The SVOM mission profile

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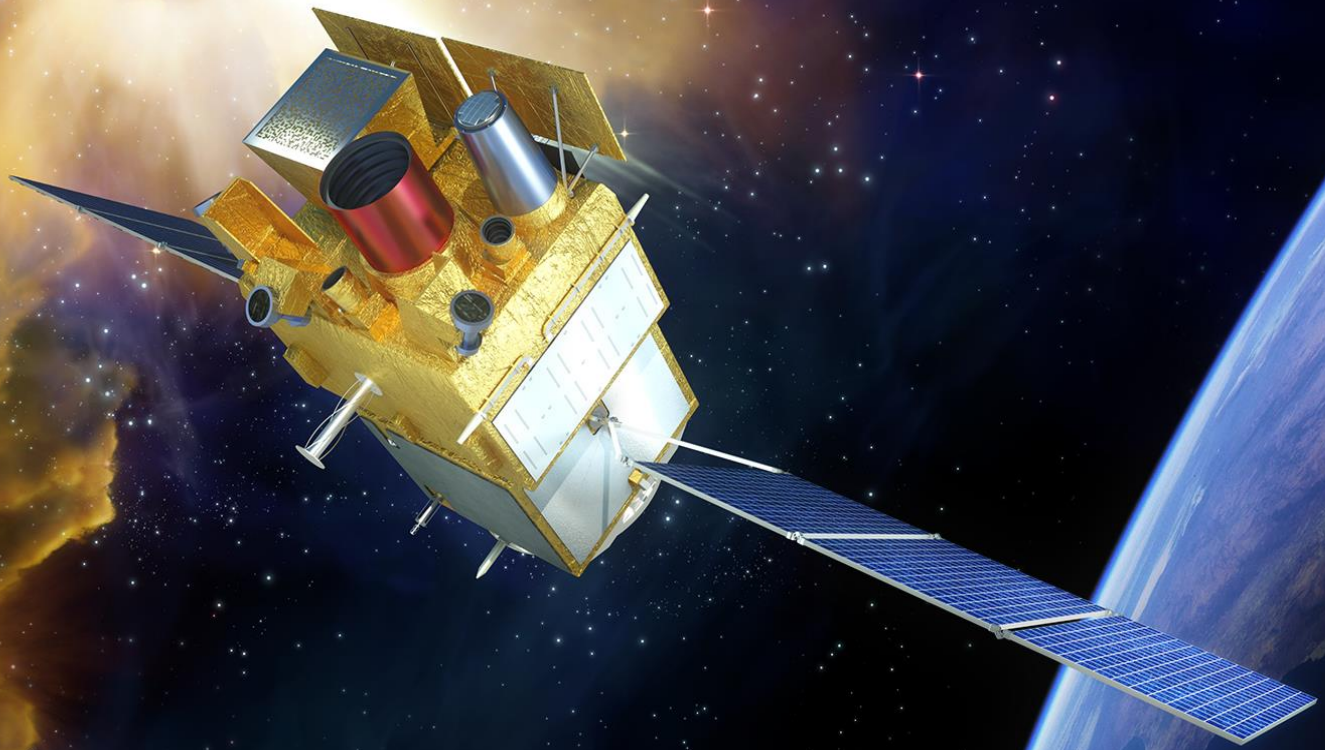
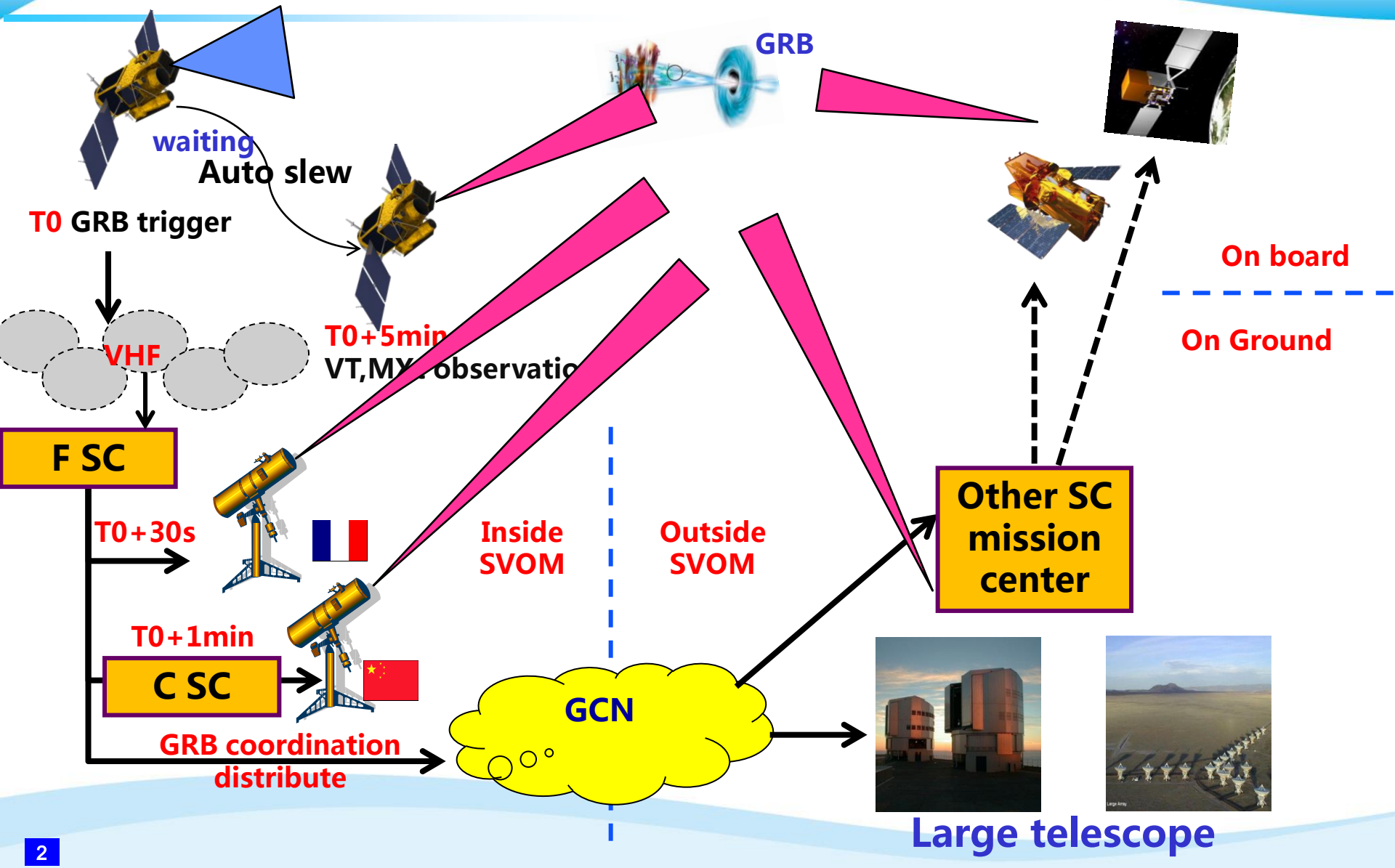
On behalf of the SVOM consortium

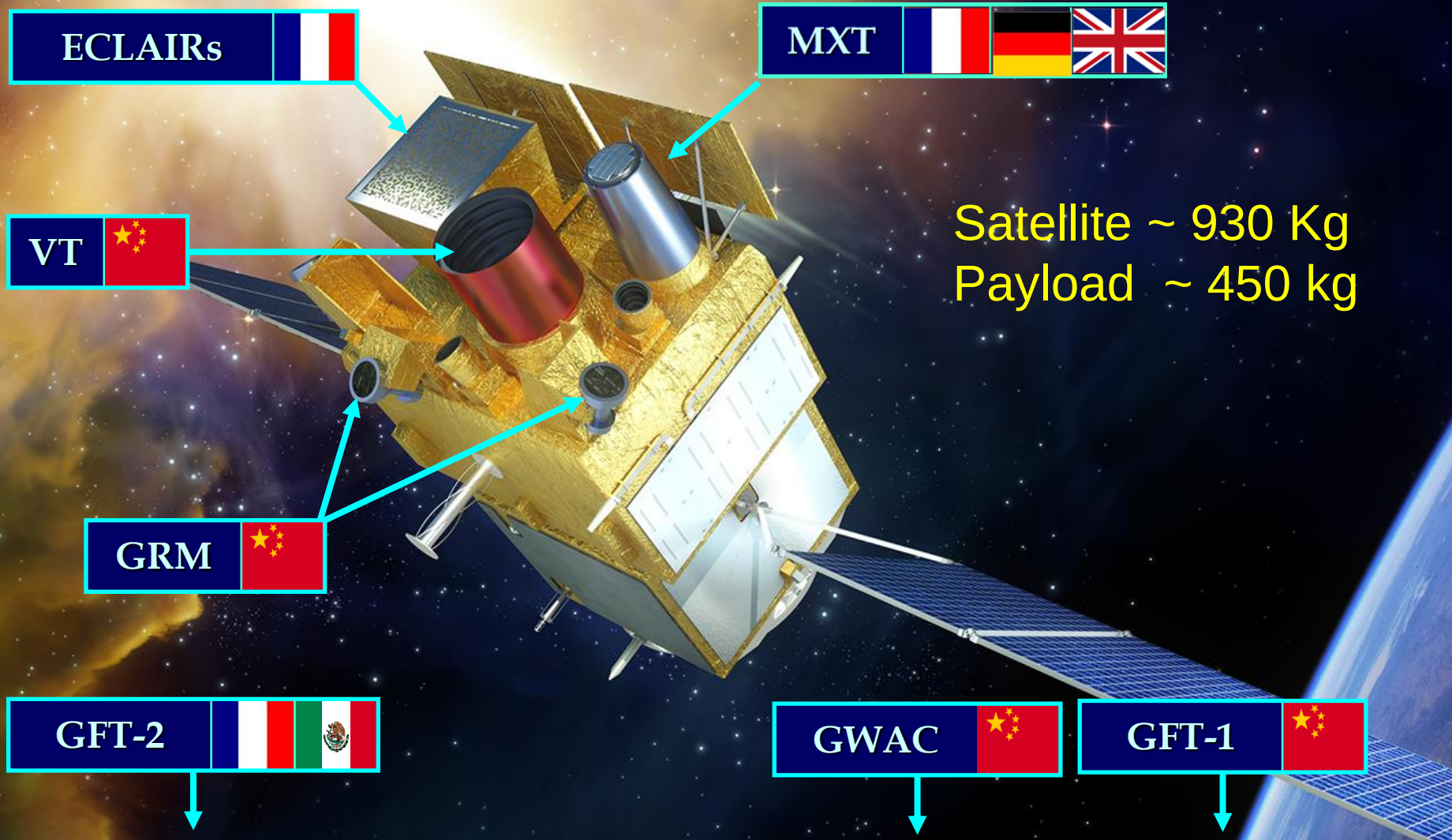


SVOM scientific workshop – Les Houches – 10-15 avril 2015

GRB Observation scenario

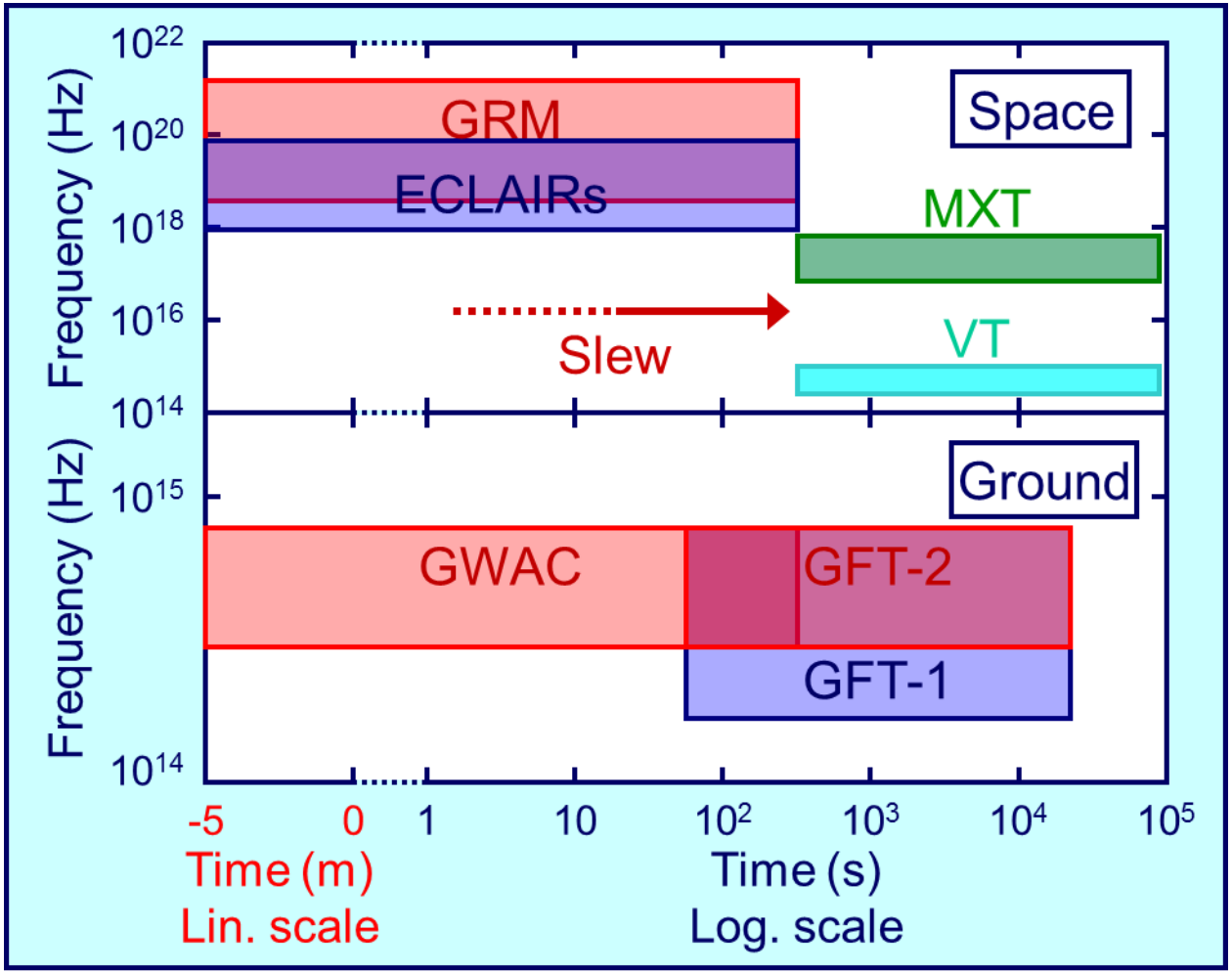


SVOM scientific instrument arrangement



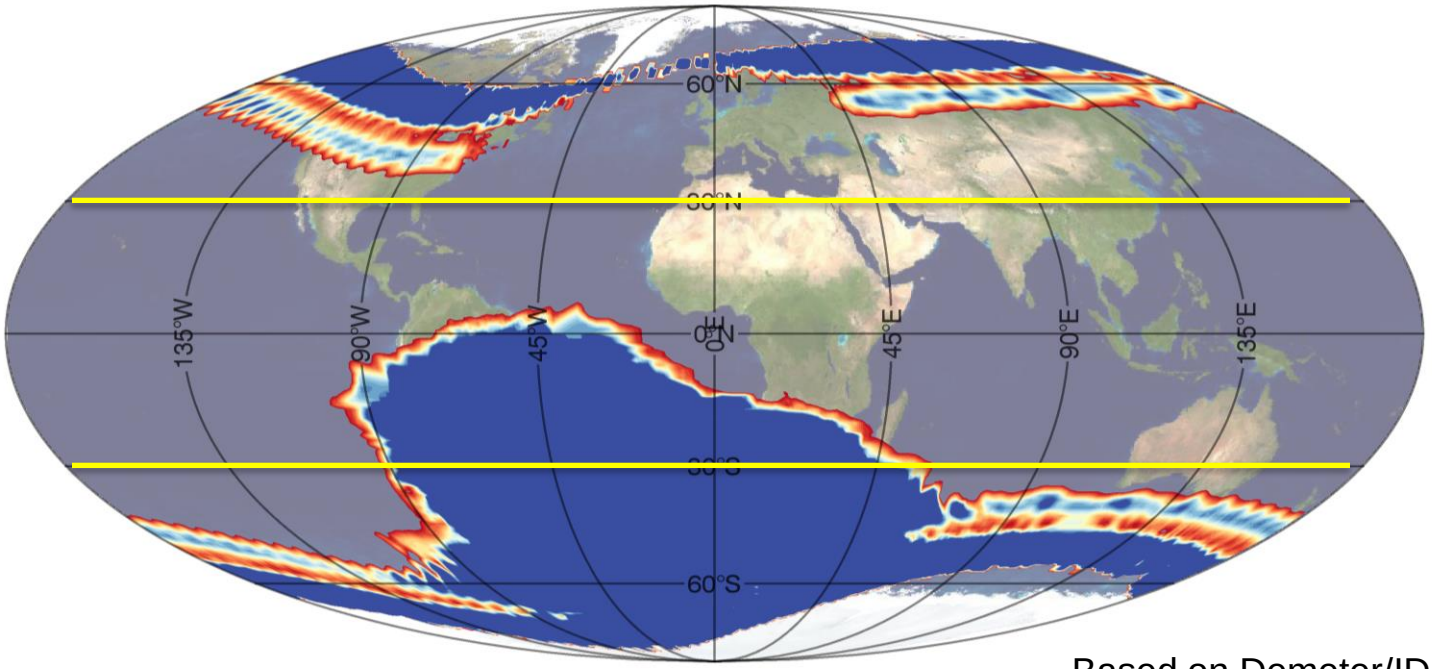
Satellite ~ 930 Kg
Payload ~ 450 kg

SVOM multi-wavelength capabilities



Space and ground instruments join to enable a unique coverage

The SVOM orbit

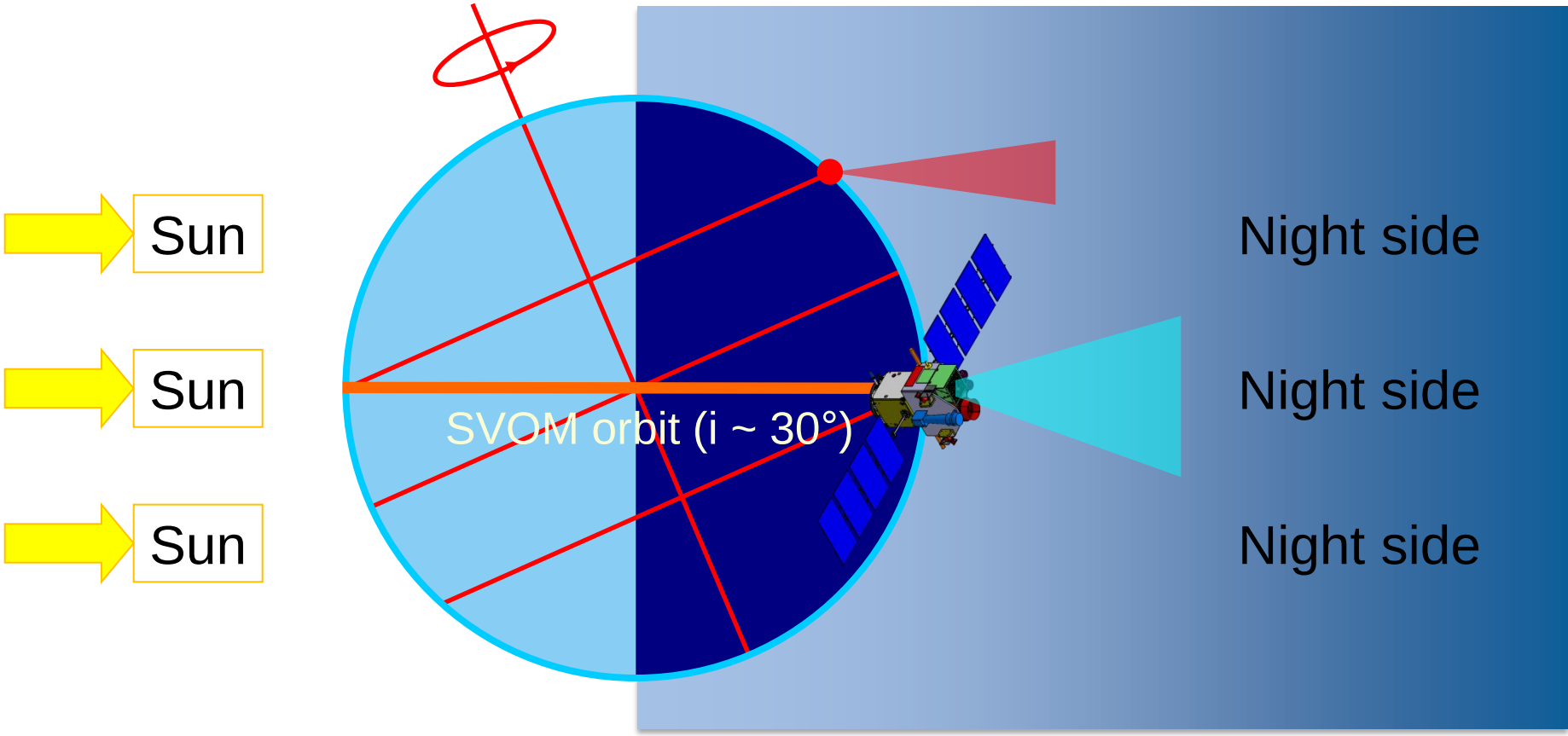


Based on Demeter/IDP electron flux

LEO altitude 625 km, with an inclination of 30°, launched by a LM-2C from Xichang

→ the satellite passes though the South Atlantic Anomaly
→ induces a dead time of (13-17)%

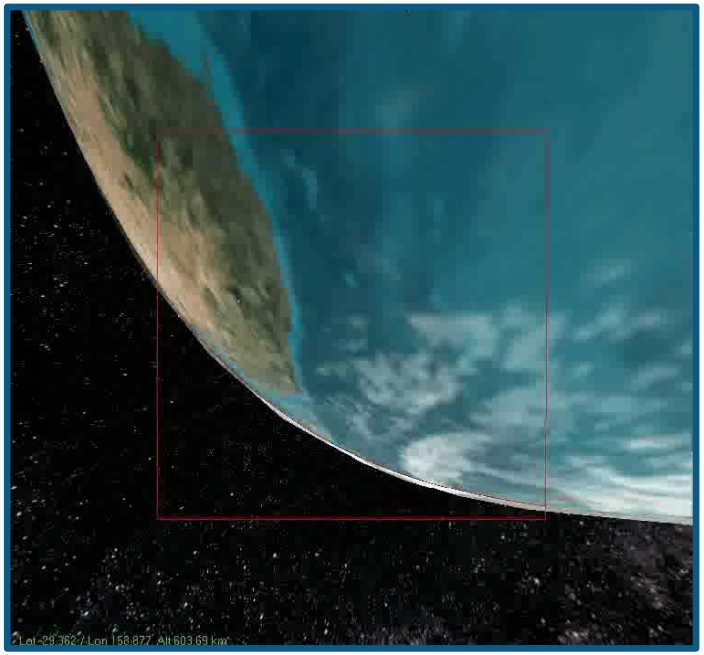
The SVOM attitude law



To detect GRB on the night side → attitude law : roughly antisolar

The SVOM attitude law

Low Earth Orbit + roughly antisolar attitude law



Consequence : at each orbit the Earth occults the instruments FOV

- ECLAIRS duty cycle 65%
- VT duty cycle 50%
- MXT duty cycle 50%

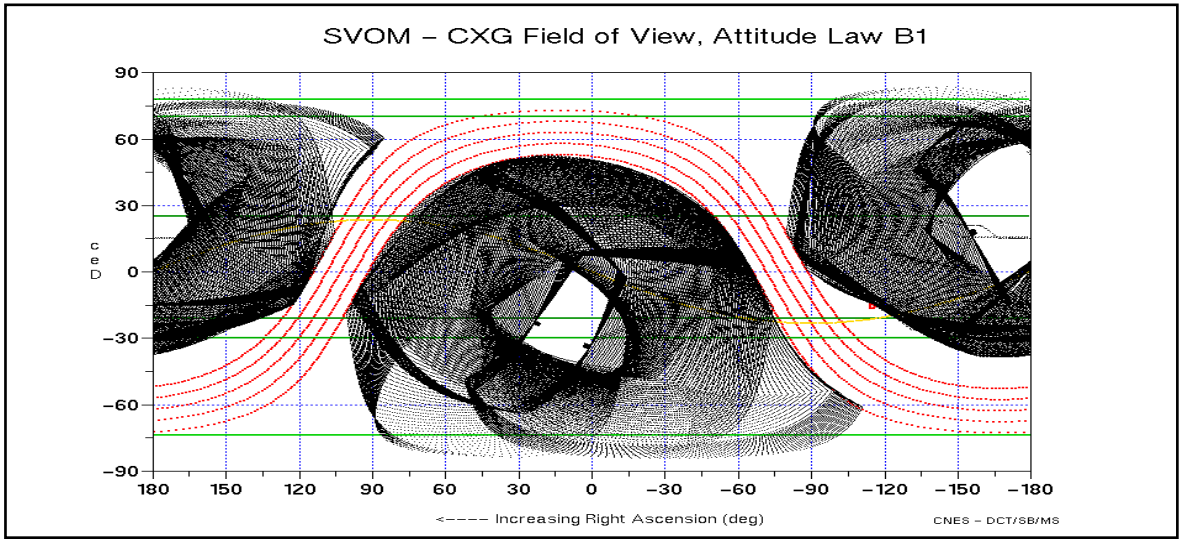
Optimization of the SVOM attitude law

To favor the GRB detection by ECLAIRs
- avoidance of the the Sco X1source (outsite of the ECLAIRs FOV)
- avoidance of the Galactic Plane (+/- 10° for the ECLAIRs FOV)

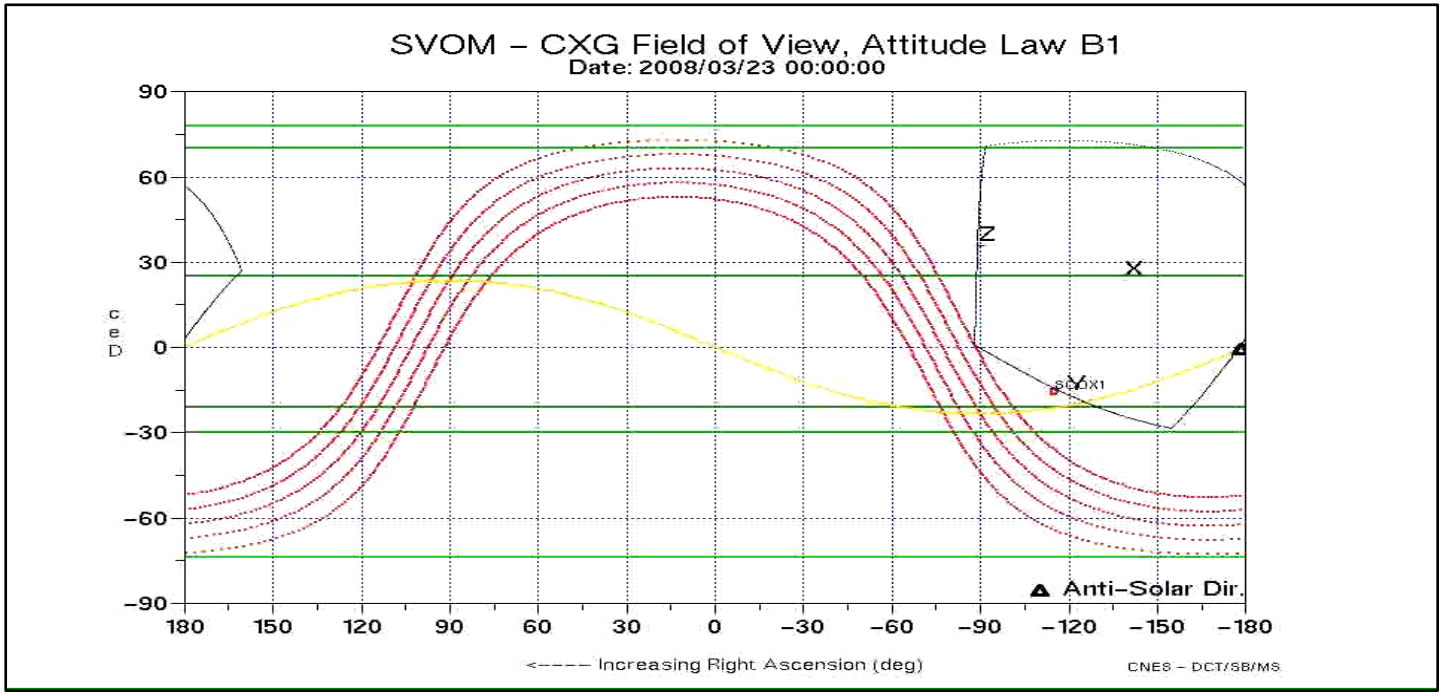
To favor the redshift measurement on ground.
- → to favor the sky area observable from both Hawaii, Chile and the Canary
- → SVOM points to areas near the equator (declination $\delta=0$)

To maintain a cold face for the satellite
Offset of 45° with respect to the antisolar direction

Tolerance of 5° with respect to the nominal pointing

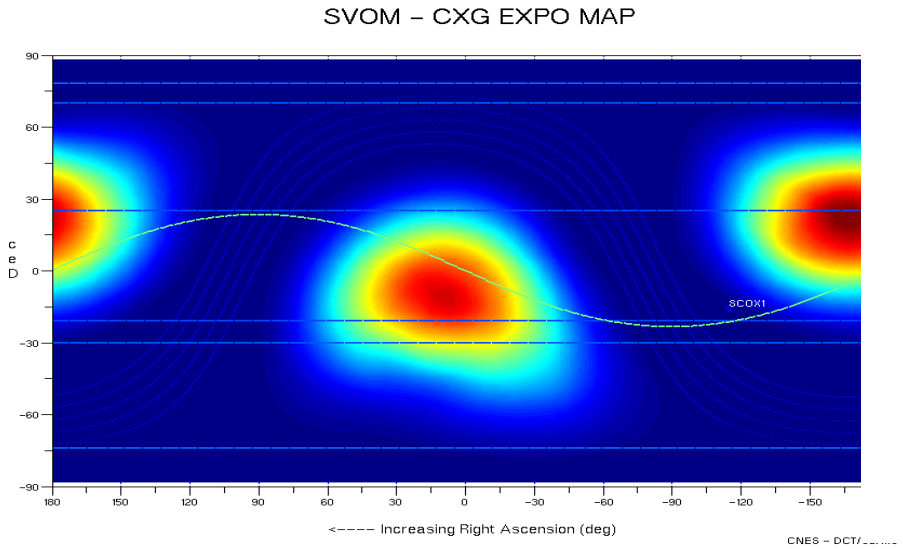


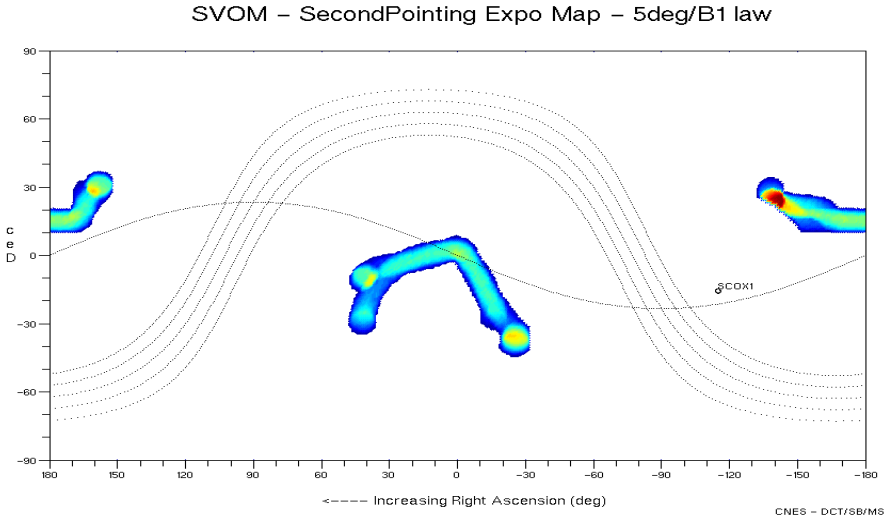
Optimization of the SVOM attitude law



The B1 attitude law over one year

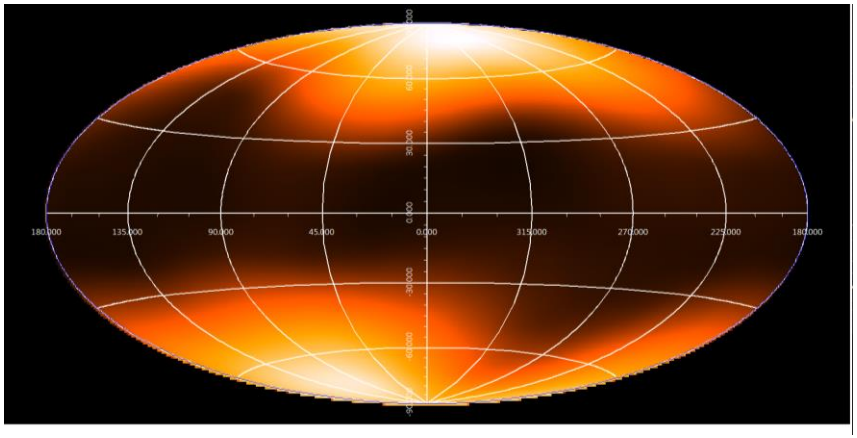
The SVOM attitude law: consequences on the exposure map
1 year scenario

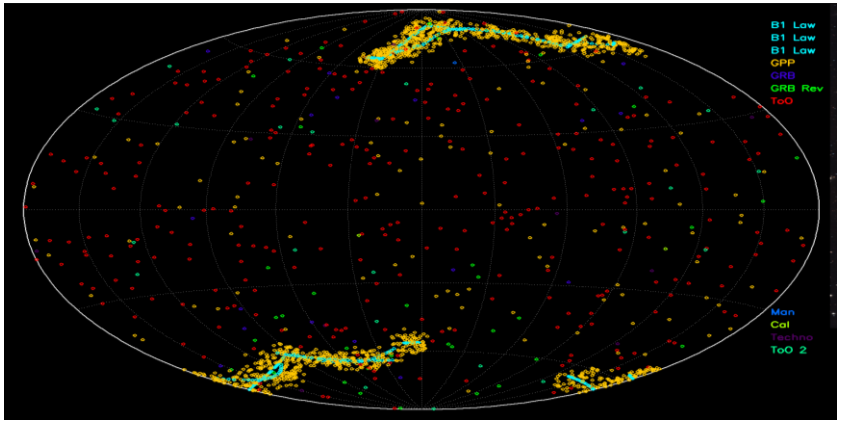




Galactic coordinates

Galactic coordinates





Wide field instruments : ECLAIRS, GRM,

Narrow field instruments : MXT, VT

Distribution of the usefull time of the mission

Nominal mission

- Core Program: the GRBs
  - 70/year
  - duration of observation : 14 orbits (tunable)

- Targets of Opportunity
  - ToO nominal : 1/day, programming delay 48h, duration of observation 1 orbit
  - ToO exceptional : 20/year, programming delay <12h, duration of observation 14 orbits (tunable)

- General Program (preplanned observation selected by a TAC)
  - 90% at 5-10° from the B1 law
  - 14 targets max per day
  - duration of observation 1 orbit minimum

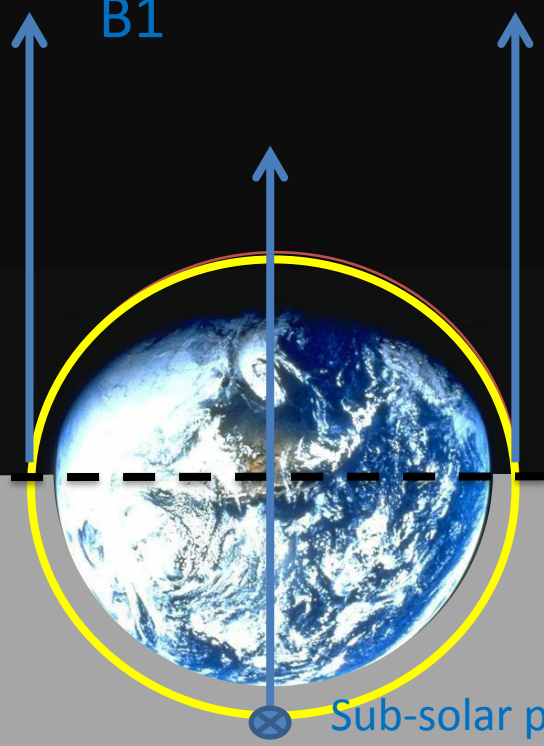
The current attitude law

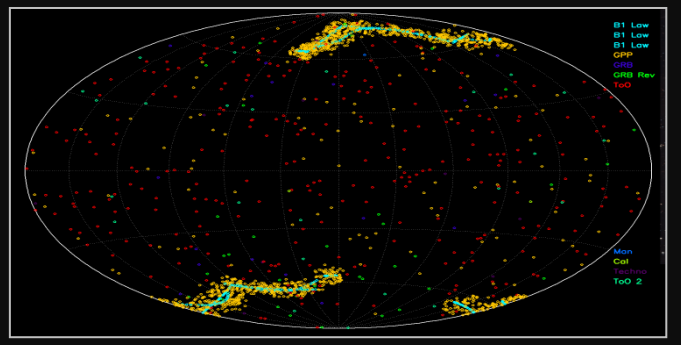
Night side

General Program
14 targets max per day in limited sky area
duration min 1 orbit

ToO
1 target per day, all observable sky
duration 1 orbit

GRBs
70 GBS /year, all observable sky
duration 14 orbits





B1 law (± 5-10°) : Authorized sky area

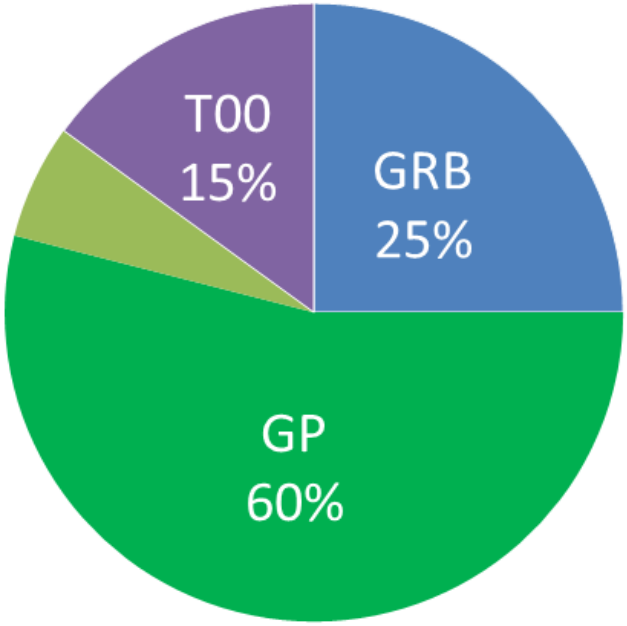
Zone Nuit

Day side

Nominal case : remains on B1 Attitude (+/- 5-10°), GP targets pointed on sub-solar point
ToO case: ToO pointed on sub-solar point
GRB case : remains on the GRB (14 orbits)

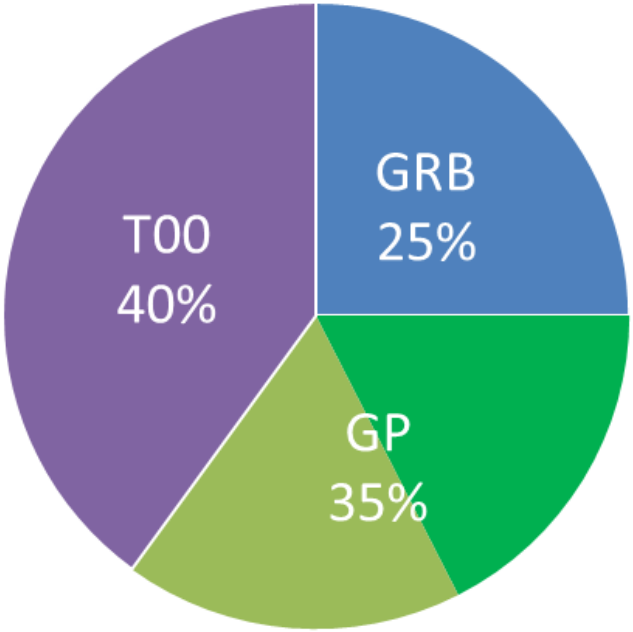
Evolution of the distribution of the useful time

Nominal mission
USEFUL MISSION TIME



1 ToO per day
10% of the GP outside the B1 law

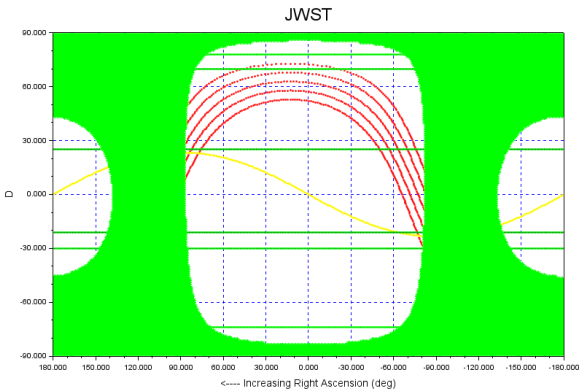
Extended mission
USEFUL MISSION TIME

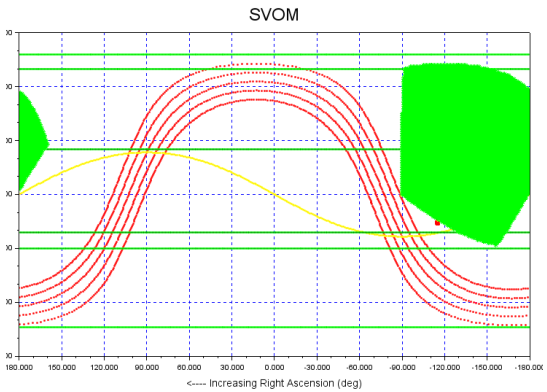


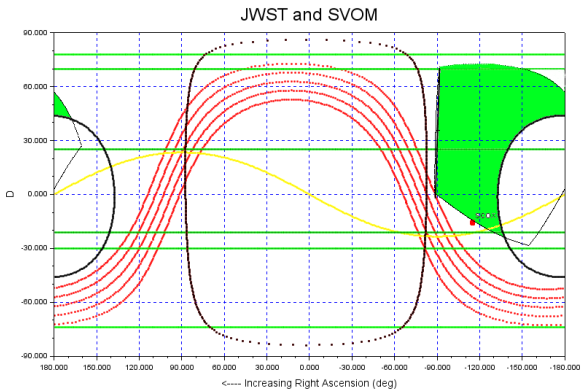
5 ToO per day
50% of the GP outside the B1 law

Common field of view : SVOM - JWST

Angle between JWST optical axis and sun must be between 85°-135°

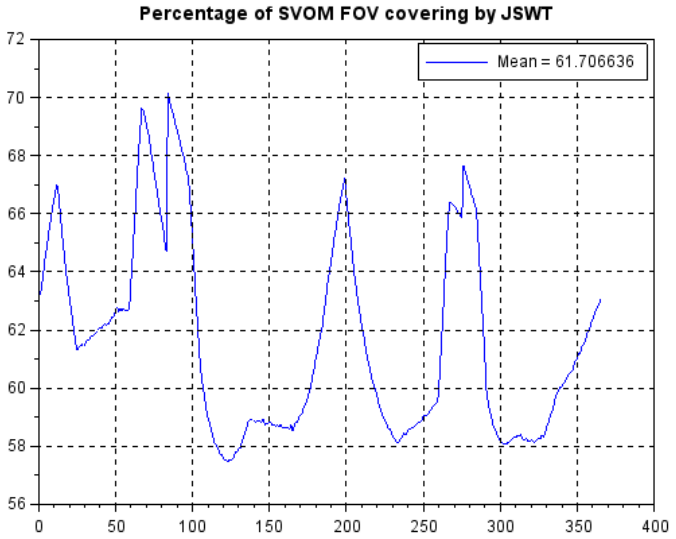






Example for one given day

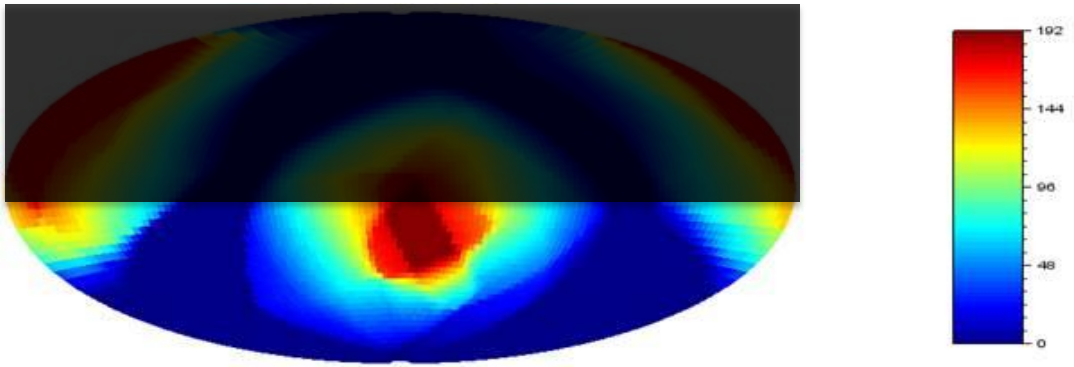
On average 61% of the SVOM field of view (B1 law) is accessible by JWST



Common field of view : SVOM - LSST

SVOM

LSST



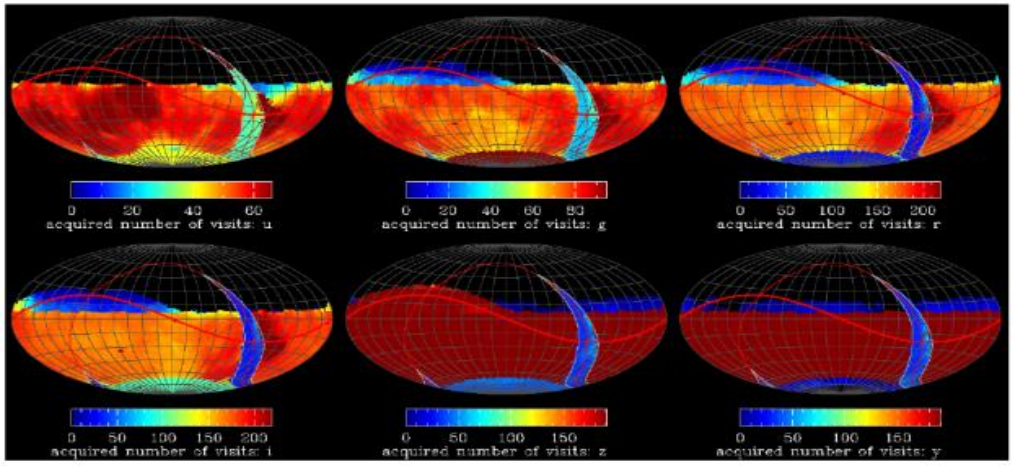


Figure 3.1: The number of visits in one realization of a simulated ten-year survey in all six LSST filters, shown in Equatorial coordinates. The project goals are to have 56, 80, 180, 180, 164, and 164 visits in the u, g, r, i, z, y filters, respectively, over 20,000 deg^2 of sky. One of the deep-drilling field is apparent at $\alpha = 90°, \delta = -32°$.

Each GRB detected in the southern Sky will be followed by LSST

Thanks to the antisolar choice, the transients sources detected by LSST could be observed immediately by SVOM

NAOC, Beijing

IHEP, Beijing

XIOPM, Xi'an

SECM, Shanghai

CEA-Irfu, Saclay

IRAP, Toulouse

APC, Paris

IAP, Paris

LAM, Marseille

Obs Strasbourg

LPAG Grenoble

LUPM Montpellier

LAL Orsay

GEPI Meudon

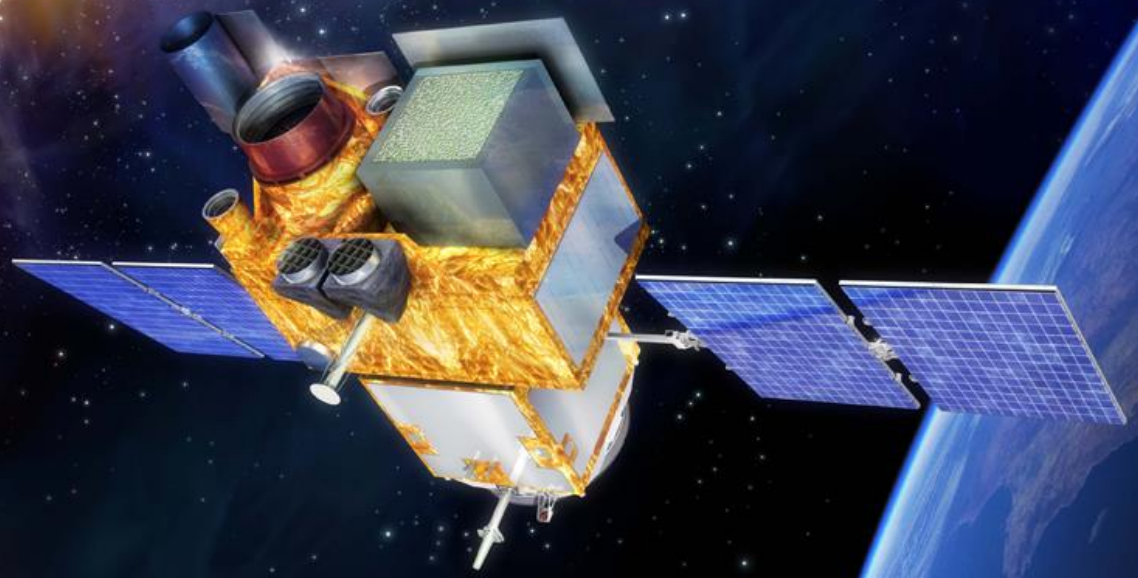
LPC2E Orléans

University of Leicester

MPE, Garching

CNES, Toulouse

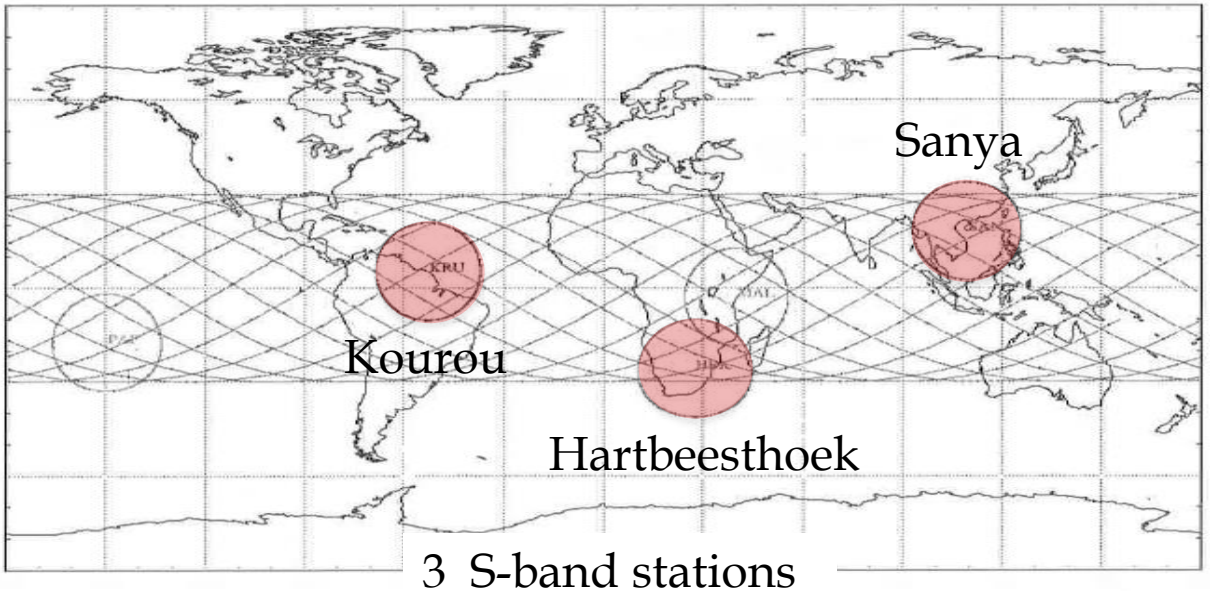
GO SVOM !



launch 2021

PDR July 2016

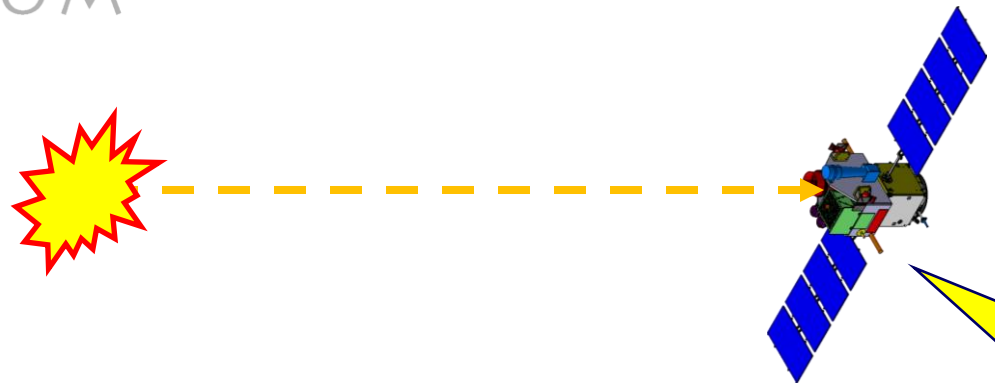
Telecommand Upload link



Sanya is dedicated , the others (Kourou & HBK) are on request
Time delay related to upload the slew commands :

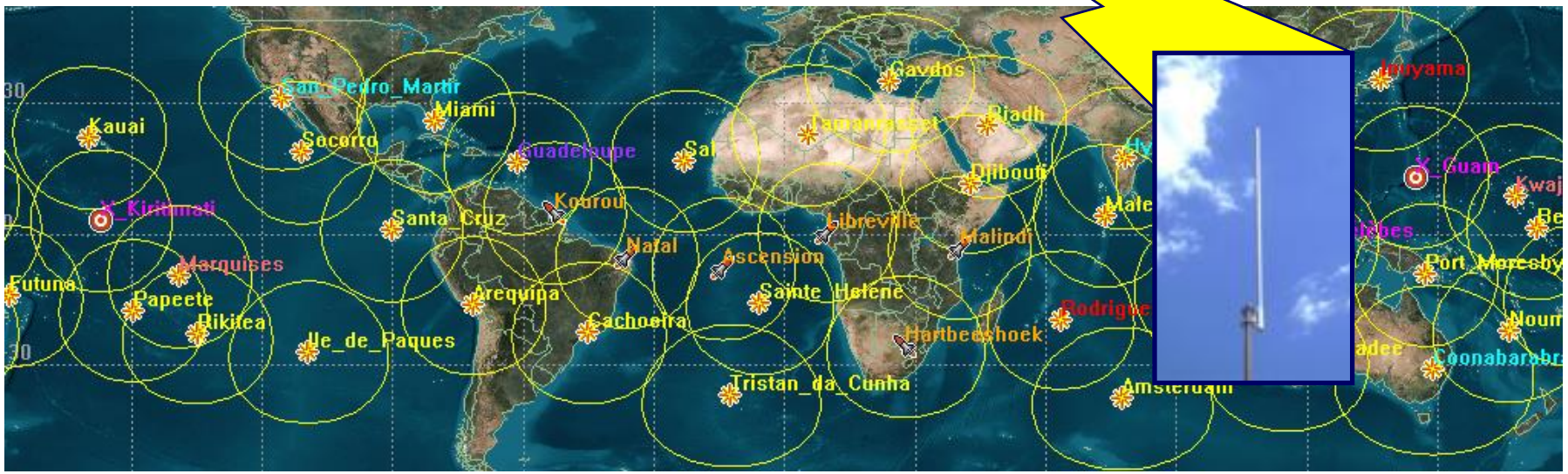
→ 70% [40%] within 6 [4] hours

Prompt Dissemination of GRB Parameters



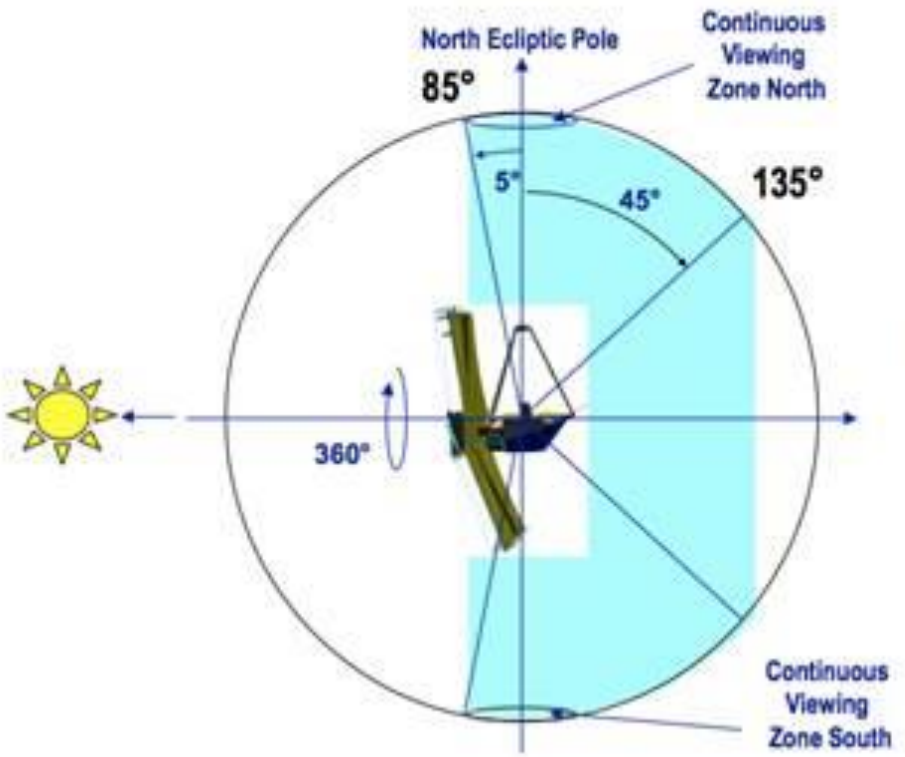
Alerts are transmitted to a network of VHF receivers on Earth by the on-board VHF emitter.

The inclination of the orbit (30°) implies 30-40 VHF receivers



Goal : 65% of the alerts received within 30 sec

JWST Field of Regard



- Observatory thermal design defines the allowed Solar orientations
  - Solar elongation 85° to 135° (like Spitzer)
  - Roll ±5° about line of sight
- JWST can observe the whole sky every year while remaining continuously in the shadow of its sunshield.
  - Field of Regard is an annulus covering 35% of the sky
  - The whole sky is covered each year with small continuous viewing zones at the Ecliptic poles