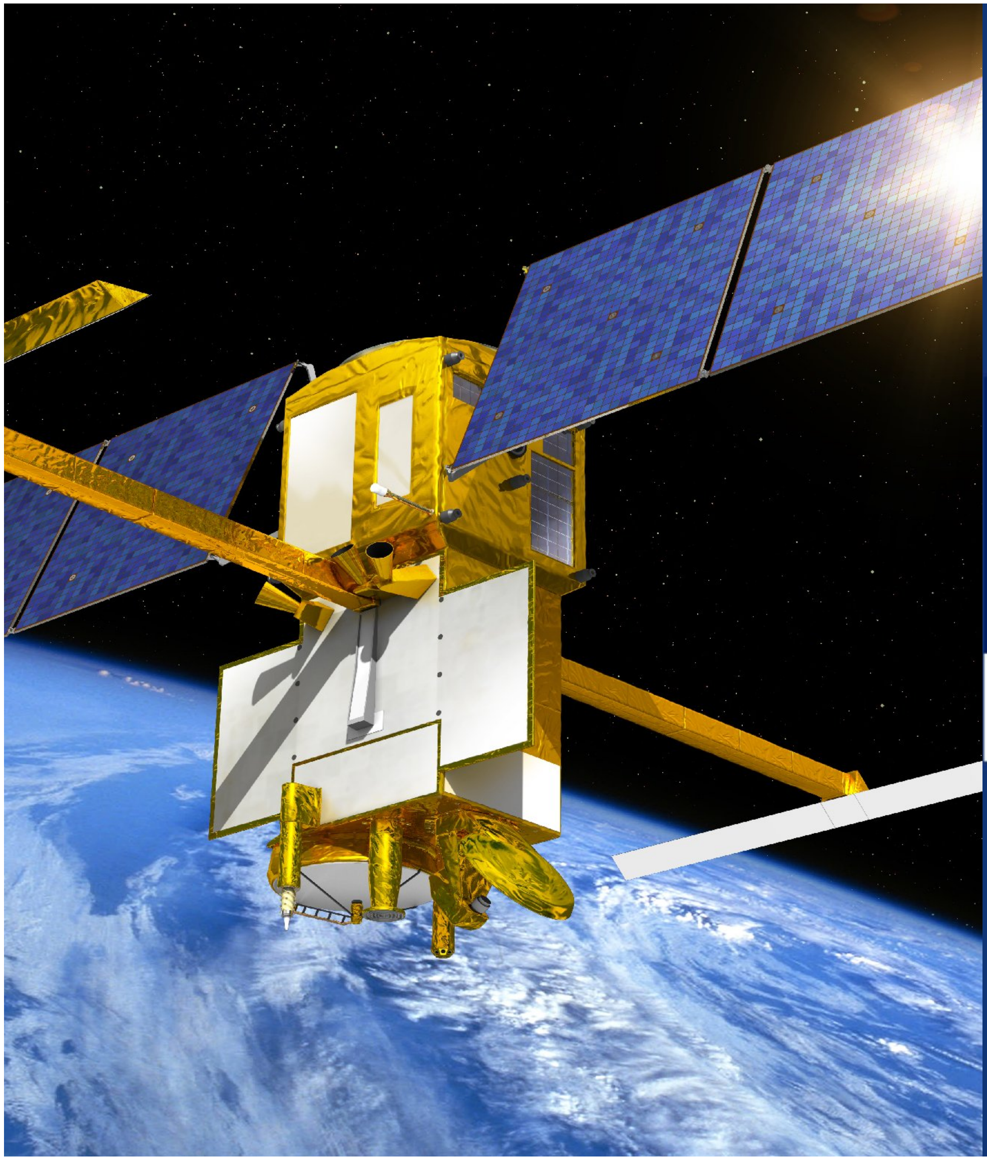


SWOT

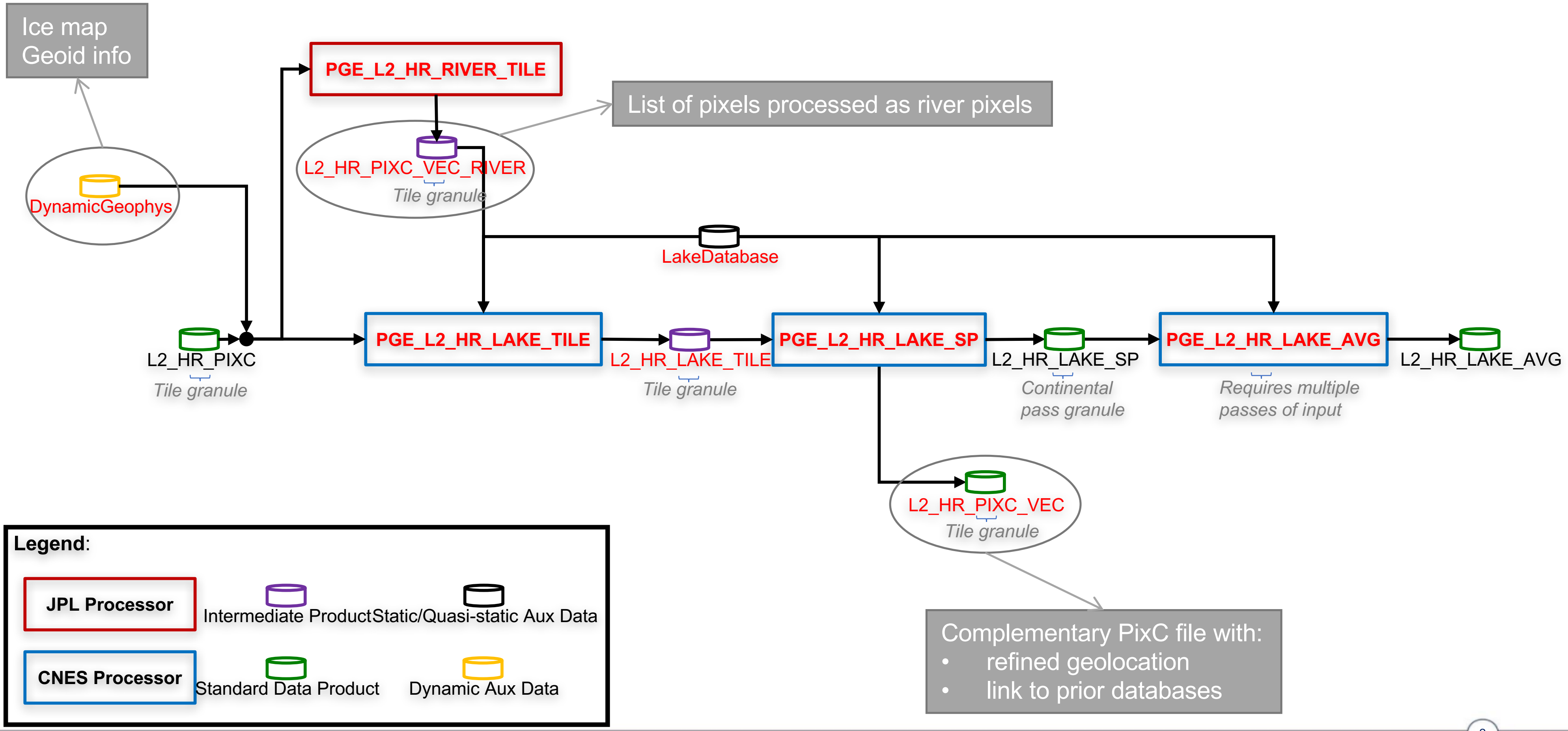
Lake Products from LOCNES

Claire POTTIER, Cécile CAZALS (CS)

LOCNES

Lake **O**bservation **C**over a**N**d **E**xtent from **S**wot

Lake processing overview



Ice map
Geoid info

DynamicGeophys

PGE_L2_HR_RIVER_TILE

L2_HR_PIXC_VEC_RIVER
Tile granule

List of pixels processed as river pixels

LakeDatabase

L2_HR_PIXC
Tile granule

PGE_L2_HR_LAKE_TILE

L2_HR_LAKE_TILE
Tile granule

PGE_L2_HR_LAKE_SP

L2_HR_LAKE_SP
Continental pass granule

PGE_L2_HR_LAKE_AVG
Requires multiple passes of input

L2_HR_LAKE_AVG

L2_HR_PIXC_VEC
Tile granule

Complementary PixC file with:

- refined geolocation
- link to prior databases

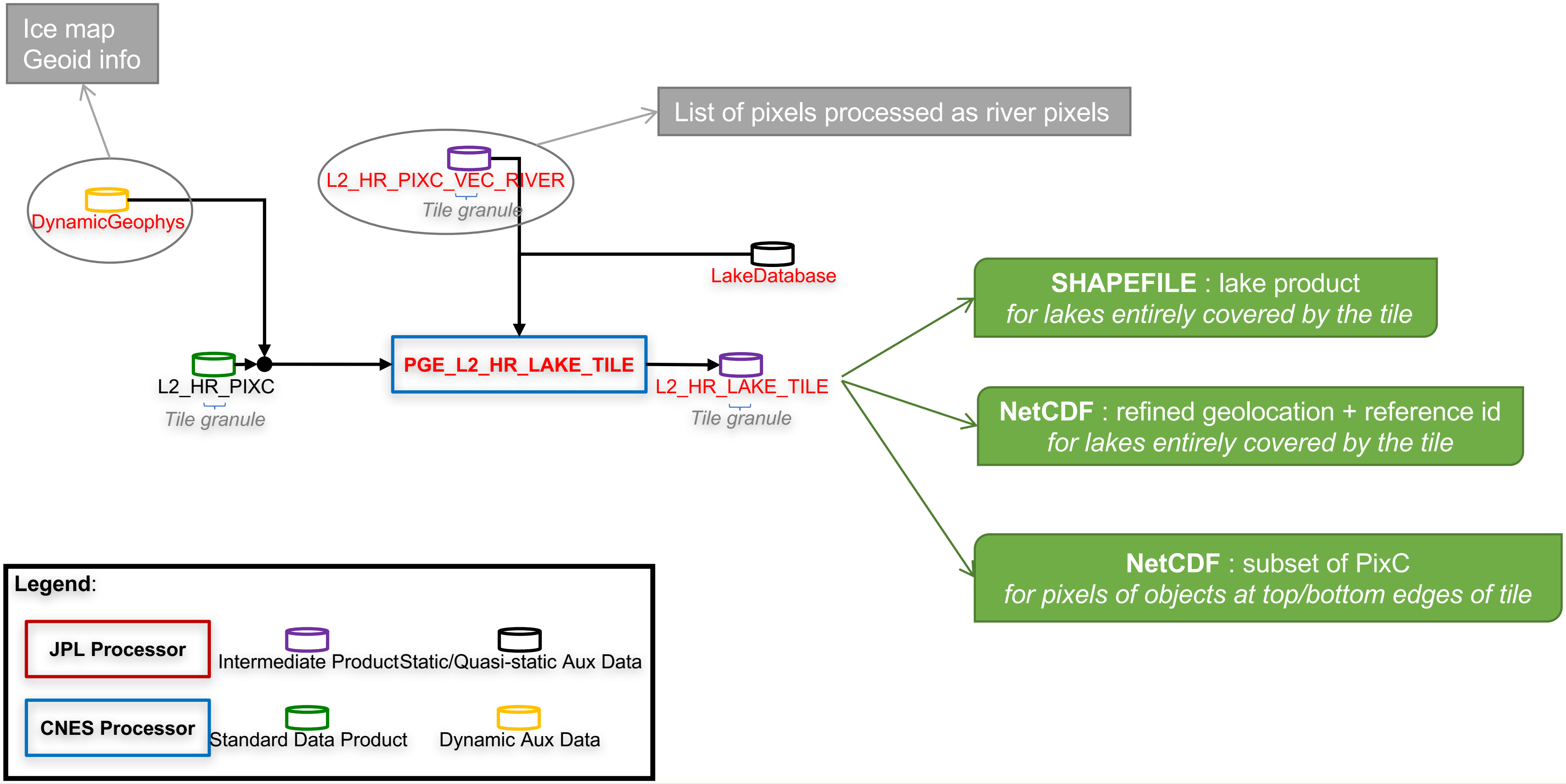
Legend:

🟥 **JPL Processor**	Intermediate Product	Static/Quasi-static Aux Data
🟦 **CNES Processor**	Standard Data Product	Dynamic Aux Data

LAKE_TILE software

LAKE_TILE

LAKE_TILE processing – Flow diagram



Ice map
Geoid info

DynamicGeophys

L2_HR_PIXC_VEC_RIVER
Tile granule

List of pixels processed as river pixels

LakeDatabase

L2_HR_PIXC
Tile granule

PGE_L2_HR_LAKE_TILE

L2_HR_LAKE_TILE
Tile granule

SHAPEFILE : lake product
for lakes entirely covered by the tile

NetCDF : refined geolocation + reference id
for lakes entirely covered by the tile

NetCDF : subset of PixC
for pixels of objects at top/bottom edges of tile

Legend:

JPL Processor

Intermediate Product

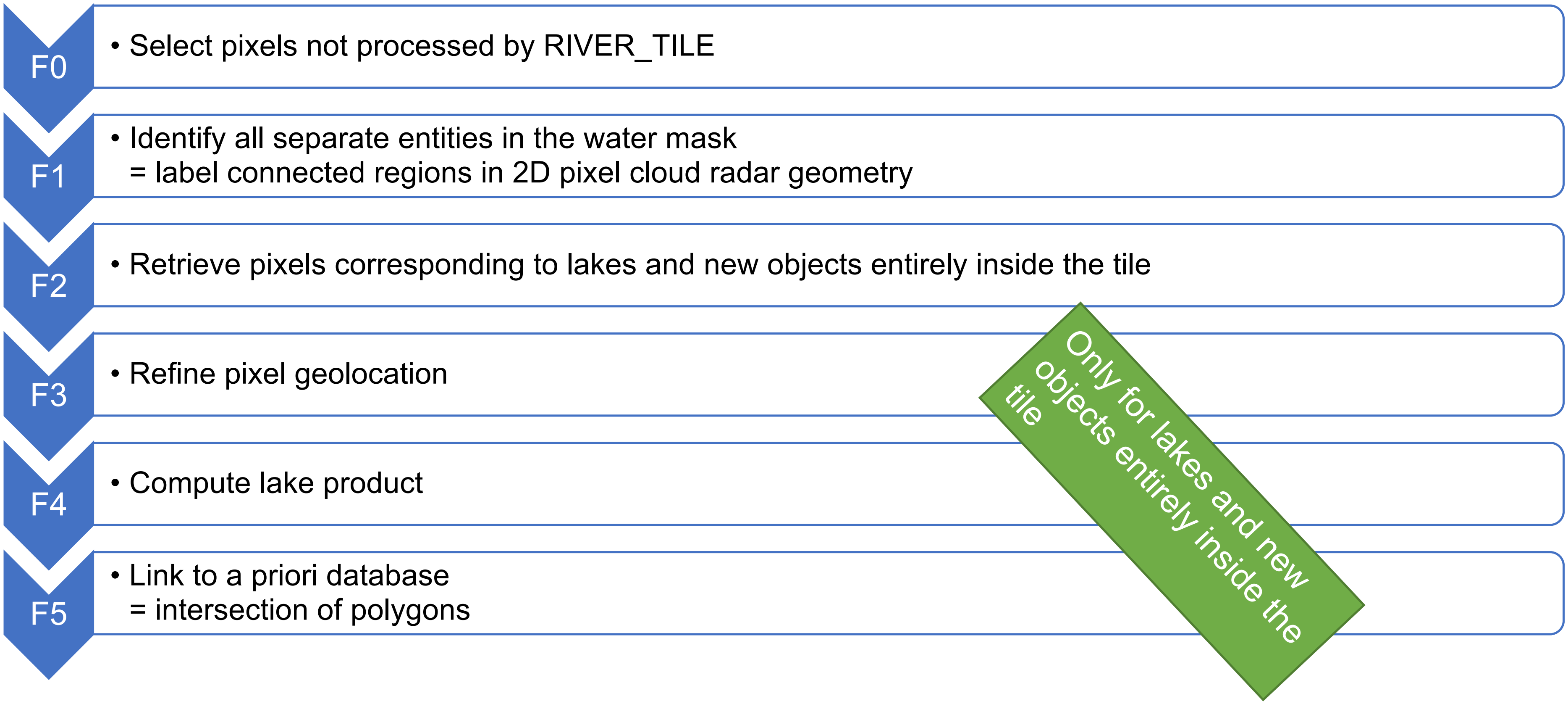
Static/Quasi-static Aux Data

CNES Processor

Standard Data Product

Dynamic Aux Data

LAKE_TILE processing steps



F0
- Select pixels not processed by RIVER_TILE

F1
- Identify all separate entities in the water mask
  = label connected regions in 2D pixel cloud radar geometry

F2
- Retrieve pixels corresponding to lakes and new objects entirely inside the tile

F3
- Refine pixel geolocation

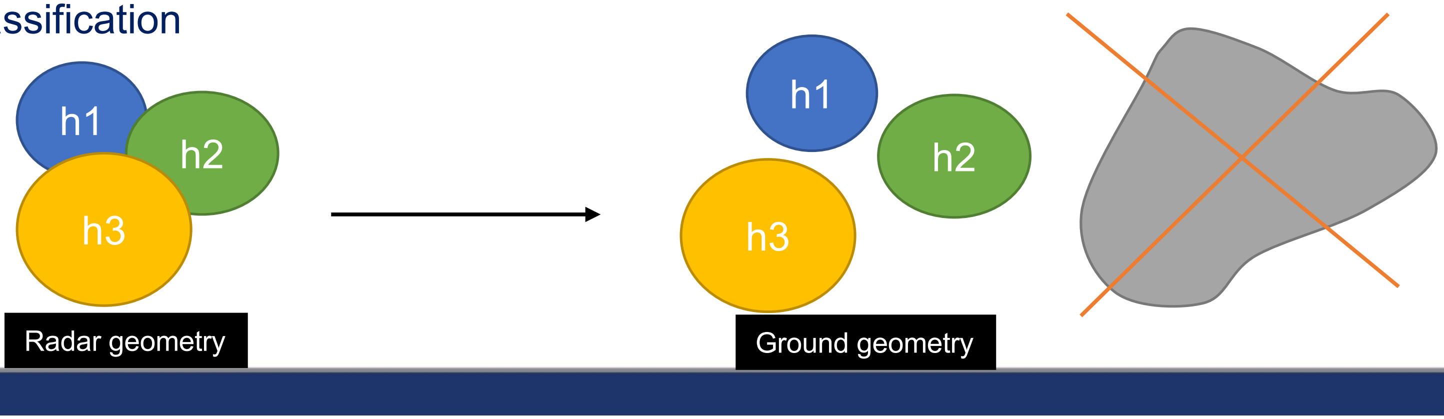
F4
- Compute lake product

F5
- Link to a priori database
  = intersection of polygons

Only for lakes and new objects entirely inside the tile

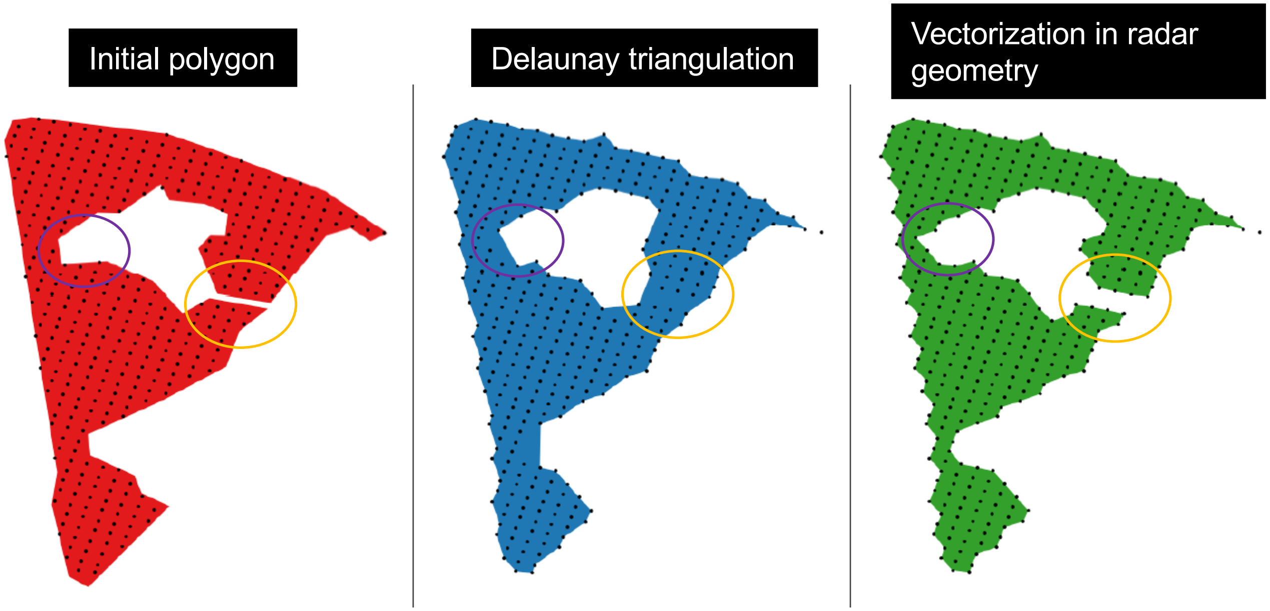
LAKE_TILE software – Limitations and on-going work

- Basic selection of pixels: = PixC – pixels in PIXC_VEC_RIVER file; therefore:
  - Reservoirs not taken into account
  - Pixel cloud on ocean not removed
  - Cases when entities incompletely processed by RIVER_TILE roughly processed
- Separation of entities: computed in radar geometry
  - Case when 2 or more lakes are interpreted as merged in radar geometry: implementation of height classification



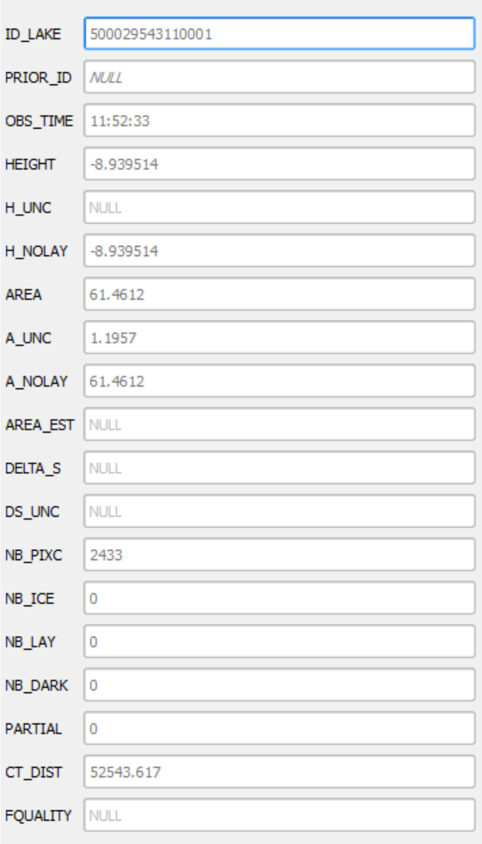
LAKE_TILE software – Limitations and on-going work (cont'd)

- Improved geolocation: processing different between "small" and "large" lakes (****ha, in configuration file)
- Polygon computation:
  - Convex hull
    → not satisfaying
  - Basic and improved concave hull computation
    → still some artefacts
    + time consuming
  - Ongoing work: computation in radar geometry then conversion in ground geometry



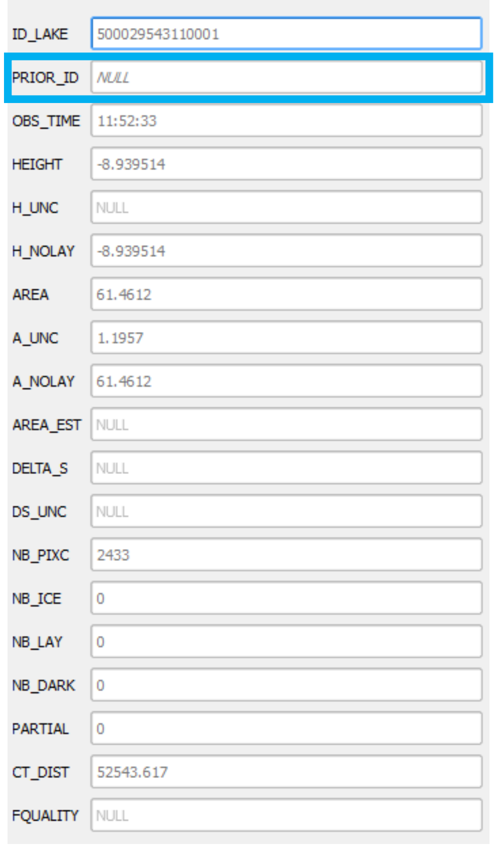
LAKE_TILE software – Limitations and on-going work (cont'd)

- Attributes:
  - Basic attributes, uncertainties not implemented
  - Current work to homogenize attributes with river products: will be implemented when freezed
  - Water storage: not yet implemented (see J.-F. Crétaux's talk tomorrow)



ID_LAKE	500029543110001
PRIOR_ID	*NULL*
OBS_TIME	11:52:33
HEIGHT	-8.939514
H_UNC	NULL
H_NOLAY	-8.939514
AREA	61.4612
A_UNC	1.1957
A_NOLAY	61.4612
AREA_EST	NULL
DELTA_S	NULL
DS_UNC	NULL
NB_PIXC	2433
NB_ICE	0
NB_LAY	0
NB_DARK	0
PARTIAL	0
CT_DIST	52543.617
FQUALITY	NULL

LAKE_TILE software – Limitations and on-going work (cont'd)



ID_LAKE	500029543110001
PRIOR_ID	NULL
OBS_TIME	11:52:33
HEIGHT	-8.939514
H_UNC	NULL
H_NOLAY	-8.939514
AREA	61.4612
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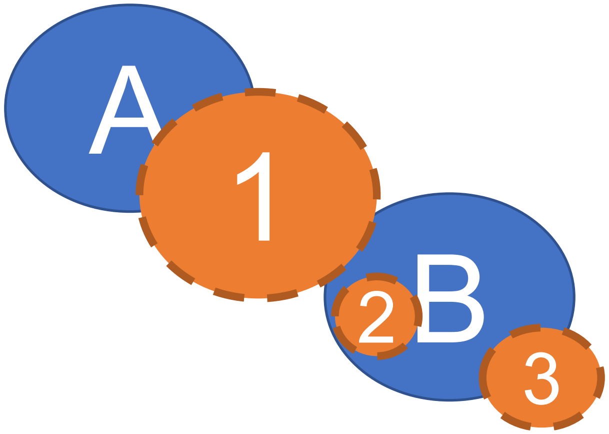
AREA_EST	NULL
DELTA_S	NULL
DS_UNC	NULL
NB_PIXC	2433
NB_ICE	0
NB_LAY	0
NB_DARK	0
PARTIAL	0
CT_DIST	52543.617
FQUALITY	NULL

- PRIOR_ID = list of lakes from DB that intersect object (default = NULL)
  - Use of <lakeDb_OGRLayer>.SetSpatialFilter(object_polygon)



A-B = observed lakes

1-2-3 = lakes from a priori DB

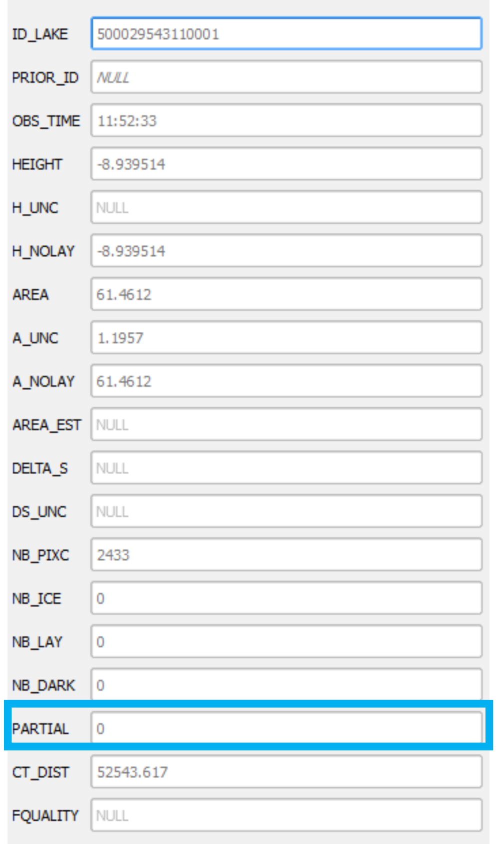
Object A:

- LAKE_TILE.shp: prior_id = 1
- PIXC_VEC.nc: tag = 1

Object B:

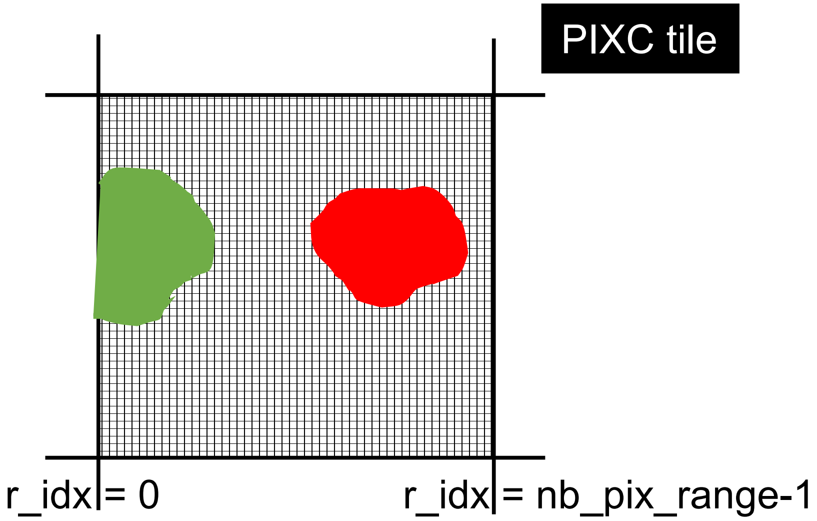
- LAKE_TILE.shp: prior_id = 2;3;1 [from highest intersection area]
- PIXC_VEC.nc: tag = 1|2|3 [distance between pixel and prior lake centroid]

LAKE_TILE software – Limitations and on-going work (cont'd)



ID_LAKE	500029543110001
PRIOR_ID	*NULL*
OBS_TIME	11:52:33
HEIGHT	-8.939514
H_UNC	NULL
H_NOLAY	-8.939514
AREA	61.4612
A_UNC	1.1957
A_NOLAY	61.4612
AREA_EST	NULL
DELTA_S	NULL
DS_UNC	NULL
NB_PIXC	2433
NB_ICE	0
NB_LAY	0
NB_DARK	0
PARTIAL	0
CT_DIST	52543.617
FQUALITY	NULL

- =1 if object on left or right edge of the tile

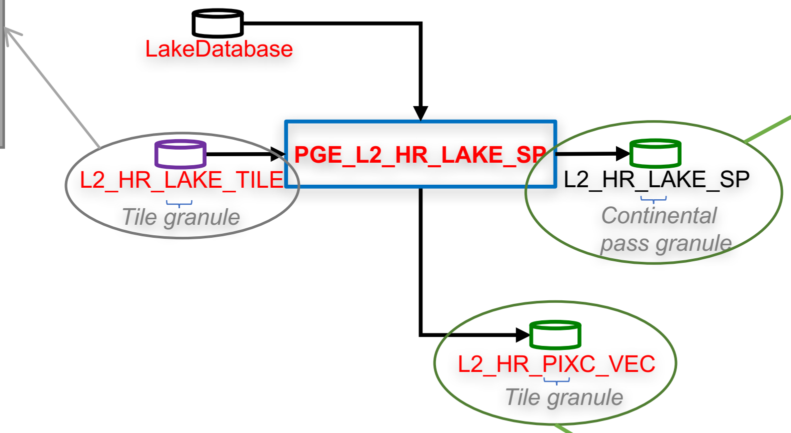


LAKE_SP software

LAKE_SP

Lake processing overview

- **SHAPEFILE** : lake product *for lakes entirely covered by the tile*
- **NetCDF** : refined geolocation + reference id *for lakes entirely covered by the tile*
- **NetCDF** : subset of PixC *for pixels of objects at top/bottom edges of tile*



SHAPEFILE : lake product
for a continental pass

Complementary PixC file with:
- **refined geolocation**
- **link to prior databases**

Legend:

JPL Processor

CNES Processor

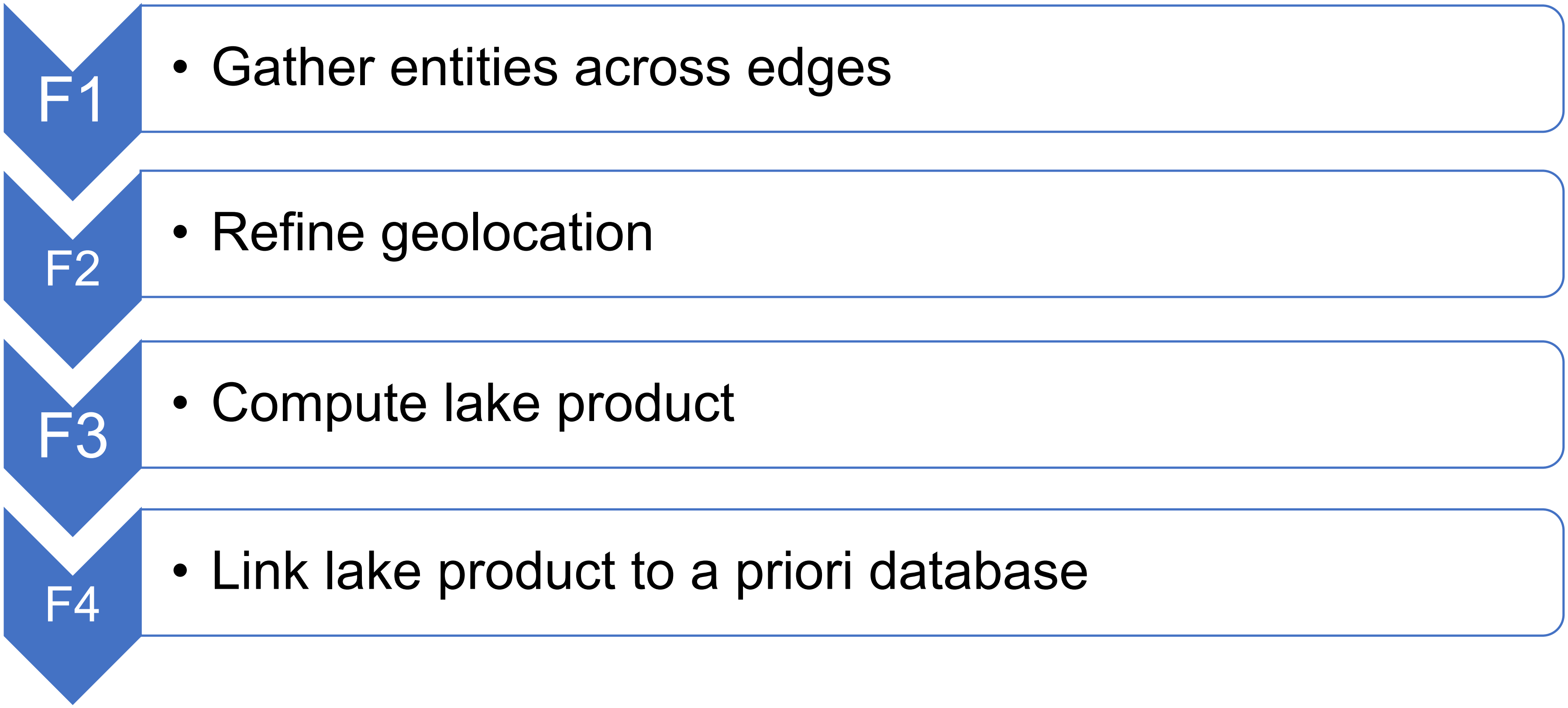
Intermediate Product

Static/Quasi-static Aux Data

Standard Data Product

Dynamic Aux Data

LAKE_SP processing steps



F1
- Gather entities across edges

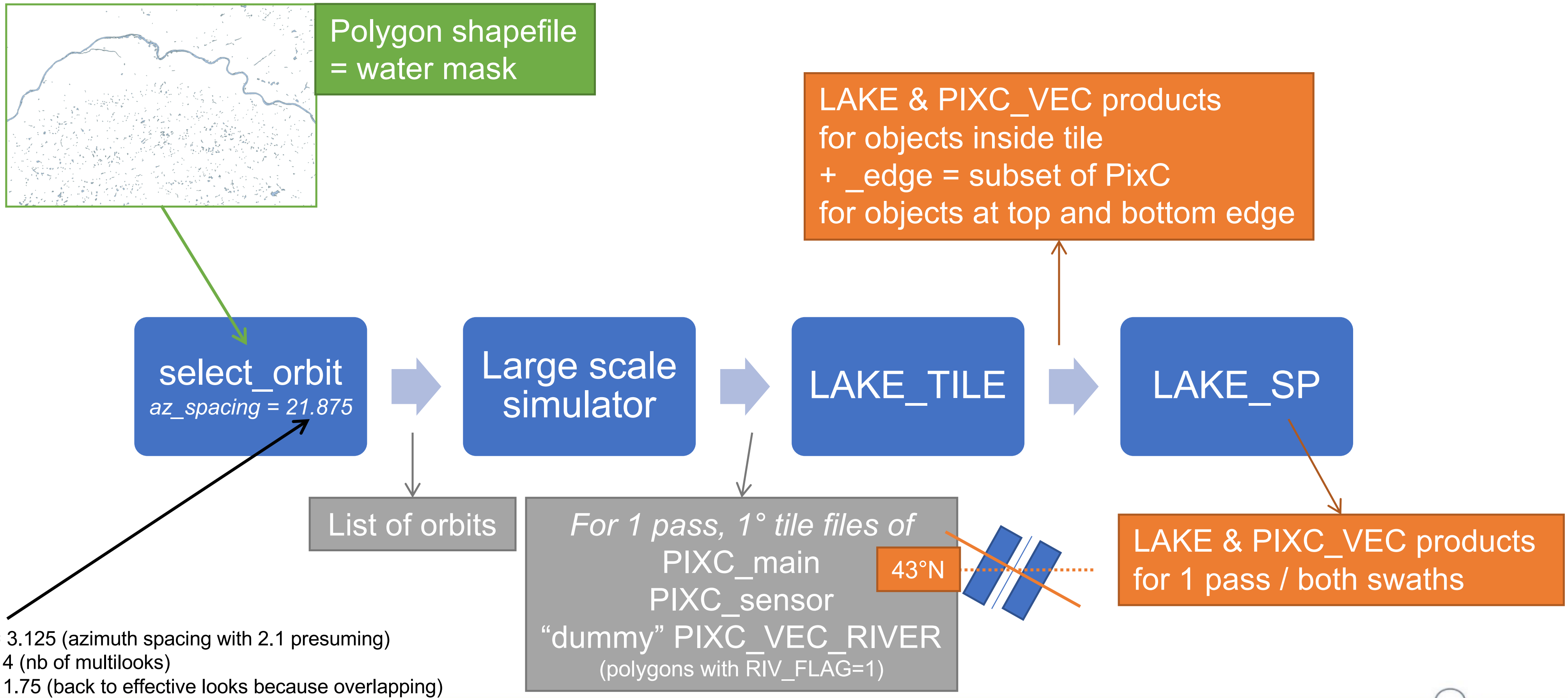
F2
- Refine geolocation

F3
- Compute lake product

F4
- Link lake product to a priori database

TEST CASE

Processing chain



Polygon shapefile = water mask

select_orbit

az_spacing = 21.875

Large scale simulator

LAKE_TILE

LAKE_SP

List of orbits

For 1 pass, 1° tile files of
PIXC_main
PIXC_sensor
“dummy” PIXC_VEC_RIVER
(polygons with RIV_FLAG=1)

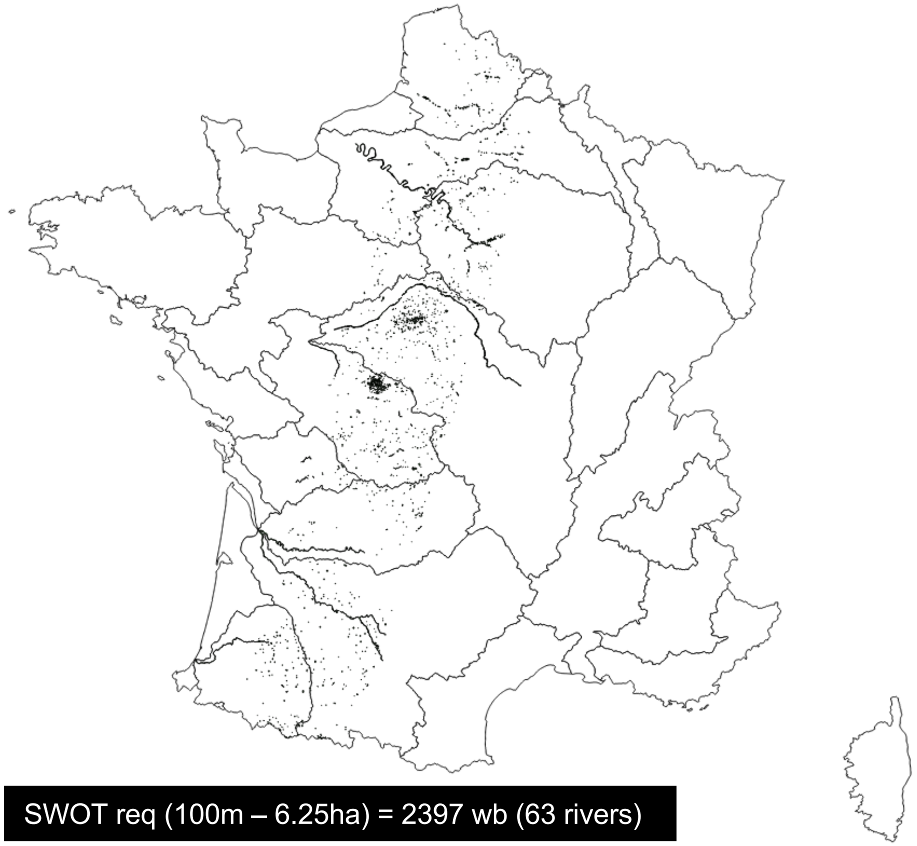
43°N

LAKE & PIXC_VEC products
for objects inside tile
+ _edge = subset of PixC
for objects at top and bottom edge

LAKE & PIXC_VEC products
for 1 pass / both swaths

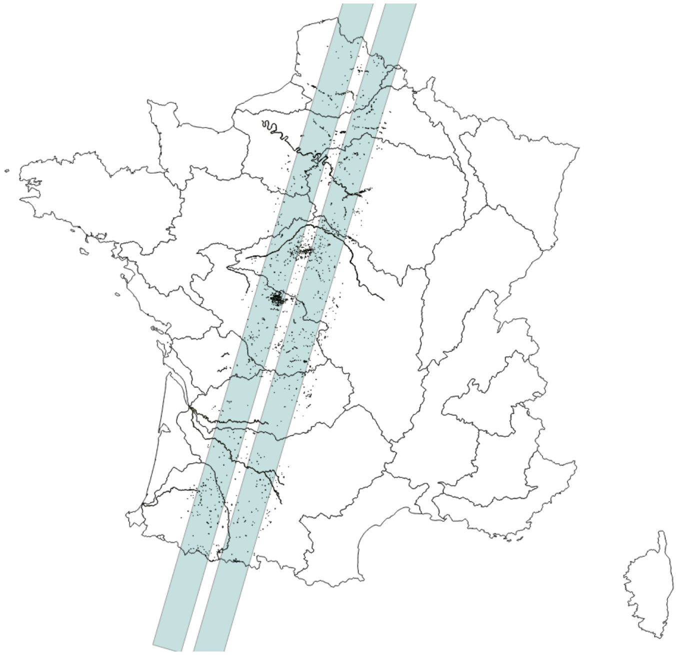
= 3.125 (azimuth spacing with 2.1 presuming)
* 4 (nb of multilooks)
* 1.75 (back to effective looks because overlapping)

Example – Subset of IGN Carthage DB



SWOT req (100m – 6.25ha) = 2397 wb (63 rivers)

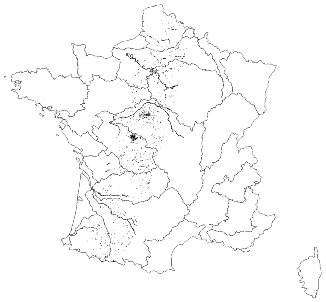
select_orbit

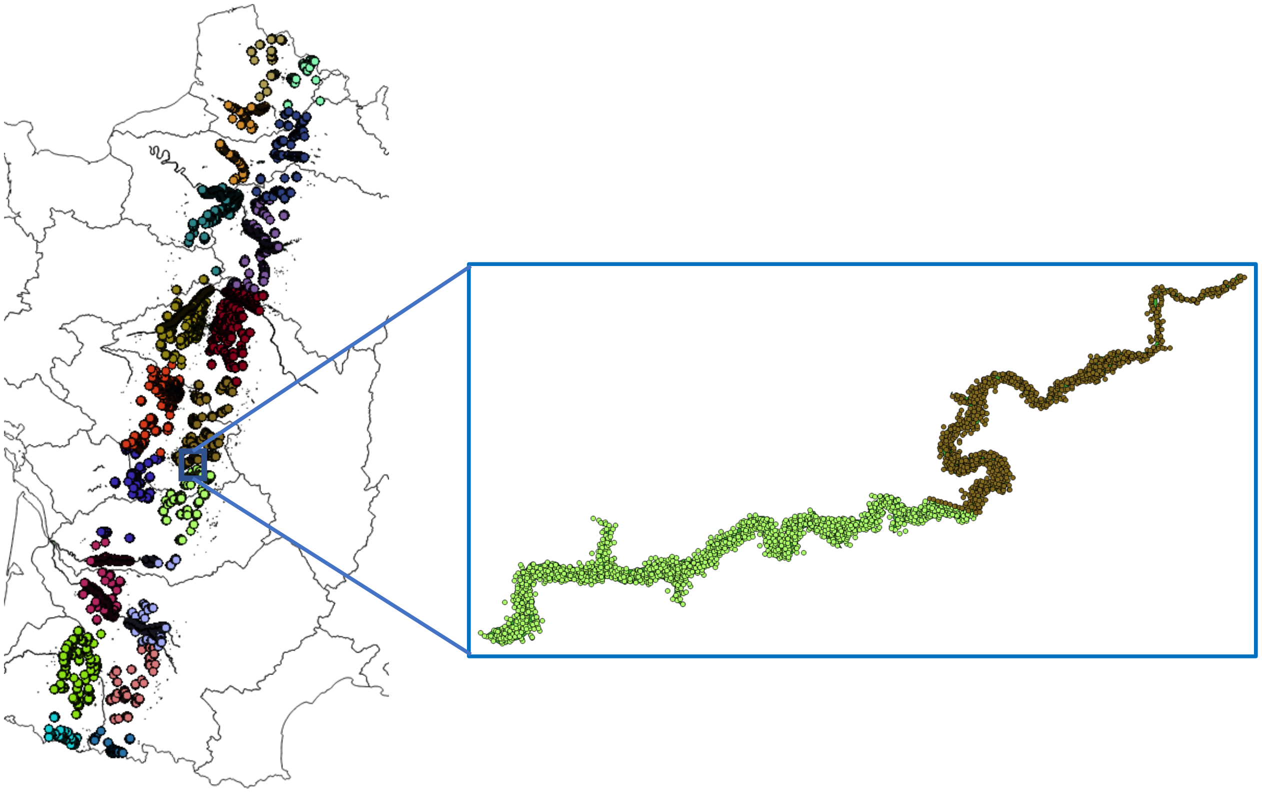


30 passes → n°60 (ASC)

Example – Subset of IGN Carthage DB (cont’d)

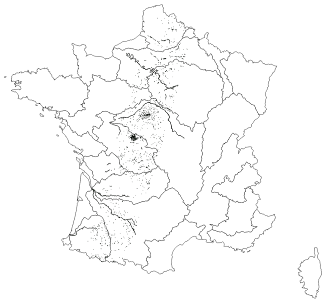
Large scale simulator / pass 60 (ASC-R+L)



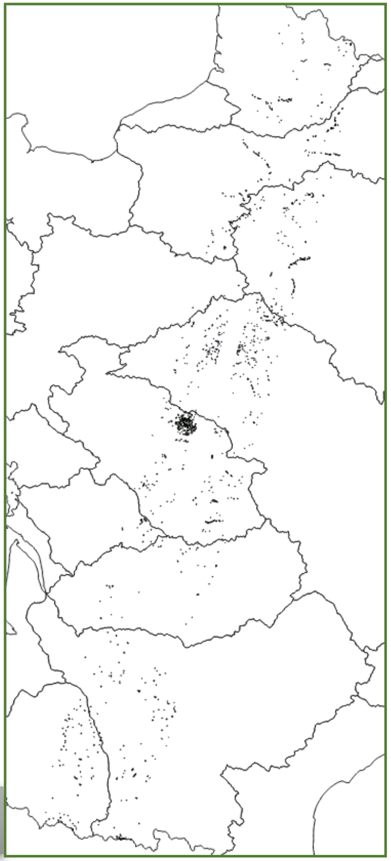


~ 1 million of pixels (18 tiles) generated in ~2min

Example – Subset of IGN Carthage DB (cont'd)

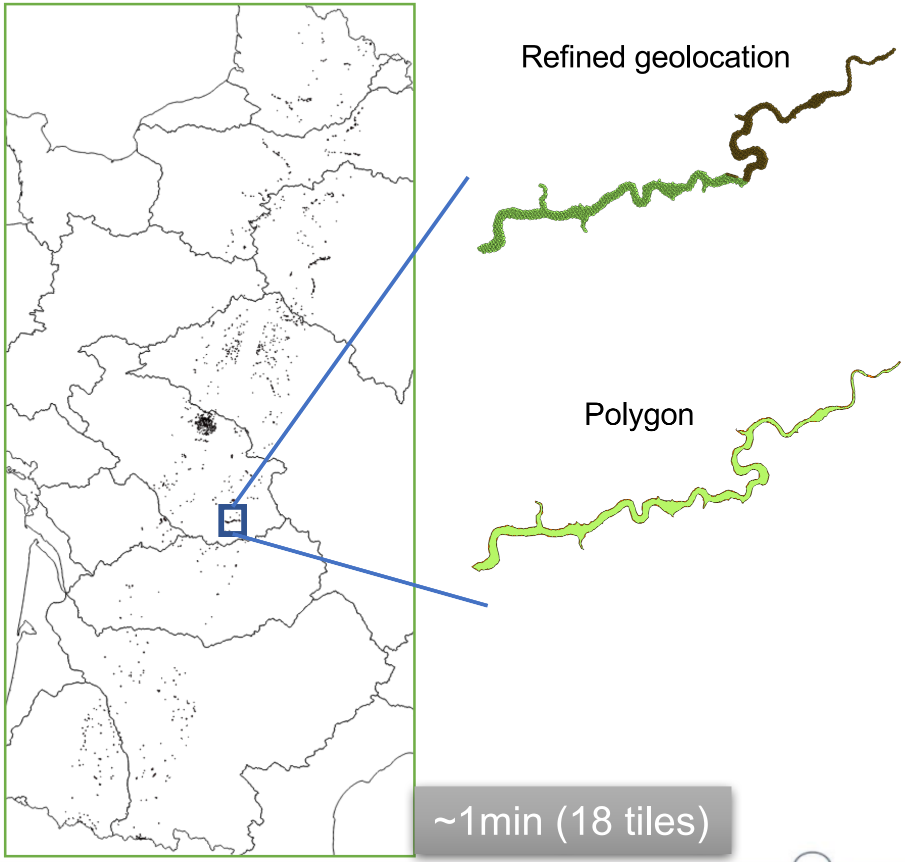


LAKE_TILE / pass 60 (ASC-R+L)



~1min / tile

LAKE_SP / pass 60



~1min (18 tiles)

Conclusion and ongoing work

LAKE_TILE and LAKE_SP:

- Prototype version with main blocks, chaining one after the other
- From this summer: work with CNES SDS to integrate into operationnal code (SDS constraints + computational efficiency)
- In parallel: ongoing work to improve geometry and attributes computation
  - Taking into account the new product content when freezed
  - Harmonize computation with river processing
- Test cases will be widened (continental test cases with large scale simulator to test computational efficiency ; hydrologically significant test cases with HR simulator to validate results quality)

LAKE_AVG:

- Development will start automn 2018

LOCNES availability:

- Available to ADT team upon request
- In CNES administrative process to make it available as an open-source