

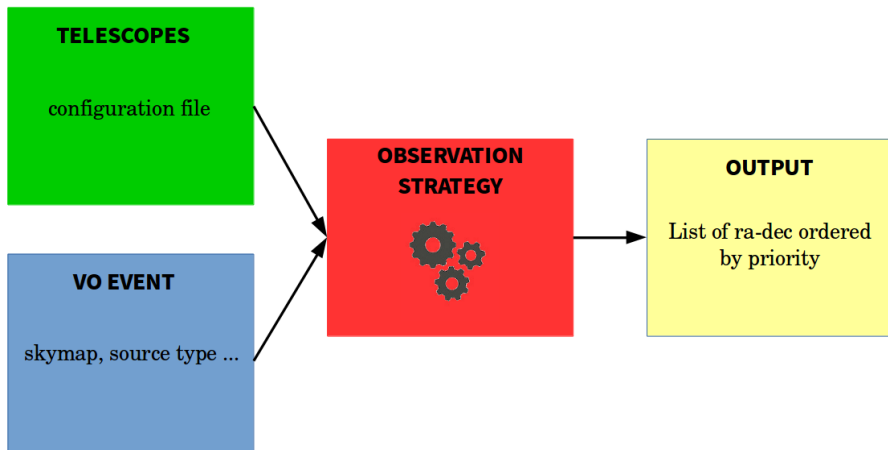
# Observation strategy

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# Context



Starting point : a large set of telescopes

GRANDMA telescopes



Different type of alerts

- Gravitational Waves
- Gamma Ray Bursts
- Neutrinos

## For a given telescope : Config file

- Field of view
 

```
|filt r
magnitude 14.6
exposuretime 10.0
latitude 43.9330
```
- magnitude
 

```
longitude 5.7147
elevation 648
FOV_coverage 0.4
FOV 0.4
```
- position (longitude-latitude)
 

```
FOV_coverage_type square
FOV_type square
tesselationFile ../input/IRIS.tess
slew_rate 10
```
- ...
 

```
readout 8.4
```

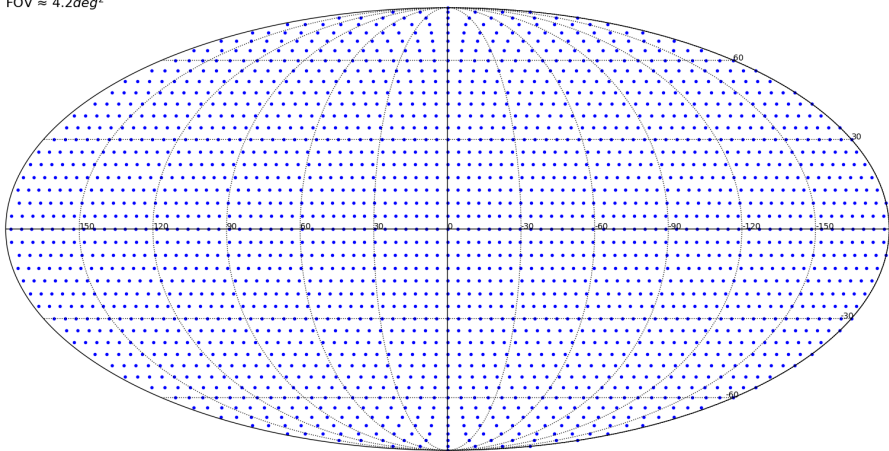
### First step : Creation of the tessellation

<https://github.com/mcoughlin/gwemopt>

## Pre-tiling of the sky (if no known survey tiles)

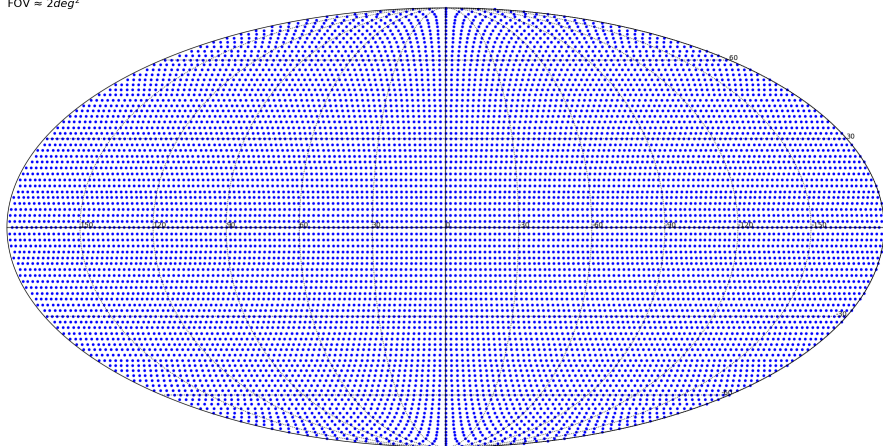
- The whole sky is pre-tiled with the telescope field of view

## Example for TAROT Réunion - get the points

 $FOV \approx 4.2deg^2$ 

Each point is the center of an tile (FOV)

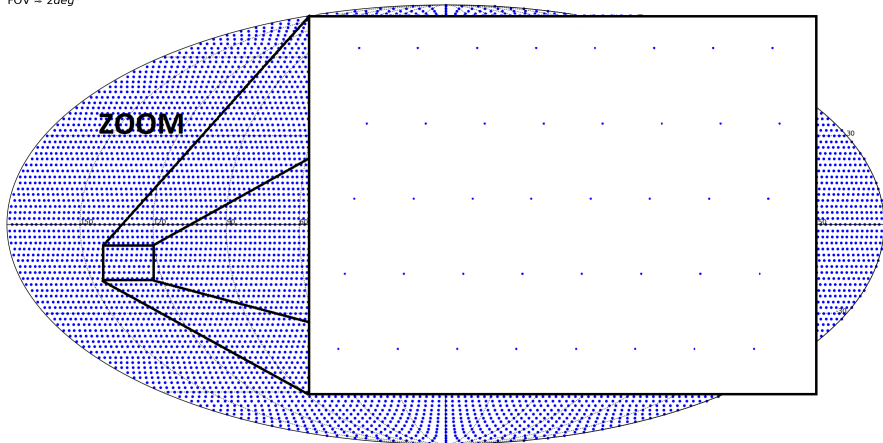
## Example for SVOM-F30 - get the points

 $FOV = 2deg^2$ 

Each point is the center of an tile (FOV)

## Example for SVOM-F30 - get the points

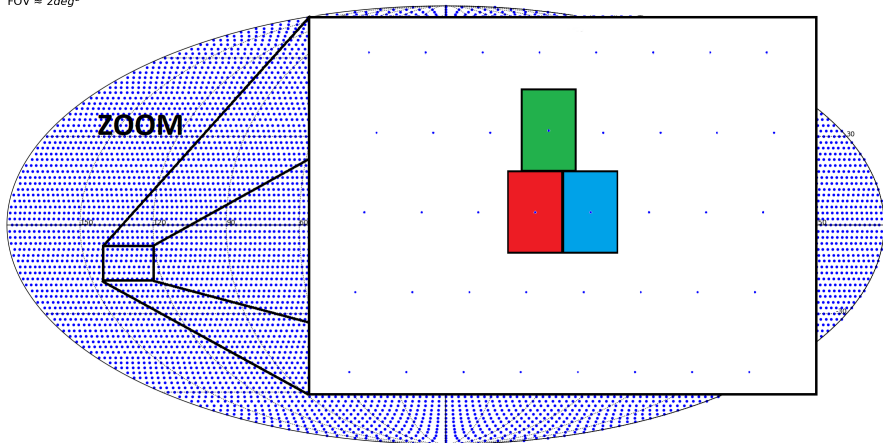
FOV =  $2\text{deg}^2$



Each point is the center of an tile (FOV)

## Example for SVOM-F30 - get the tiles

FOV =  $2\text{deg}^2$



We get the tiles using Healpix to get all the pixels inside each one



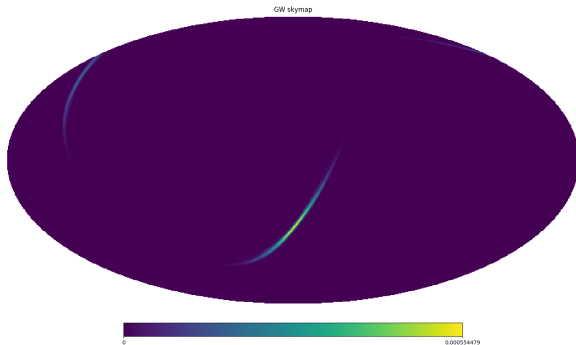
For a given event  $\Rightarrow$  scheduling the observation

For a given telescope provide a list of tile ordered by **priority**  
 $\Rightarrow$  we need to define a metric (weight) to order the tiles

How to do that?

# First idea : Brute force

Example : GW skymap



We use the position probability distribution of an event to order the tiles by the probability they contain

## Second idea : Galaxies targeting

### Galaxies targeting

hypothesis : the source is inside a galaxy

- choice of catalog  $\Rightarrow$  GLADE (<http://aquarius.elte.hu/glade/>)  
The catalog has been constructed (combined and matched) from four existing galaxy catalogs : GWGC, 2MPZ, 2MASS XSC and HyperLEDA.  
GLADE contains 3,262,883 objects.  
Widely used during O2 for the follow-up
- Selection in the catalog of the galaxies compatibles for a given 3D volume :  
RA, Dec, distance (if available : BNS/BBH for GW)

## What to do with the galaxies ?

- rank the tile in function of the number of the galaxies inside

## Add some physics ?

- define a metric (weight) to put on each galaxies  
→ the tile weight is so the sum of the galaxies weight inside the tile

## How to define the weight ?

Only few informations are available on GLADE catalog...

What is available yet (from LCOGT metric) :

- the skymap probability  
→ angular position + **distance**
- the blue luminosity (as an indicator of mass)
- likelihood of detection (assuming an max/min luminosity for the event)

<http://iopscience.iop.org/article/10.3847/2041-8213/aa910f/meta>

# Work in progress

## Work on building a better definition of the weight

Is the LCOGT metric improvable?

There is still some informations available that are not used

- red luminosity in GLADE
- sub-catalog informations (ex : GWGC give the galaxy type)
- separate different metric definitions for the type of the source (BNS, BBH, Burst ...)
- ...

## Choice of the catalog

galaxies targeting strategy  $\Rightarrow$  careful on the choice of the catalog

- completeness
- fiability of the informations

# Work in progress

## Work on the tessellation

Go more in details on the tessellation building

- define the overlap between each tiles
- define a little tile shift for optimization ?

## O4 and further



Work on the SVOM-MXT tessellation  
satellite  $\Rightarrow$  system restrictions

- restrictions on the tessellation (ex : put a galaxy in the SVOM-VT FOV)
- restrictions on the scheduler (slew limitation, Sun-Moon-Earth obstruction ...)
- ...

THANKS!