AirSWOT – Hydrology in France

S. Calmant (and many others)

Hydrology Airborne Campaigns (April and June 2013)

Main tasks to perform during the hydrology **AirSWOT campaigns** to mitigate the major mission risks :

- **Priority 1:** ka-band σ_0 over water and land (function of incidence angle, classification of river/lake and land cover, surface roughness, …)

- **Priority 7:** Determine the impact of topography or vegetation on height determination (Layover, data loss, mis-estimates…).

- **Priority 2:** Measure surface water correlation time

- **Priority 4:** Demonstrate the ability to estimate river bathymetry and Manning's constant to assess the discharge accuracy using Manning's rule and validate the part played by SWOT-like data in improvement of existing hydrological models.

Hydrology Airborne Campaigns (April and June 2013)

4 main scientific questions for AirSWOT campaigns:

- Estuaries (river flow / ocean tide interaction)
- Modelling of surface water-aquifers interaction
- Reach modelling (discharge, overbanking in lowlands, ….)
- Lakes, reservoirs & wetlands (count, distribution of size, …)

Location of targets: mid-latitude and tropical environments

Fast-sampling orbit

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Priority 1: Ka-band σ_0 in a variety of hydrological cases associated to scientific targets

Targets provide as many case studies of water surface

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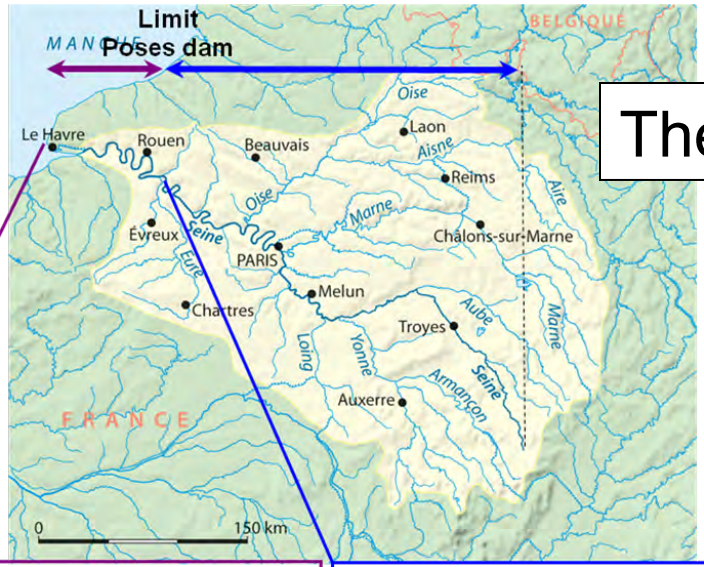
Priority 4: Estuary (April and June 2013)



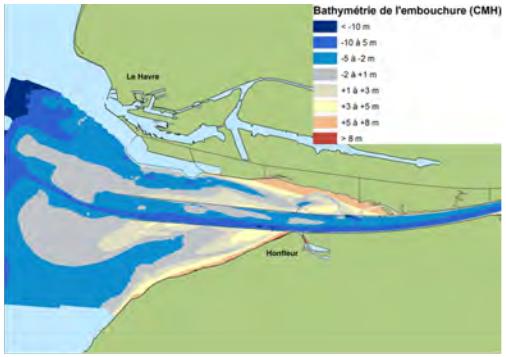
The SEINE

Seine downstream (estuary)
3 stocks of water interact on the water stage (surface water of the river and its tributaries, groundwater and sea water)

Seine upstream
2 stocks of water interact on the water stage : surface water of the river and its tributaries and groundwater

Lower estuary affected by the salinity and tide propagation

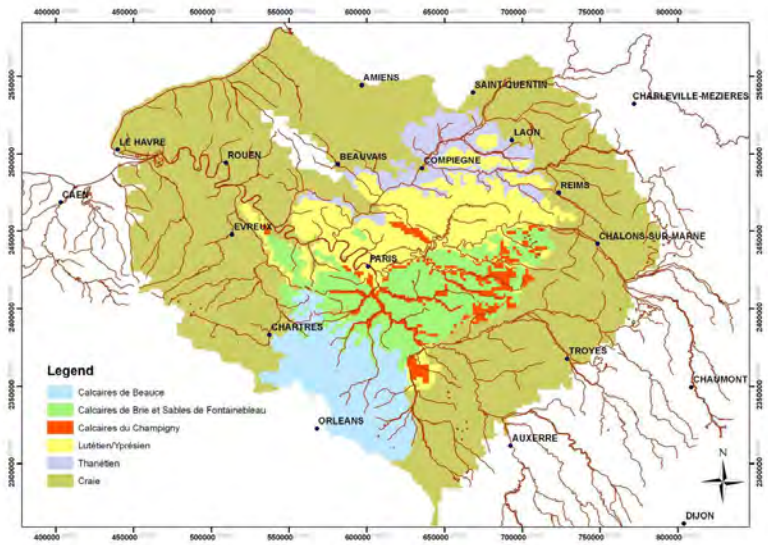
Upstream estuary only affected by tide propagation

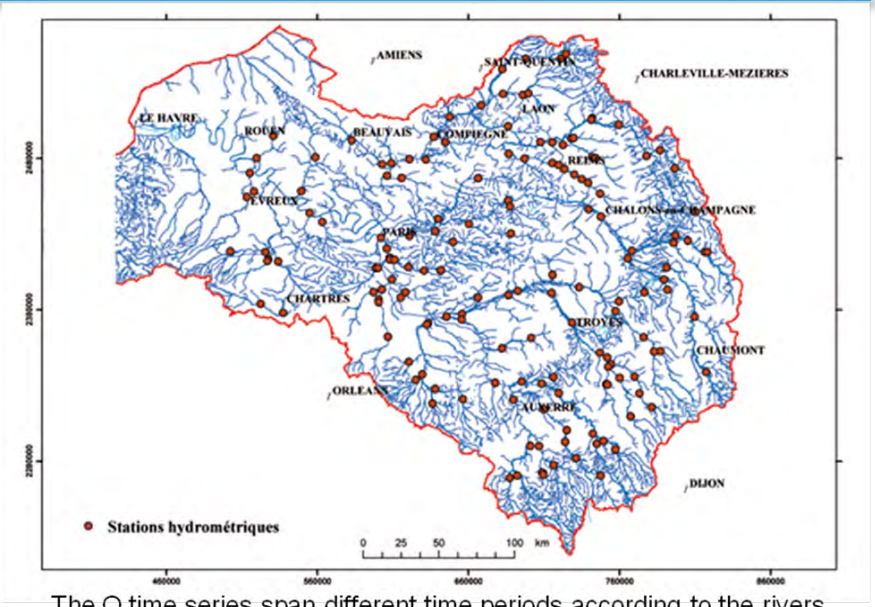


Bathymetry in 2005 - Harbour of Rouen – source GIP Seine Aval

GIF Seine-Aval, University of Rouen, UMR EPOC, LEGOS

Hydrodynamic Campaigns (April and June 2013)





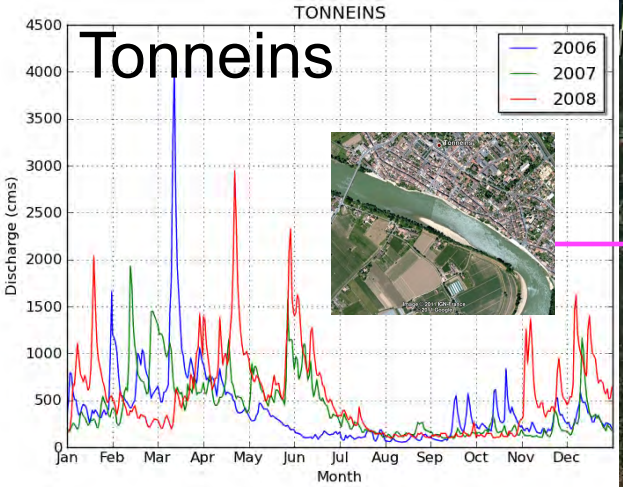
The Q time series span different time periods according to the rivers but generally are at least 10 years – daily data
Example - Poses dam : the first steps have been made in the forties

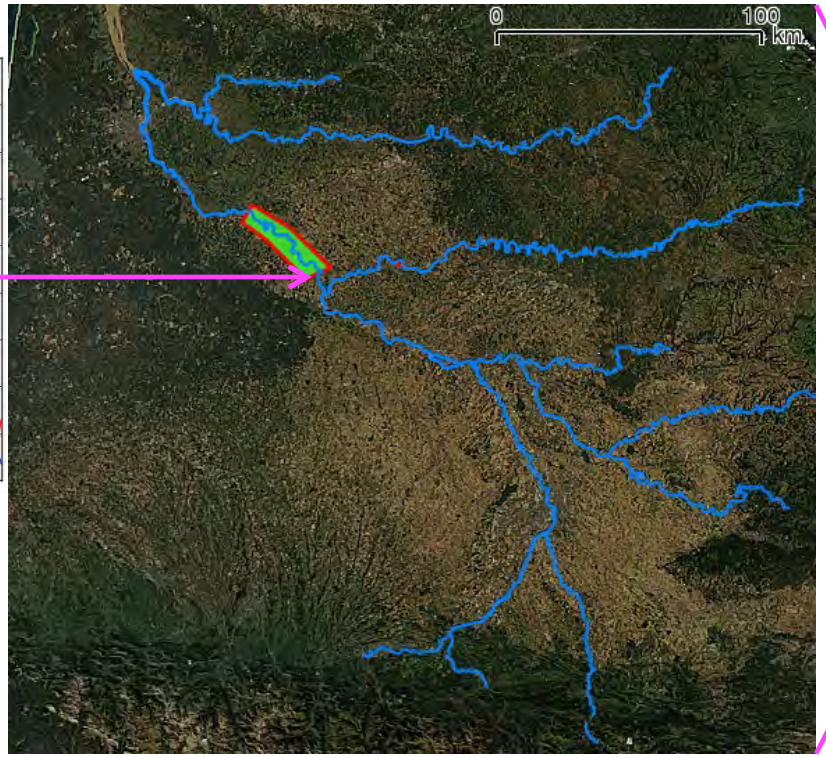
- Validation of the linkages between water surface elevations in rivers, ponds and groundwater recharge in the Seine basin (MODCOU simulation)

Ecole des Mines (Sisyphe, EMSE), CNRM, BRGM, ENSAT, ONEMA, EAURMC, LNHE EDF, CEMAGREF

SWOT

Priorities 1 & 4: Validation of discharge algorithm (1 pass every 10 days between April and June 2013)





- Garonne river between *Tonneins* and *La Reole*.
- River width ~ 200 m and river reach ~ 80 km.
- 1D and 2D models available with measured cross-section profiles.
- 3 to 4 operational in-situ water level gages (discharge with rating curve).
- Collaborations: EDF/LNHE, LEGOS, CERFACS, SCHAPI.

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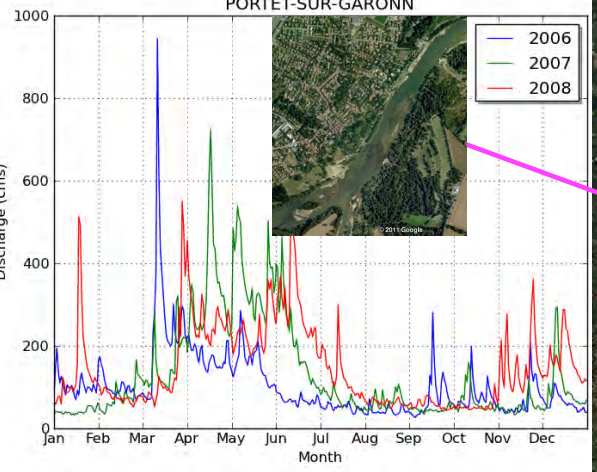
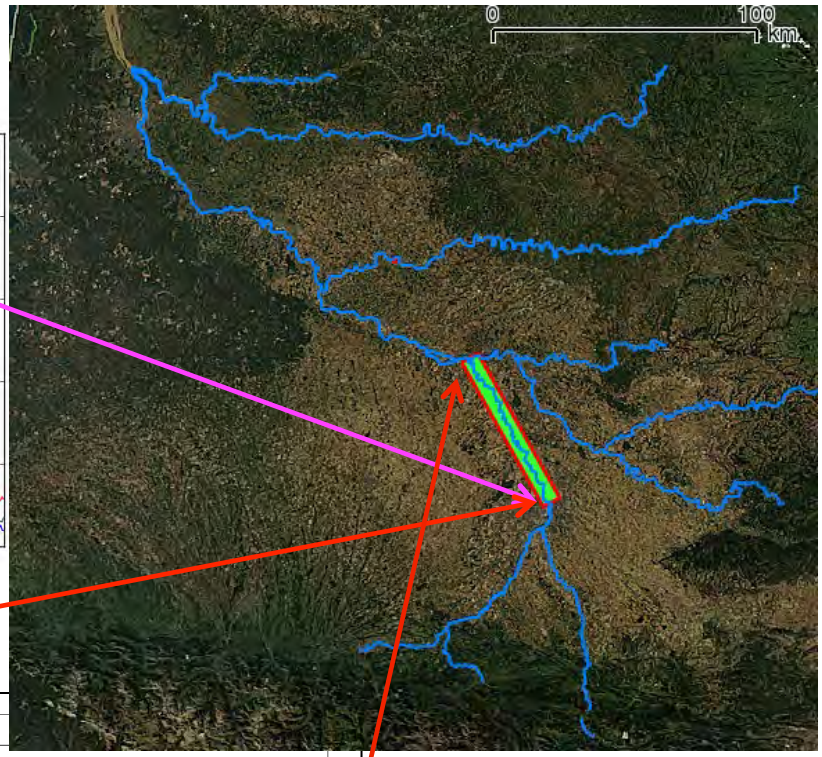
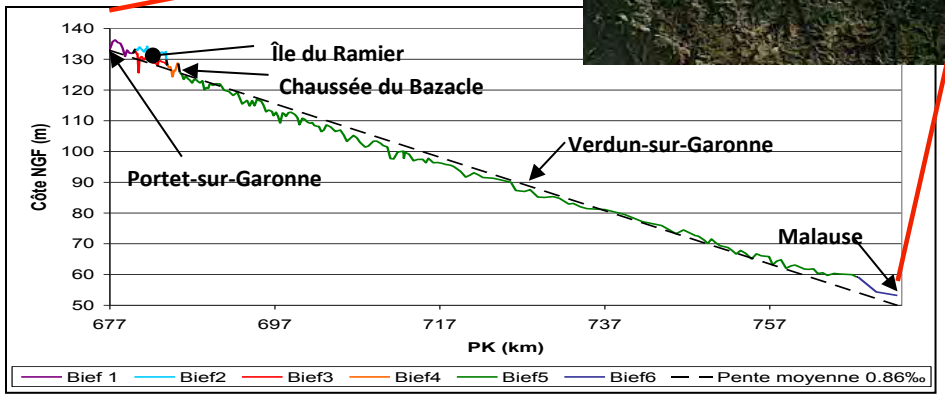
Priorities 1 & 4: Validation of discharge algorithm (1 pass every 10 days between April and June 2013)

Portet-Sur-Garonne







- Garonne river between *Portet* and *Malause*.
- River width ~ 150 m and river reach ~ 115 km.
- 3 operational in-situ water level gages (discharge with rating curve).

- 1D model available with 203 measured cross-section profiles (2D model soon).
- Collaborations: IMFT, INSA/IMT, LEGOS.

Priorities 1 & 7: Lakes and Reservoirs Campaigns

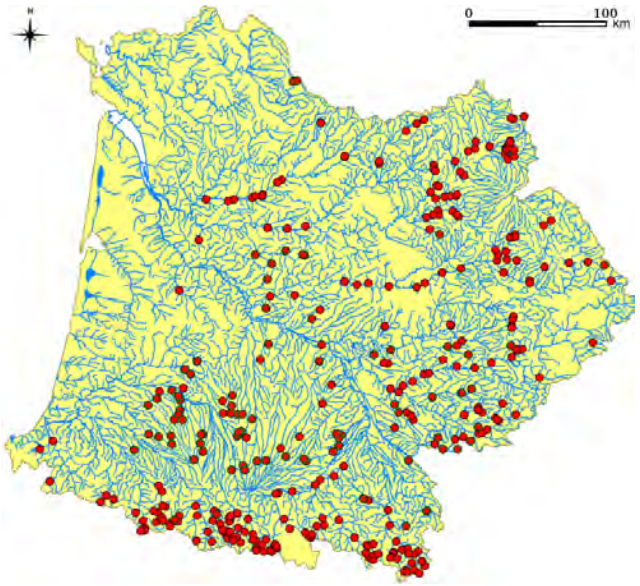
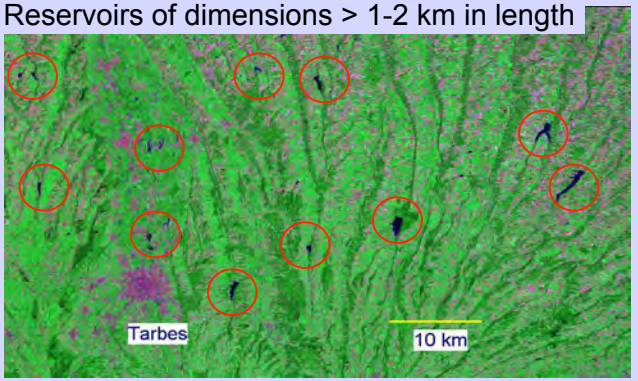


Figure 1. Reservoirs on the Adour Garonne basin

- **Priority 7:** Layover effects in the Pyrénées and SW France
- Storage in lakes and reservoirs
- LEGOS, SDAGE, UMR EPOC,

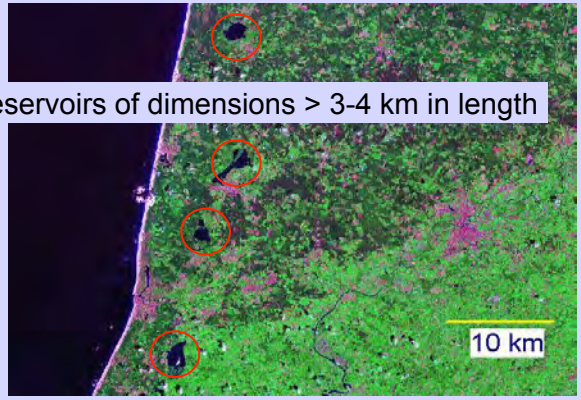
Lakes & reservoirs in the Pyrenées on the French side

Reservoirs of dimensions > 1-2 km in length



Bayonne

Reservoirs of dimensions > 3-4 km in length



Tarbes

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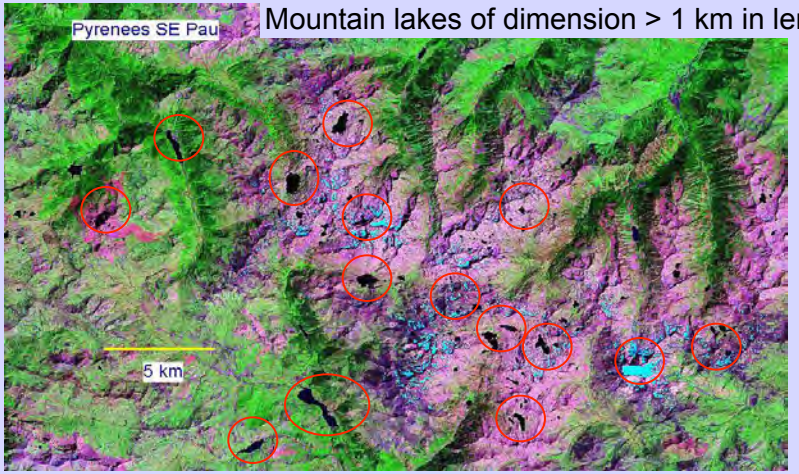
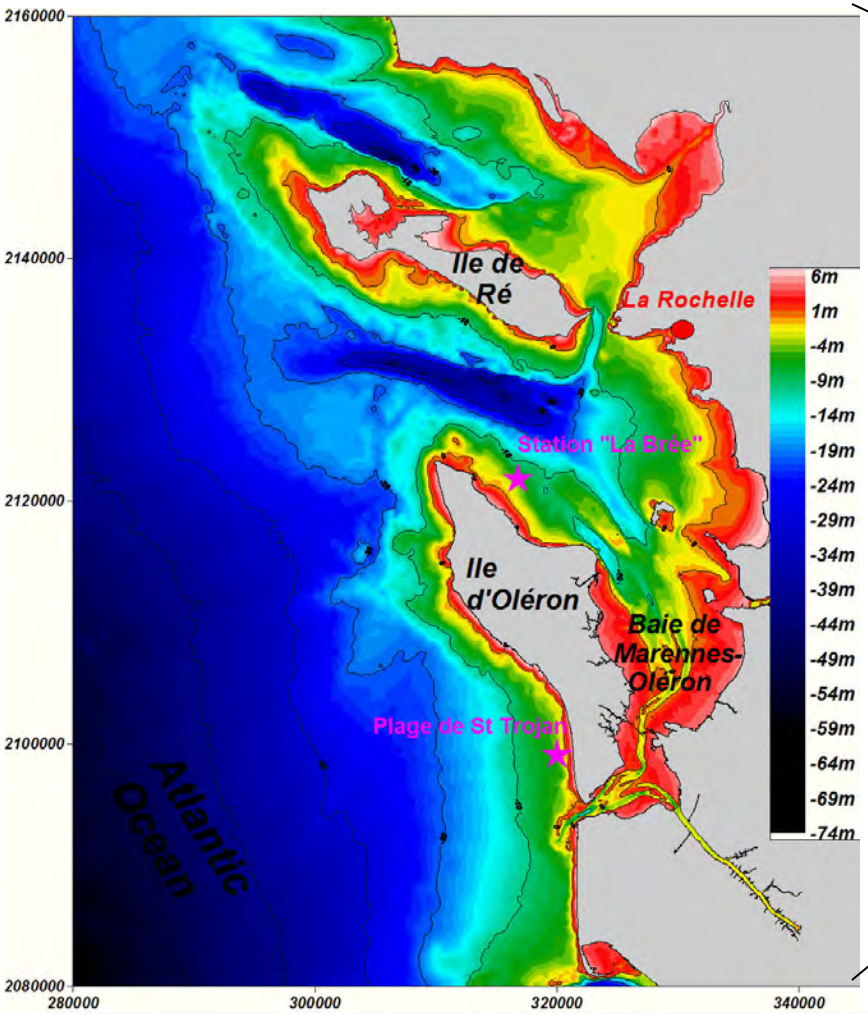
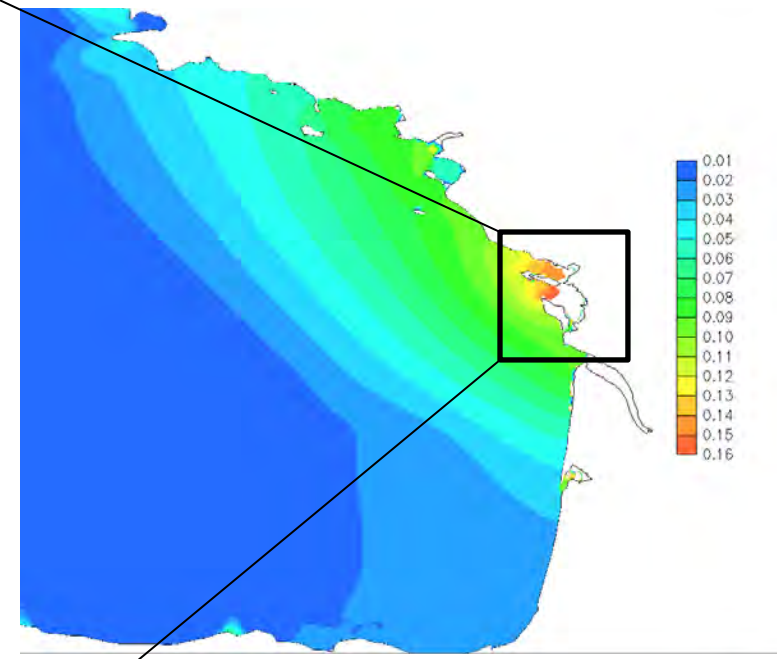
Mountain lakes of dimension > 1 km in length



Interaction between tidal waves and wind waves





Tide amplitude increase in shallow bays

Priorities : all (1 week flights)

- Potential targets in Tropics :

French Guyana

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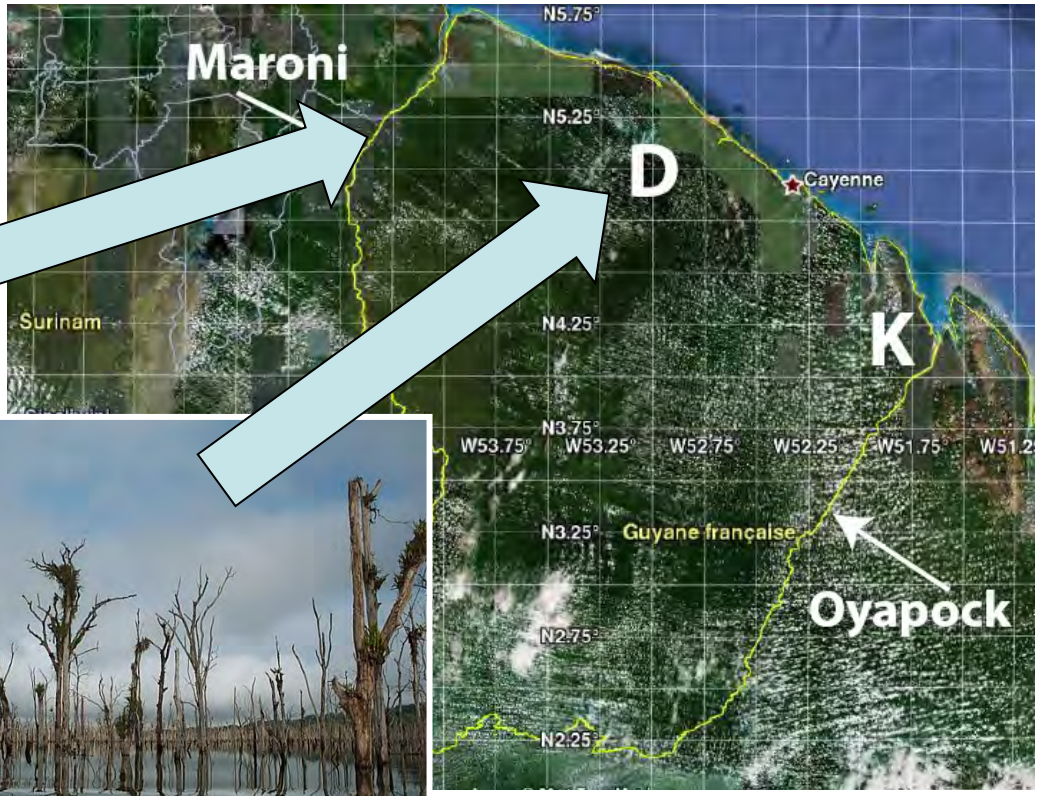

Priorities : all (1 week flights)

- Potential targets in Tropics :

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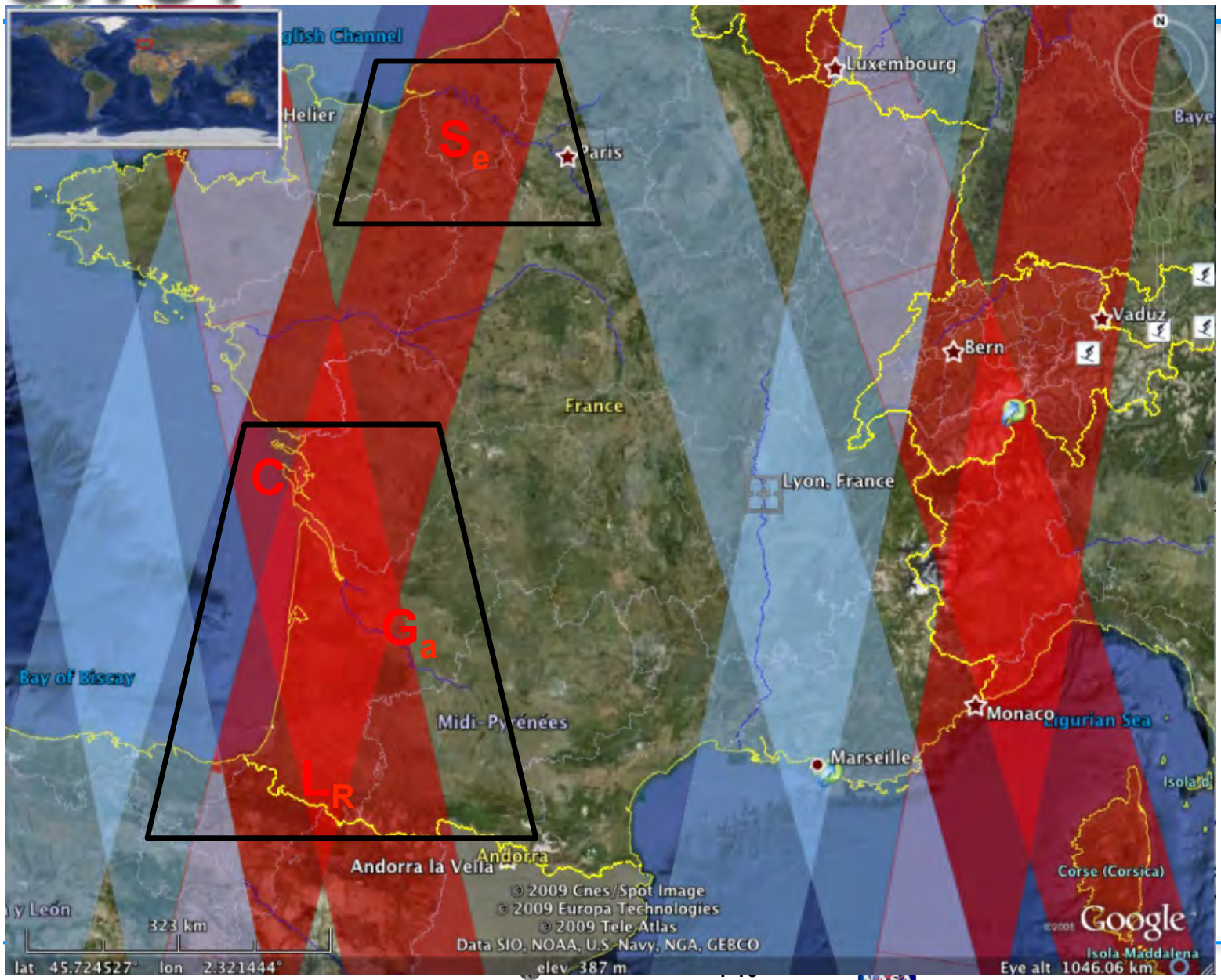
SWOT 3-day repeat orbit over France



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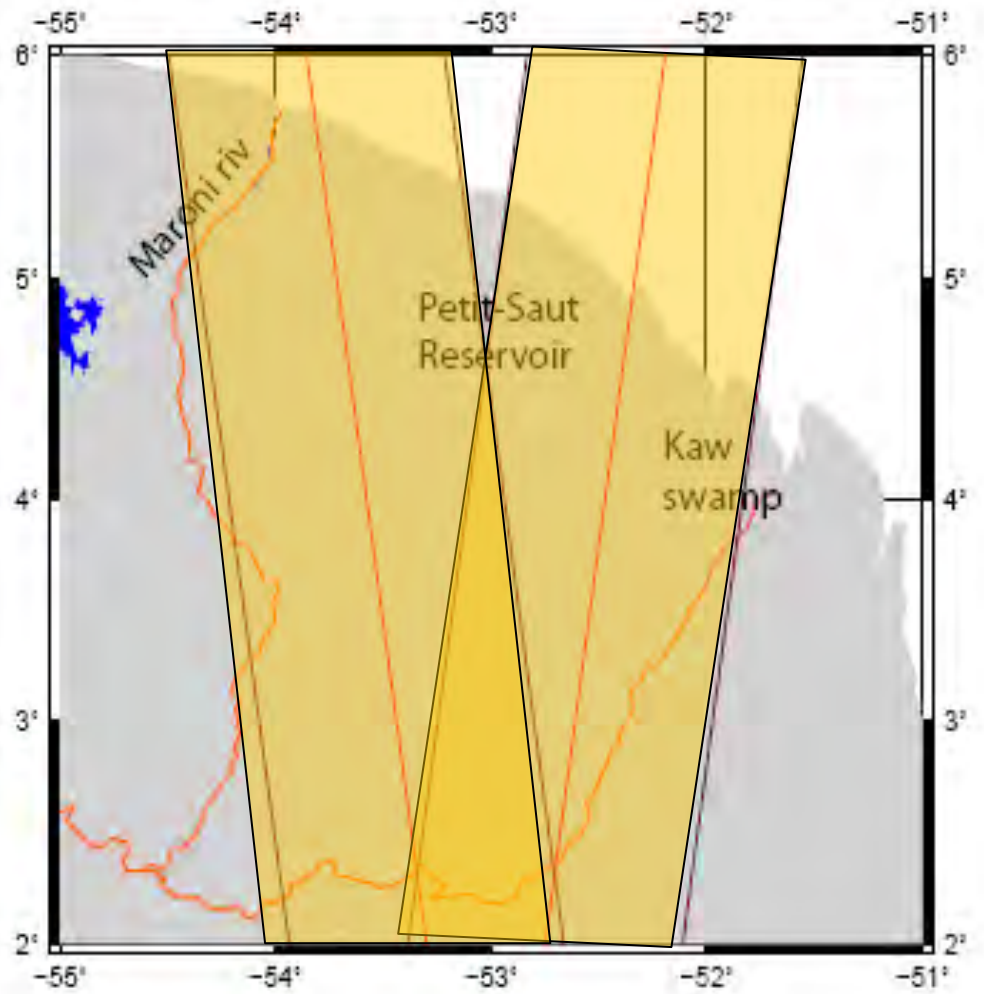
SWOT 3-day repeat orbit over Fr Guyana



Most targets can be re-used (at least partly) by the 3-day fast-sampling orbit

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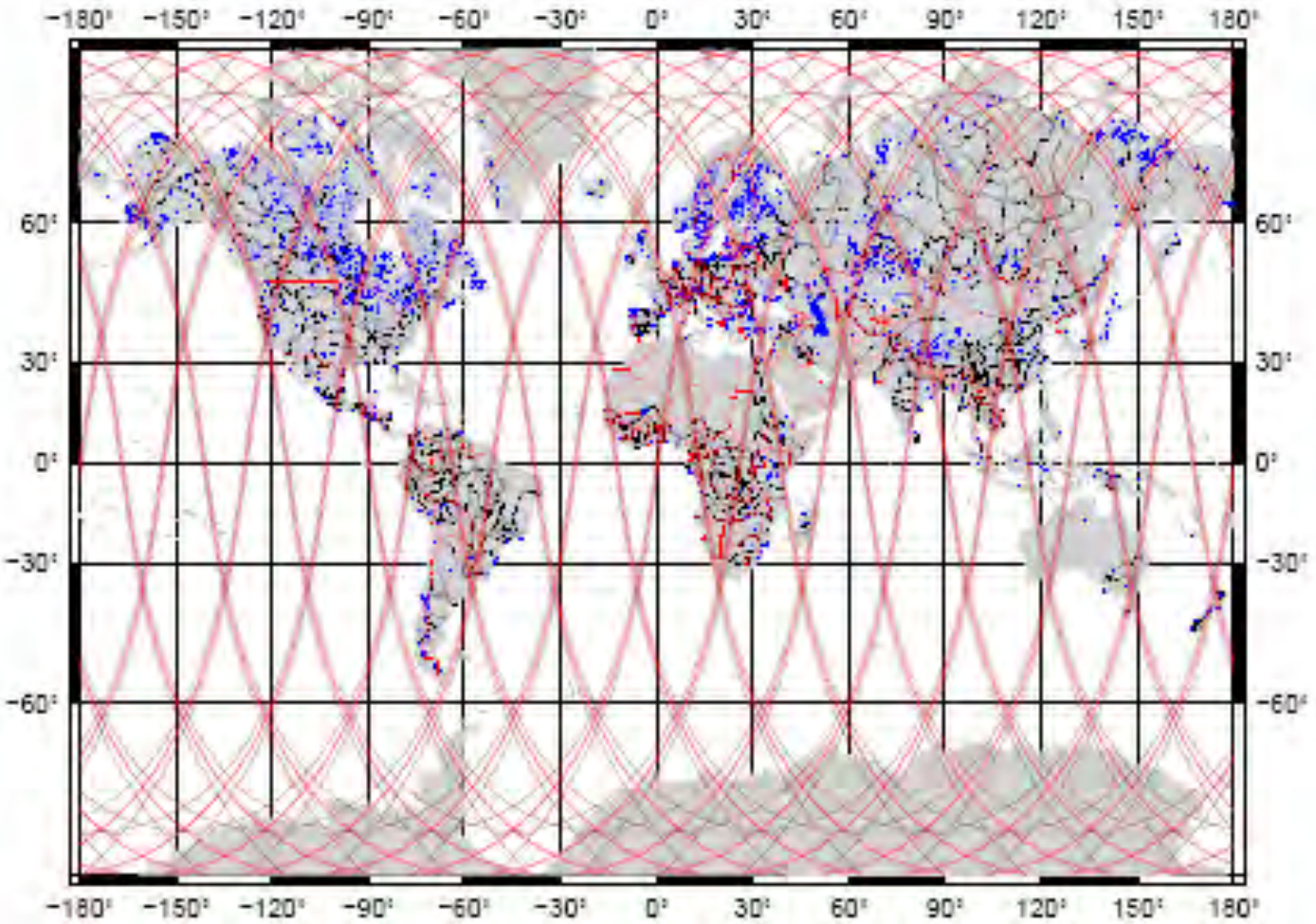
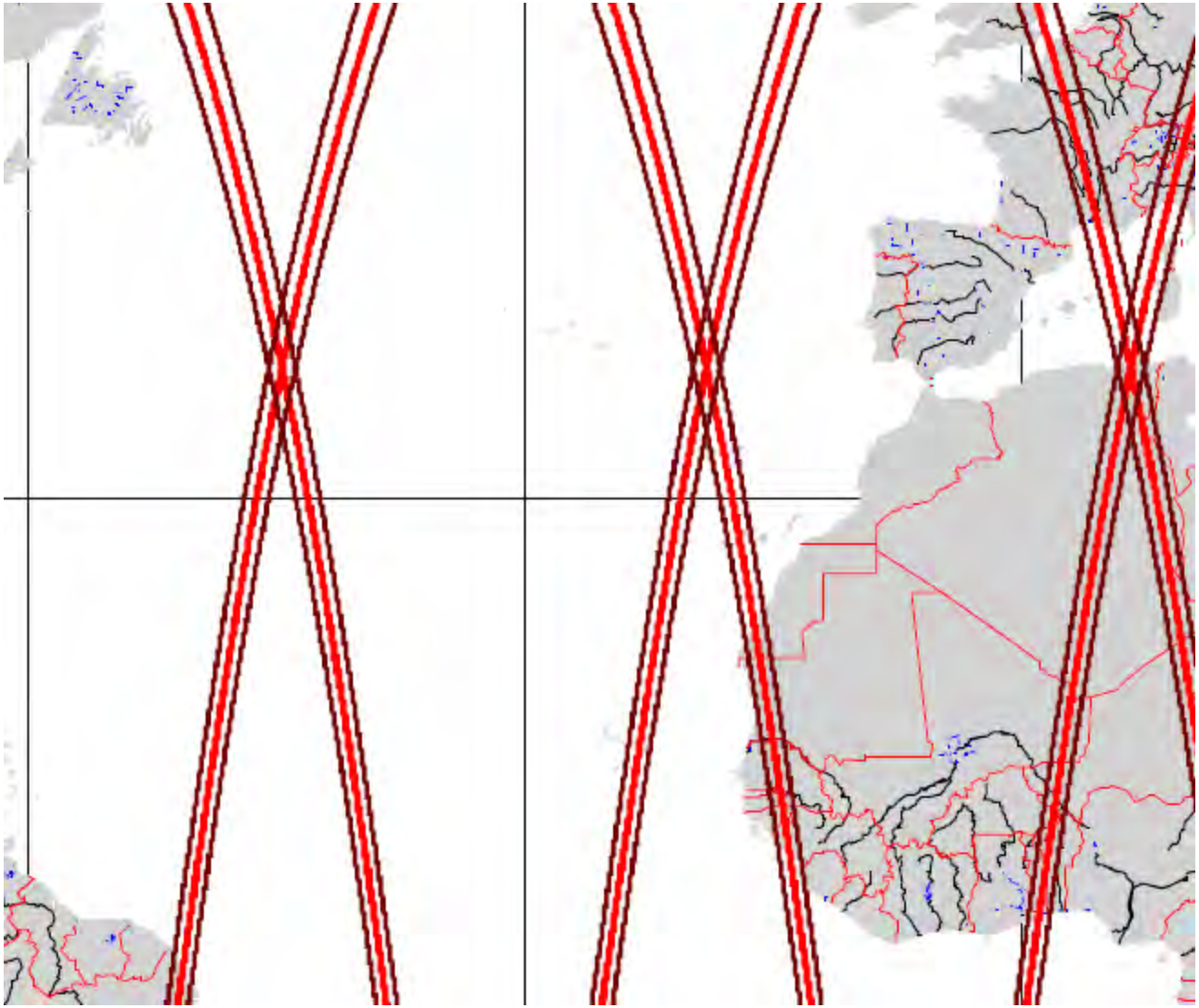
1-day fast-sampling orbit



Most AirSWOT targets are missed by the 1-day orbit



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