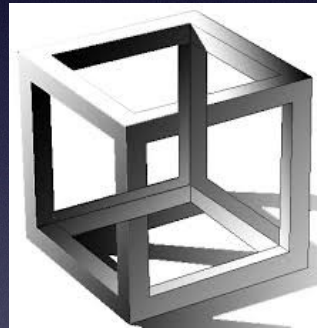


HiPS³

=

Hierarchical progressive surveys
for CUBE^s



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My dream...

« A cube survey provided in *one huge file*
on a *10 TB RAM computer*
with an *hyper-fast CPU...* »

⇒ *I load the cube & I do all I want !*



My reality...

« A cube survey provided in *thousands of individual files*
located *on the other side of the Atlantic ocean.*

My computer is *a basic dual core with 2GB RAM* »

⇒ *I'm stuck !*



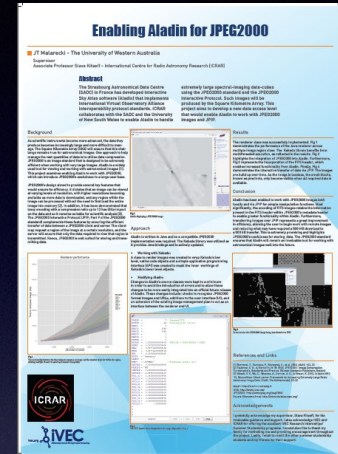
The constraints of the reality..

- 1) **All cube functionalities will not be possible** (*displaying ? rotating ? preview ? sub-cube extraction ? ...*)
- 2) The individual cube files **must be pre-processed** – in a first step - for providing one homogeneous and coherent data set (*mosaicing, resampling, ...*)
- 3) A **protocol/method has to be invented** for accessing, downloading and displaying strictly what I need (*not all the cube survey but just the part of the survey on which I am working*).

R&D 2013/2014 => 2 approaches

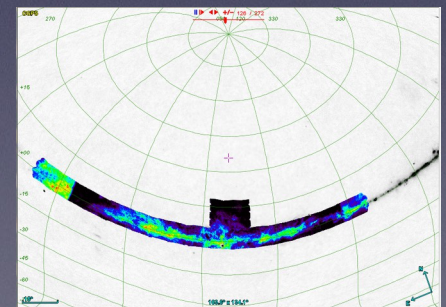
1) **JPG2000** Aladin extension [ICRAR/UWA (JT.Malarecki S.Kitaeff) + CDS]

- In progress.
- <http://www.ivec.org/wp-content/uploads/JTMalareckiSymposium2014.pdf>



2) **HiPS³** [CDS + CADC (D.Durand)]

- Ready to use.
- My presentation today



HiPS³ : The idea

« *Extend the HiPS principle to cube survey* »

The advantages:

- **Compatibility** : 1) with other HiPS surveys (HiPS client easy to extend – for instance Aladin, Aladin Lite or Mizar), 2) with MOC IVOA standard
- **Scalability** : no size limit, good client performances (even through a bad network and on a slow machine)

The provided functionalities : Zoom & pan, **3rd dim scrolling**,
2 modes : preview or true value, Access to the original data

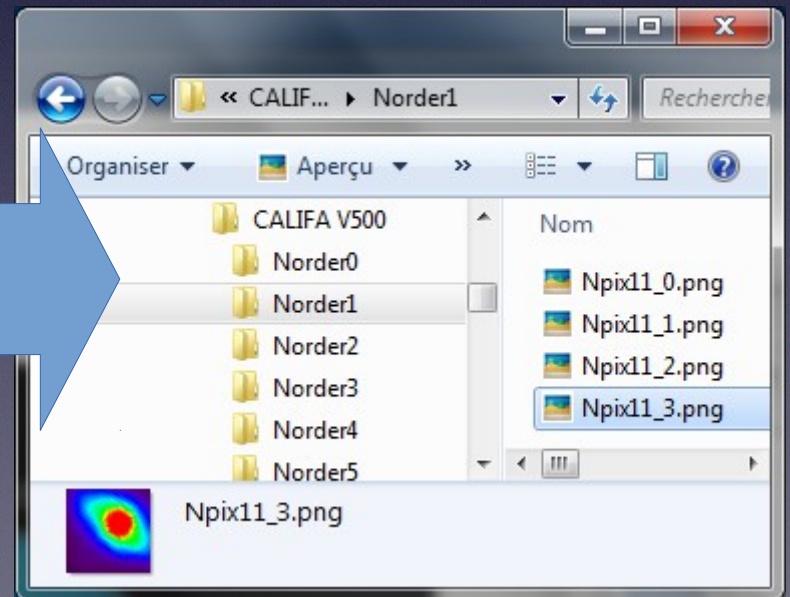
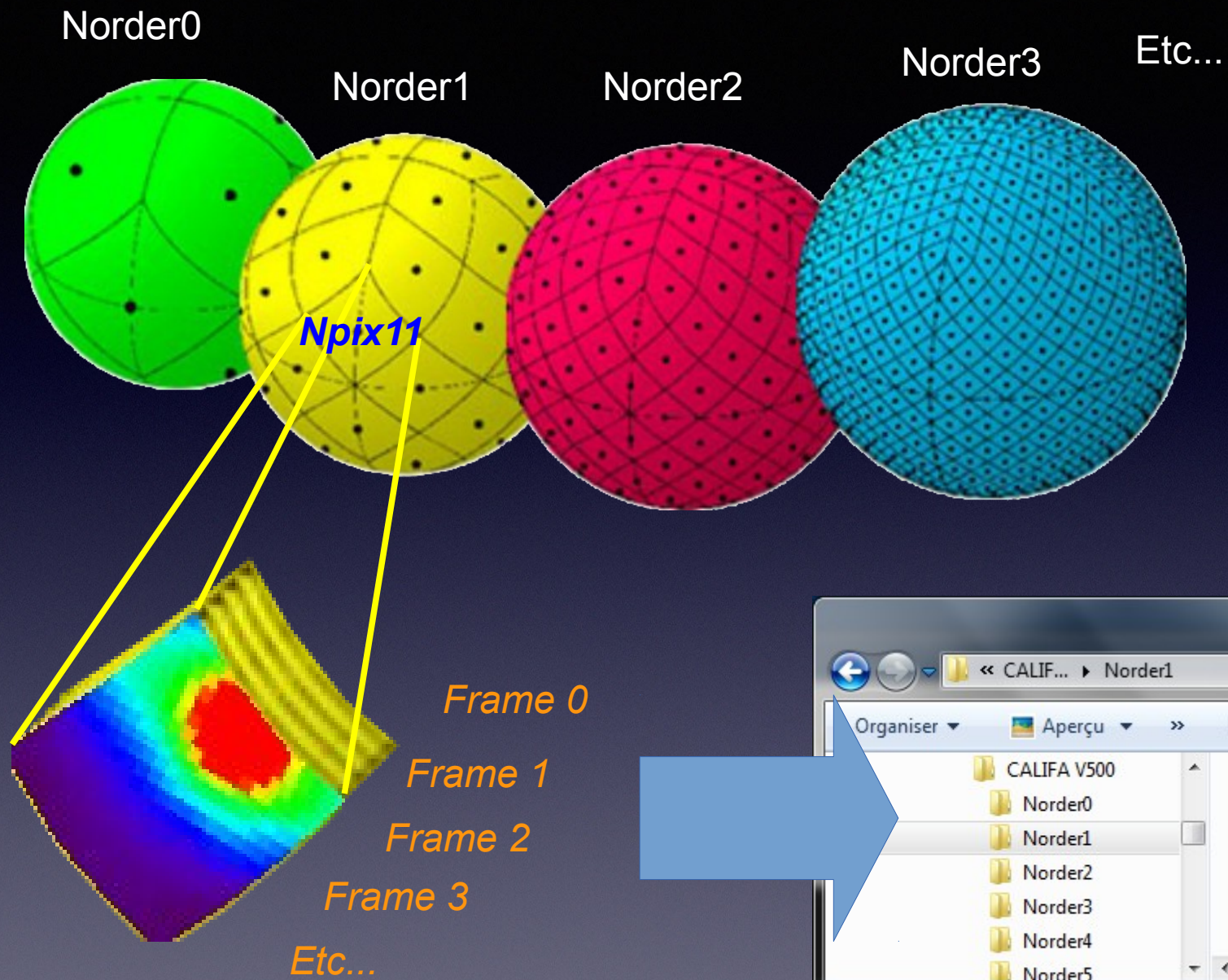
How to do that ?

In classical HiPS (image),
1 HEALPix cell correspond to 1 tile stored
as an image (FITS, JPEG or PNG)

*« In HiPS cube,
1 HEALPix cell correspond to 1 cube tile »*

How to store **each cube tile** ? => 2 approaches has been tested

- As a cube (FITS cube, MPEG..) ?
=> *Do not allow to dowload just a few frame from a cube tile.*
- **As a collection of images** (FITS, JPEG or PNG images) corresponding to each frame of the tile
=> *Yes ! It works*



Developements

1) HiPS cube generator : HiPSgen java package has been extended for supporting collection of FITS cubes as input of HiPS generation (available via independent java package, or inside Aladin directly)

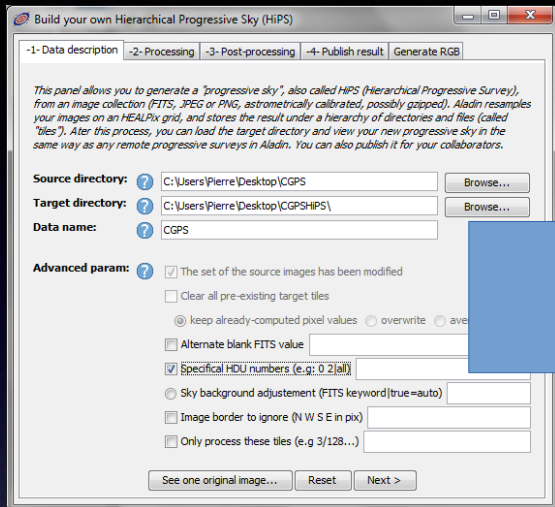
=> <http://aladin.u-strasbg.fr/java/Hipsgen.jar>

2) HiPS cube viewer : Aladin v8.1 beta ready for displaying HiPS cube (see demo or test it yourself)

=> <http://aladin.u-strasbg.fr/java/AladinBeta.jar>

HiPS cube generator

GUI



or

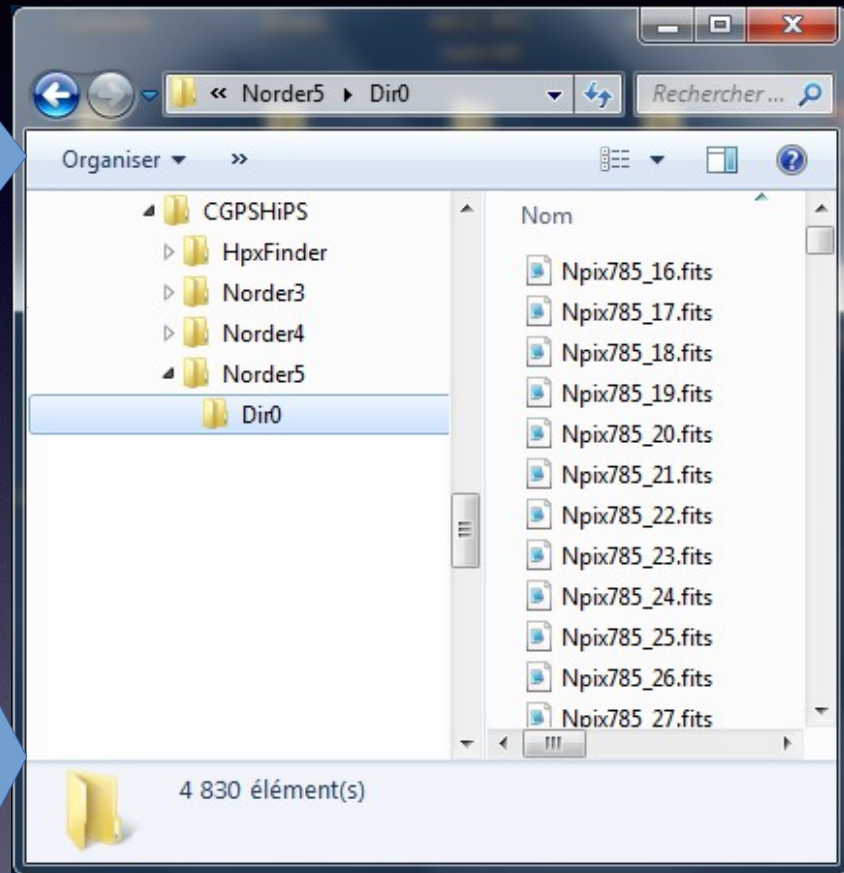
Command line

```
 /cygdrive/c/Users/Pierre/Desktop
INFO : Partitioning large original image files in blocks of 1024x1024
4 pixels
INFO : Use this reference image => CGPS\CGPS_MV1_HI_line_image.fits
INFO : Order=5 => PixelAngularRes=12.88"
INFO : MEF stategy => extension 0, otherwise 1
RUN : INDEX in progress...

STAT : 4 files in 0.511s => 4mpix using 2,12GB => biggest: [1024x1024
4x272 x2]

DONE : INDEX done (in 0.512s)

INFO : Reference image: CGPS\CGPS_MV1_HI_line_image.fits
INFO : BITPIX found in the reference image => 16
INFO : Original images are cubes (depth=272)
INFO : Data range [-32767/-602.9 .. 32767/263], pixel cu
755 .. 18667/76.7]
INFO : mode=OVERWRITE: Replace existing pixel values if the new valu
e is not BLANK
RUN : TILES in progress...
RUN : Creating .fits tiles and allsky (max depth=5)...
INFO : sky area to process: 10336 low level HEALPix cells
INFO : BITPIX = 16 (no conversion)
INFO : Disk requirement (upper approximation) : 1,67TB
INFO : BSCALE=0.01321310796507 BZERO=-169.9488525391
INFO : BLANK conversion from -32767.0 to -32768.0
INFO : Tile aggregation method=MEAN
INFO : Will use 4 threads
INFO : Available RAM: 237,89MB => Cache size: 158,59MB
WARN : All original images do no used the same BZERO & BSCALE factor
s => rescaling will be applied
.....
```



HiPS³

HiPS cube viewer

Server selector

Others **HiPS** File all VO Watch FoV... Tools...

Image servers

Aladin images

SkyView

UKIDSS

Sloan

DSS...

VLA...

Archives...

Others...

Progressive surveys (HiPS)

Target (Gal, name) 120.9777 +12.15

Radius 180°

WISE cube *WISE acknowledgment*

CALIFA V500 *from Calar Alto Arc*

CGPS *from CADC*

GOODS cube *NASA/ESA/AURA*

HST cube *from CADC*

IRAS cube

Default format: Preview (jpg)

Reset Clear

Aladin v8.1 *** BETA VERSION (based on v8.103) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Location 120.14376 -07.49445

DSS SDSS ZMSS WISE GALEX PLANCK XMM Fermi Simbad NED

CGPS

RAJ2000	DEJ2000	id	access	FoV
142.54223	7.90358	IC0540	original cube	FoV
184.76215	8.85726	IC0776	original cube	FoV
207.87804	14.09332	IC0944	original cube	FoV

Aladin v8.1 *** BETA VERSION (based on v8.103) ***

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Location 057.48176 +85.58532

DSS SDSS ZMASS WISE GALEX PLANCK XMM Fermi Simbad NED

CALIFA V500

Mouse controls:

- Left: source selection.
- Middle: quick panning.
- Right: contrast adjustment.
- Wheel: quick zoom on the reticle.
- Simple-ctrl: move the reticle.
- Double-ctrl: re-center.

CGPS CALIFA V500 PRCS CALIFA V500 CGPS

epoch size dens. cube opac. zoom

100 sel / 100 src 101 view 11fps / 222Mb

CGPS

DSS colored

epoch size dens. cube opac. zoom

119.55450 +09.93539
151.7° x 100.6°

Adjust the visible area (click&drag + mouse wheel)

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4 categories of HiPS³ have been tested

1.All sky cube survey - ex : CGPS - 84 cubes
1024*1024*272 covering the galactic band

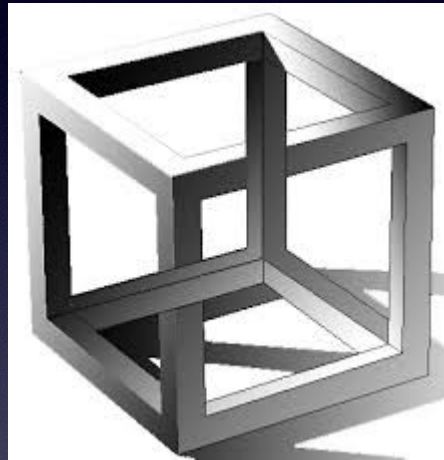
2.Pointed cubes - ex : CALIFA v500 - 100 cubes
78x73x1877 pointed on SDSS galaxies

3.Composite all sky cube – ex : WISE-cube built from the
4 original WISE bands (3.4, 4.8, 12 ad 22 um) => **4TB cube**

4.Composite pointed cube - ex : HST-cube build from 13
originals HST bands (F110W, F160W...,F850LP)

Demonstration...

Thank you !



Question ?

<http://aladin.u-strasbg.fr/hips/>