ASSESSING POTENTIAL ERRORS OF SWOT LAKE PRODUCTS

SNORKS Science Team

GREAUS

Natural Resources Canada

CSA ASC

LEGOS

UDS Université de Sherbrooke

SWOT MISSION

NASA & CNES project with the collaboration of the Canadian Spatial Agency and the British Space Agency.

The Ka-band radar interferometer will measure the water height of global:

- Lakes and reservoirs of 250 m x 250 m
- With accuracy of 10 cm (averaged on 1 km^2)
- On a 21-day revisit period
- Relative error of water mask < 15% (goal < 25%)

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B.Sc GIS applied to the environment
M.Sc Engineering (ongoing)

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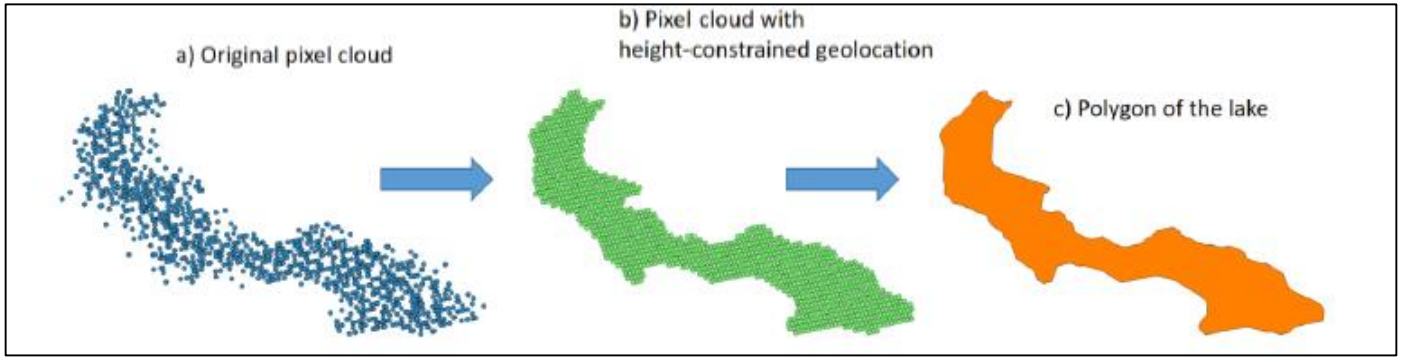
RESEARCH QUESTION AND OBJECTIVES

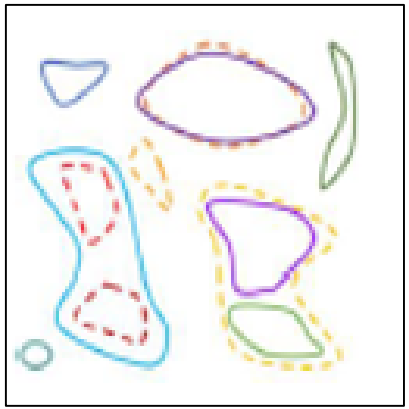


My master thesis aims to assess the precision of **SWOT lake vector products** on the Grand Lac Saint-François region in Estrie, Canada.

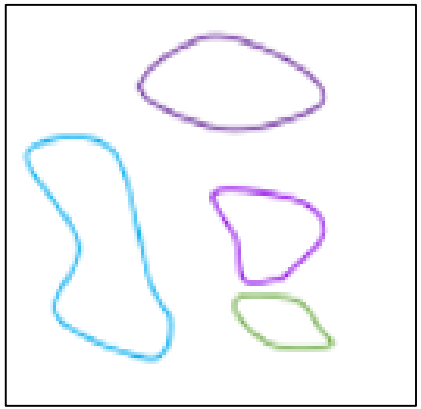
- How the official processing chain (from pixel cloud to vector lake products) will impact the value of the vector attributes (WSE, area detected, storage change)?
- What is the influence of the lake vector product types (Lake_SP_Obs, Lake_SP_Prior, Lake_Avg) on the calculus of these attributes?

Figures are taken from the SWOT Product Description (L2_HR_LakeSP) document

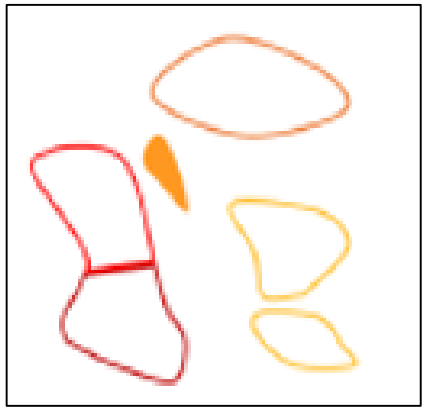
SWOT LAKE VECTOR PRODUCTS



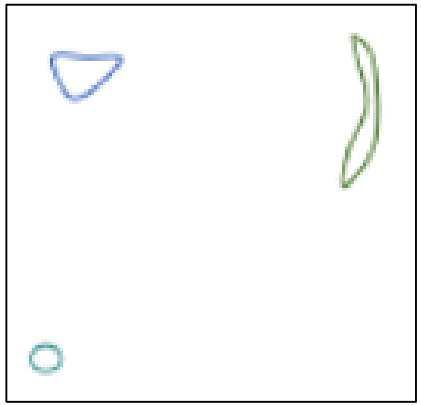
SWOT Acquisition



LakeSP_Obs



LakeSP_Prior



LakeSP_Unassigned

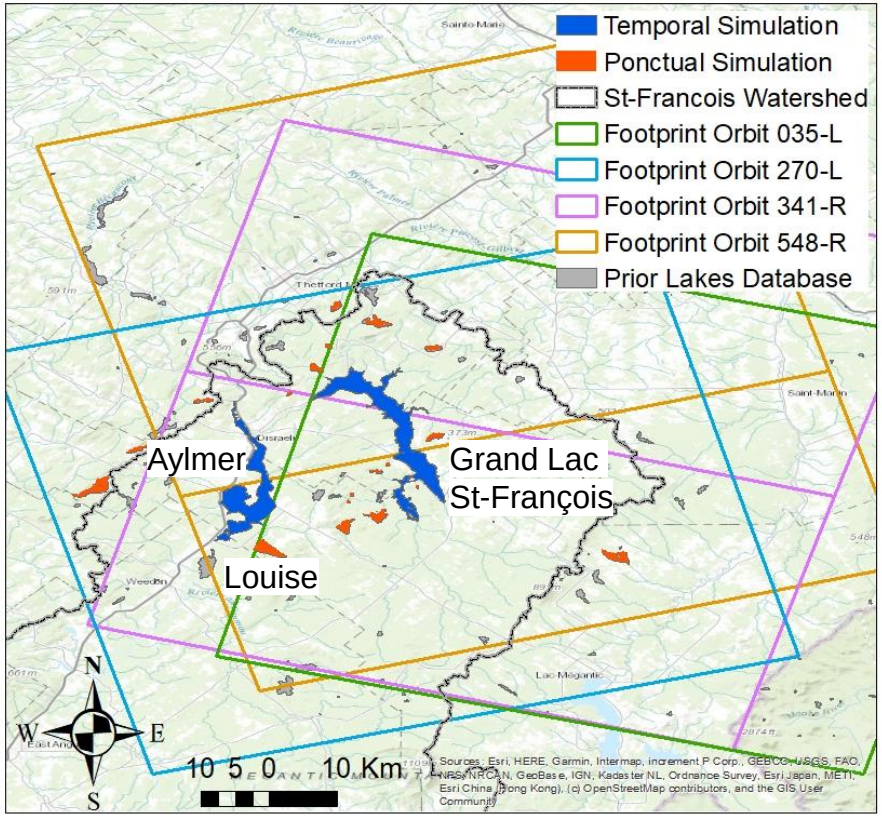
Full line = observation

Dot line = PLD

Related to lakes association to the Prior Lake Database (PLD)

Figures are taken from the SWOT Product Description (L2_HR_LakeSP) document

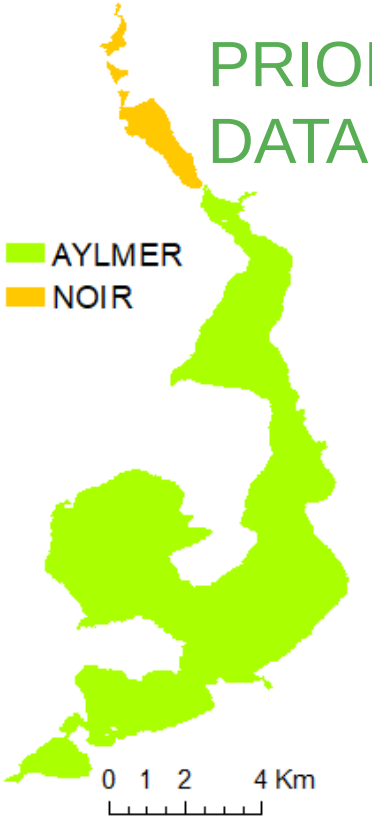
STUDY AREA AND METHODOLOGY



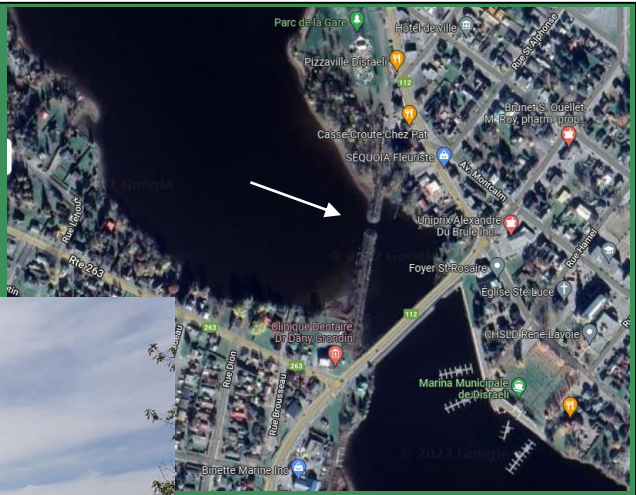
1. Simulation over 3 years (2019-2021) using water masks generated from gauges, bathymetry, and a LiDAR DEM (1m resolution)
2. Punctual simulations for ungauged lakes (water masks using Sentinel-1 + Sentinel-2 and GNSS measurements)
3. Focus on connected lakes or lakes distanced by less than 100 meters

CONNECTED LAKES : LAKE AYLMER AND LAKE NOIR

PRIOR LAKE DATABASE



REALITY



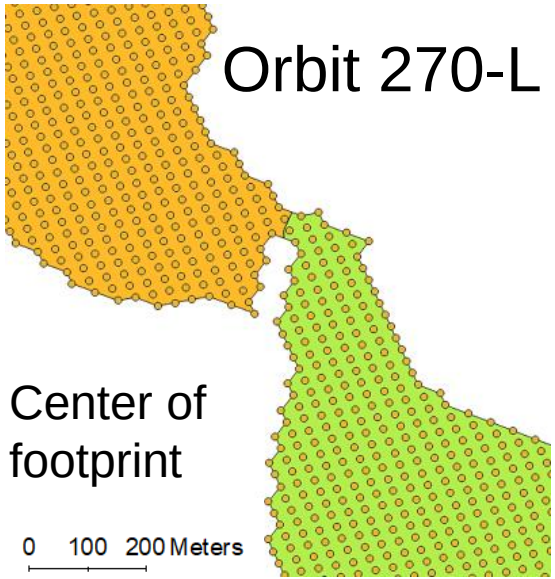
A levee separates the two connected lakes

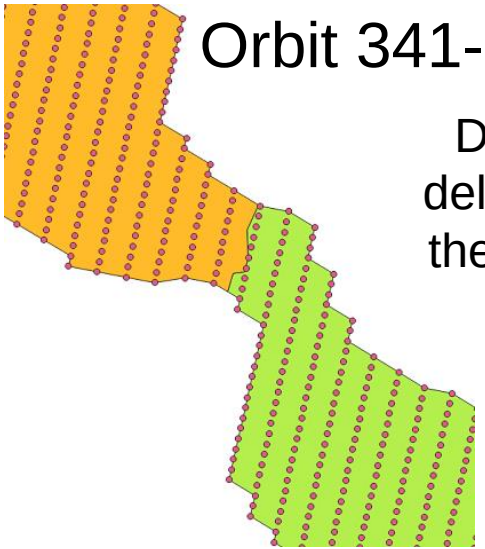
CONNECTED LAKES : LAKE AYLMER AND LAKE NOIR

Lakes delimitation according to orbit

Input:

Noir	Aylmer
247.4 m	247.4 m
198 ha	3150 ha





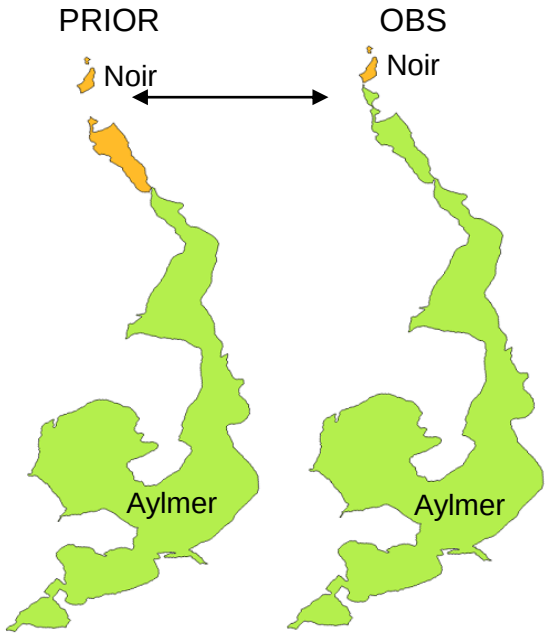
PIXCVEC & LakeSP_PRIOR

CONNECTED LAKES : LAKE AYLMER AND LAKE NOIR

Variation of attributes value between product types

		PRIOR		OBS	
	NOIR	**WSE** (m)	**AREA** (ha)	**WSE** (m)	**AREA** (ha)
center	Orbit 270-L	247.40	178	247.34	21 (12%)
	Orbit 341-R	247.32	169	247.29	18 (11%)

	AYLMER	**WSE** (m)	**AREA** (ha)	**WSE** (m)	**AREA** (ha)
center	Orbit 270-L	247.41	3094	247.57	3251 (0,5%)
	Orbit 341-R	247.61	3068	247.60	3220 (0,4%)



Higher variation of area detected compared to variation of WSE

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CONCLUSION

- Configuration of the lake will affect all SWOT products
- There is a higher variation of the area detected values VS the variation of WSE between products
- The pixel cloud and all vector product types should be analyzed before using a vector product

Next Steps:

1. To evaluate the incertitude of new LakeSP_Avg product
2. To test the same case study with the JPL simulator
3. To install pressure transducers => temporal simulations & SWOT calibration phase

TRACKING OF SIMULATIONS

Case Study	Large-Scale simulator	JPL simulator
Connected Lakes (Noir-Aylmer)	Poor and good delimitation of levee depending on orbit Misidentification of the lakes in LakeSP_Obs Part of Lake Noir missing in LakeSP_Prior	TO-DO
Lakes distanced by less than 100 meters (des Iles, Noble)	Good delimitation of the lakes in all SWOT vector lake products	TO-DO
Layover effects (Lake Caribou)	Cannot evaluate layover effects	TO-DO