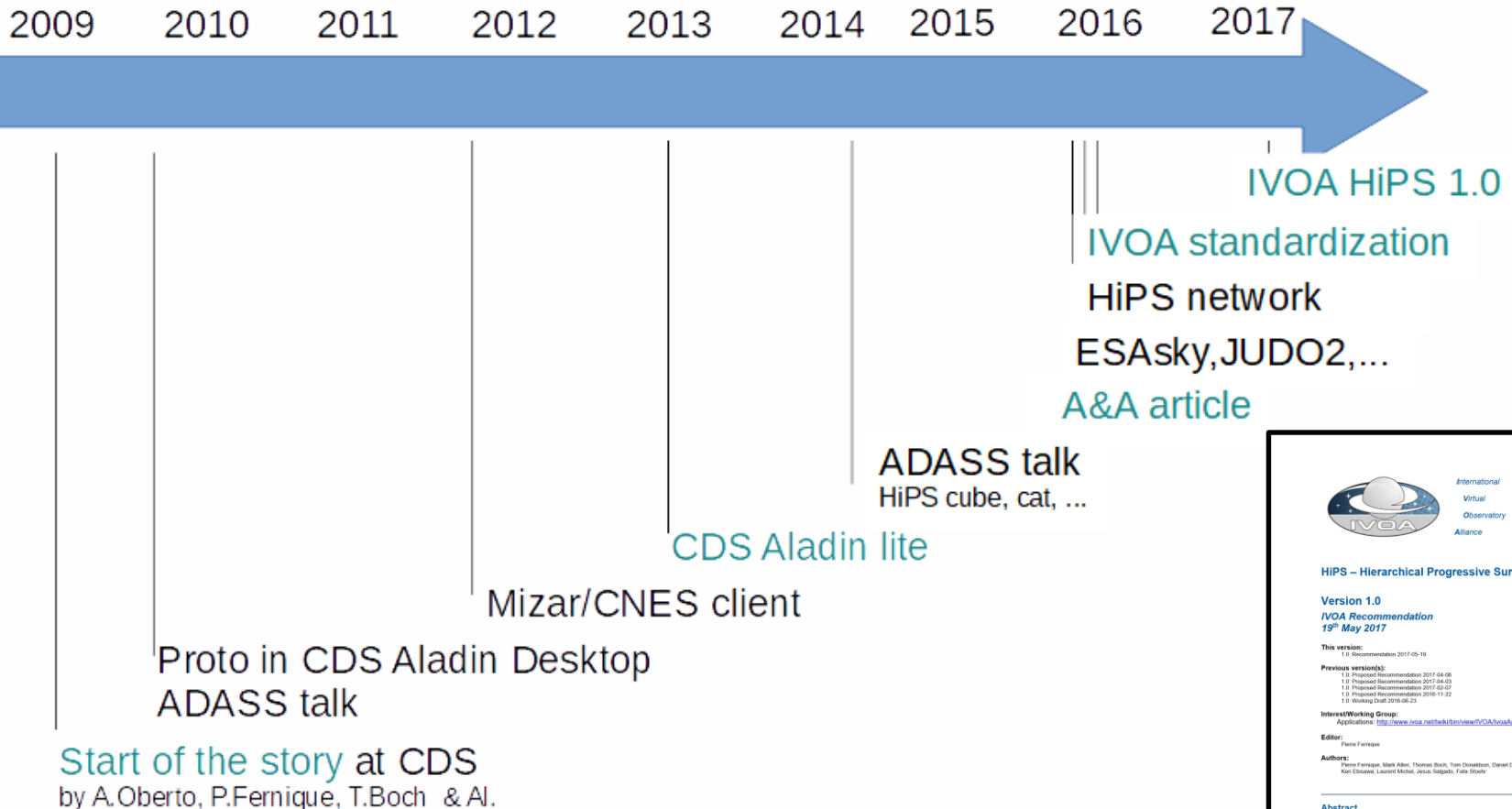
Going beyond zoom and pan

- **Visualisation** and **preservation** of **science data**
  - JPEG/PNG and **FITS** (preserves dynamic range)
  - HEALPix is scientifically robust
  - Link mechanism to original data

- **Ease** of implementation (generation & publication)
  - No databases or servers, just HTTP
  - Leads to fast take-up and innovation

    ```
    java –jar Hipsgen.jar in=Fits_directory
    ```

IVOA standard since 2017

States of the art
(June 2018)

- **500+** HiPS for **200TB** data
- New HiPS last months:
  - Big reference surveys: **PanSTARRs**, Skymapper, VISTA, SWIFT, DECaLS, DECaPS, DES, BASS, Gaia2,…
  - **Planetary maps** (+50)
- **600 000+** HiPS tiles requested / day (x2 in 1 year)

- HiPS clients : **8** independent implementations (**+4**),
  - Aladin Desktop (java), Aladin Lite (JS/canvas) + derived tools, MIZAR/CNES (JS/WebGL + **Firefly/IPAC (JS), Stellarium (C), Kstar (C?)**, 140 Aladin Lite implementations
  - In preparation : **OpenWWT/china-VO, *Globalsphere*/NAOJ? (WebGL)**

HiPS network = the HiPS cloud
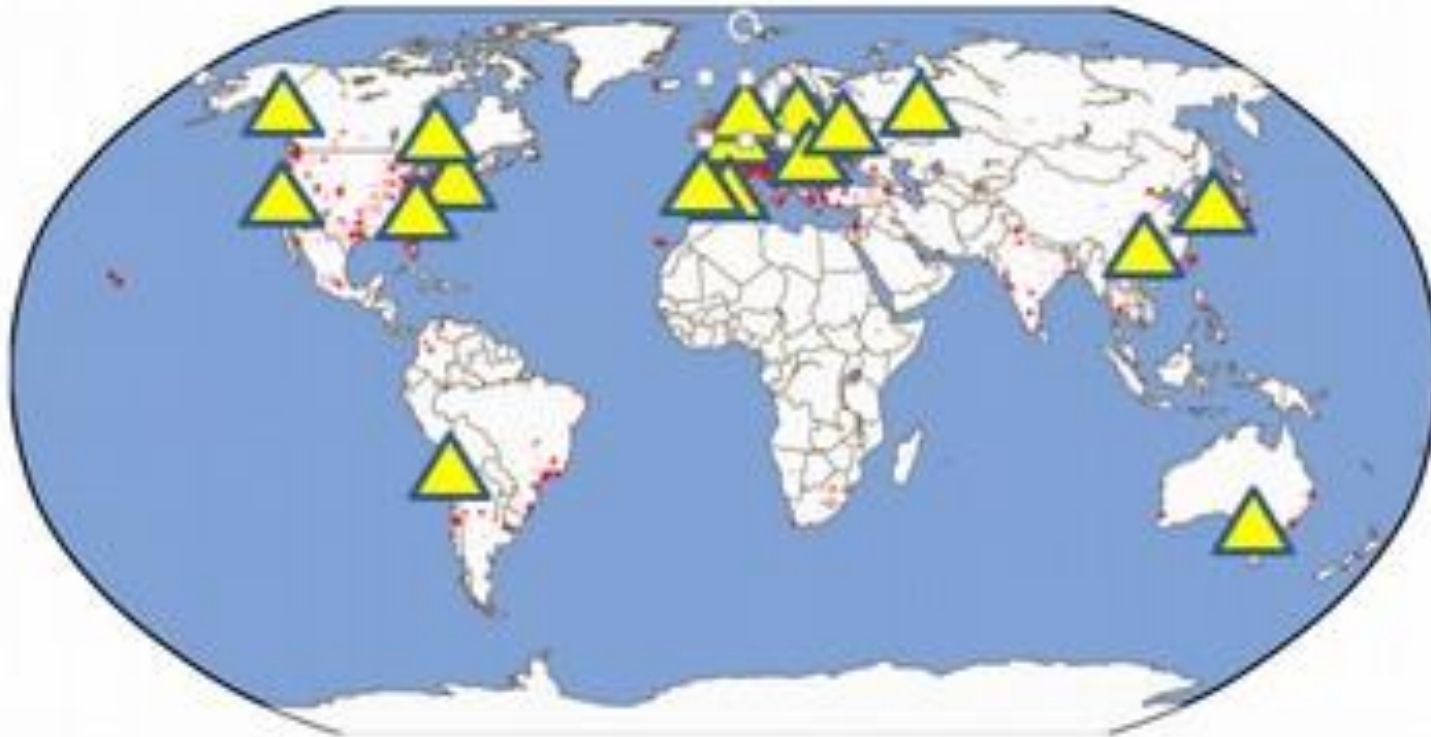
States of the art
(June 2018)
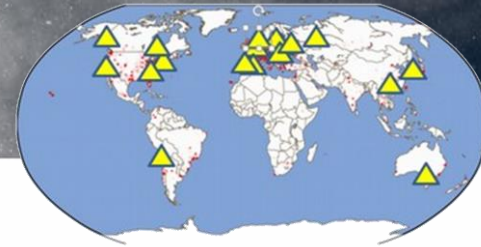
- HiPS network: **20** HiPS nodes (**+8**)
  - Leiden, IRAP, SSC, 3xCDS, AMIGA, svo.cab, IAS, ESAC, JAX + **IPAC, ANU, 2xCADC, HEASARC, China-VO, MPIK, PADC**
  - Not yet official: **ESO, Stellarium AWS/S3, Chili-VO** (in prep) **=> "HiPS IVOA cloud"** in an heterogenous context +multiple institutes/funding

- 3 HiPS generators:
  - Images & cubes: **Aladin/Hipsgen** (perf: 10h/1Tpix),
  - Catalogs: **Hipsgen-cat**
  - Skyview code/HEASARC (image) => used for SWIFT
- HiPS validator: Hipslint.jar
- HiPS libs : astropy **Hipspy** (Google summer of code)

HiPS future large surveys

- **LSST**

  - HiPS sky viewer for LSST **EPO** (cf. ADASS P3-140 poster)

  - Adoption of RFC-441 "Request to **adopt HiPS** and MOC **as standard DM data products**"
    "HiPS and MOC are becoming the standard in representing all-sky images and coverages. This RFC requests that DM adopt those two standards and make the corresponding data products to fulfill the above DMS requirement. This does not replace any other data products that DM already committed to generate."

- Euclid ?
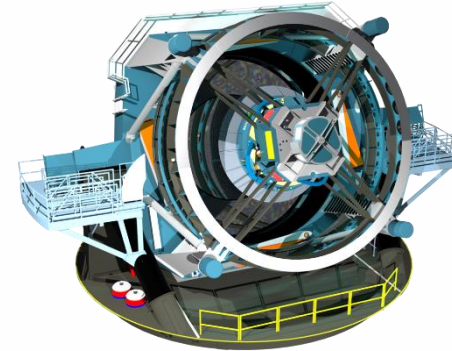
☐ Do HiPS yourself

1. **Make** my HiPS in 2 minutes
2. **Publish** it in the VO
3. **Browse** it in Aladin

The 4 HiPS principles
(in an ideal world)

- **Universality**: Anybody is able to generate HiPS (authors, projects, missions, archives, data centers…)

- **Quality**: HiPS should be generated by the data providers themselves (they know their data). Otherwise, archives or data centers do the job.

- **Efficiency**: HiPS is distributed by several sites and mirrored/synchronized as much as possible (big data is here – think petabytes !)

- **Simplicity**: user point of view: just "click & play" !

Links

- Fernique et al. 2015, A&A 578, 114
- IVOA standard: http://www.ivoa.net/documents/HiPS
- HiPS on CDS web pages: http://aladin.u-strasbg.fr/hips
- HiPS generation tools: http://aladin.u-strasbg.fr/hips/#tools

Thanks – Questions ?