

Overview of mission calval during the fast sampling orbit

Mostly a reminder of the plans we presented last year and
the status of the field data acquired

Colin J Gleason
Nicolas PICOT

WHY

- Formally, to assess SWOT performance relative to Science Requirements
- Formally, to inform SWOT data processing and data products
- This presentation covers *mission calval*: calval funded by NASA/CNES with tightly iterated and defined parameters.
- Many of you will do your **own calval**- that's great! The space agencies will use mission calval to make a formal assessment, but this doesn't diminish individual efforts. For example, CNES TOSCA covers part of the field campaigns in various countries

WHERE

NASA Tier 1

During fast sampling

Connecticut River inland reach
Connecticut River tidal reach
Willamette River
Waimakariri River
Pacific Northwest Lakes
Prairie Pothole Lakes

After fast sampling

Sagavanirktok River
Mississippi River
North Saskatchewan River
Lake Tahoe
Sierra Lakes
Yukon Flats lakes
Peace Athabasca Delta

CNES/IRD Tier 1

French sites cooperation

Maroni River
river
Garonne River
Rhine River
Rhine Valley lakes
Pyrénées lakes

In international

Madagascar Tsiribihina

Kyrgyzstan lake Issykkul
Brazil: Amazon (& Negro) rivers

CNES/IRD Tier 2

In international cooperation

Brazil Sao Fransisco rivers
Nordeste reservoirs
Colombia Meta & Orenoque rivers
Mali: small lakes in Sahel
Chile: Fagnano

During & after the fast sampling

Some are funded by the
project, other are related to
TOSCA funds

WHERE



★ Lake Fagnano, Chile



★ Tier 1 sites



WHEN

Launch
Dec '22

Start of CalVal activities

*Start of nominal
orbit*

End Mar '23

~July '23

~Sep '23

Preparation

Intense
fieldwork

Comparison
break

Intense
fieldwork

2 week rest

"Northern Swing"
Intense fieldwork

NASA timeline

Preparation (remaining
field campaigns and
installation of gauges)

Intense fieldwork

Intense IS data processing

Start of the inter-comparisons
with SWOT data (L+8m or
before if possible)

CNES timeline

Goals for the Fast Sampling orbit:

What are we **currently** assessing [coarse validation]?

- Pixel cloud
- River SP
 - WSE [reach and node]
 - Slope [reach]
 - Area [reach and node]
- Lake SP
 - Area
 - WSE
- ADT algorithms that produce those products

What are we **going to** validate [fine validation]?

- River SP
 - Change in WSE [reach]
 - Slope [reach]
 - Area [reach]
- Lake SP
 - Area
 - WSE

Overview of calval in the fast sampling phase: US Inland Water

CJ Gleason



University of
Massachusetts
Amherst



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL



University of Colorado
Boulder



BROWN

Where did we focus?



What did we measure, and how?

Aerial data

- Images
- Lidar
- High res. satellites
- Calculates areas

**Identical approach
for FR teams**

Humans

- Work hard
- Strict data entry control
- Professionally trained and certified: safety, wilderness medicine, science, boating



GNSS

- Measures elevations as SWOT does
- Geoid, ellipsoid, pole tide, solid earth tide
- PPP processing- no base stations
- 30m static > kinematic > 30min static
- Records every 1s
- Can take >1hr to traverse a reach
- 'drifts'

Pressure Transducers (PT)

- Record pressure
- Combine with air pressure to get 'level' via hydrostatic eq.
- Records every 15 minutes
- Fixed position

Philosophy- measure rivers in the field as SWOT does from orbit

**Identical approach
for FR teams**

- We accept SWOT CL errors
- We accept SWOT reach definitions
- We use the SWOT slope definition
 - $(\text{top elevation} - \text{bottom elevation}) / \text{SWOT reach length}$
- Comparisons are therefore to the products SWOT would make if it had no measurement error
- Accept field data when it is coincident with SWOT (PT always, drifts sometimes), and stage-match data when it is not coincident
 - Look up table of longitudinal profiles ('drifts') based on PT observed hydraulics at SWOT times

Status of Fast Sampling data on US side

- ~200PTs logging the entirety of FS orbit
- Almost 100 longitudinal drifts logged
 - Either coincident or 'matched' to SWOT
- ~Dozens of watermarks available

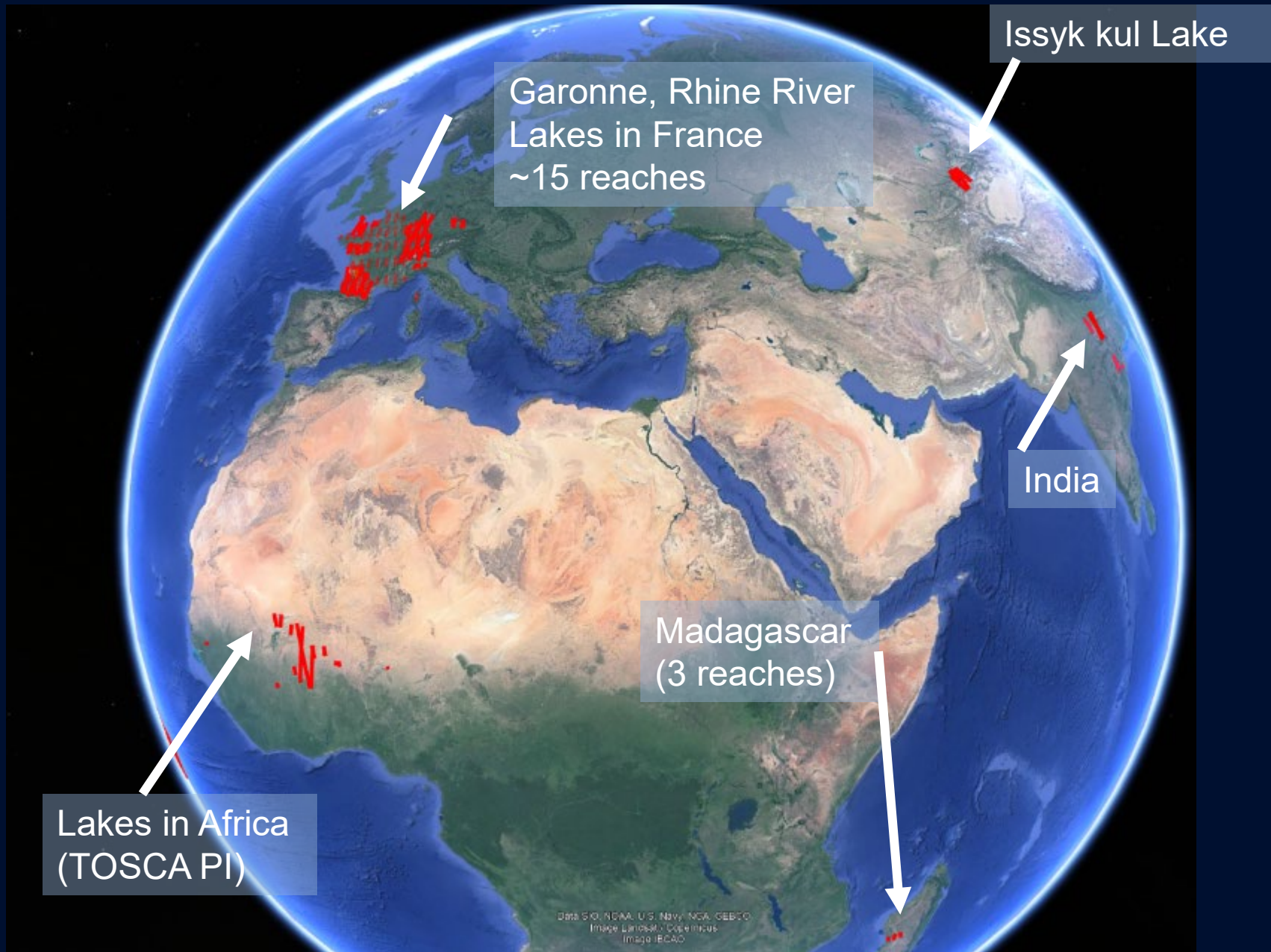
start date	end date	site	pass	data type	process level (s	Notes
??	5/25/2023	NS		24 PT		1 PTs installed by ECCC, waiting on ECCC to process
5/17/2023	5/25/2023	NS		24 GNSS drift		3 6 drifts btwn 5/17 and 5/25,
5/25/2023	6/13/2023	NS		24 PT		3
5/25/2023	6/13/2023	NS		24 GNSS drift		3 SBi and Polarx5 drifts (2x per day), 17 drifts with out-and-backs (~33 total drifts)
6/13/2023	??	NS		24 PT		1 Waiting on ECCC to uninstall and process the PTs
6/13/2023	6/15/2023	NS		24 GNSS drift		3 2 drifts (out-and-backs, so ~4 total profiles)
3/26/2023	5/10/2023	WM		13 PT		3
3/26/2023	5/10/2023	WM		13 GNSS drift		3 12 drifts
5/9/2023	6/1/2023	WM		13 PT		3
5/9/2023	6/1/2023	WM		13 GNSS drift		3 8 drifts
6/1/2023	8/2/2023	WM		13 PT		2 Looking for the PT key file, water level was dropping and PTs were coming out of the w
6/1/2023	8/2/2023	WM		13 GNSS drift		1 looking for June GNSS drift data (~3 drifts)
6/8/2023	6/8/2023	WM		13 ADCP		2 most PT locations have adcp data
6/6/2023	6/7/2023	WM		13 lidar, NIR		2 2 days of lidar flights, 1 NIR flight
6/6/2023	6/21/2023	WM		13 NIR		3 NV5 NIR imagery: 6/6/2023; 6/12/2023; 6/21/2023
3/22/2023	6/14/2023	CR		9 PT		3
3/22/2023	6/14/2023	CR		9 GNSS drift		3 27 drifts (some out-and-backs)
6/14/2023	??	CR		9 PT		1 PTs at reach boundaries are installed
5/31/2023	6/1/2023	CR		9 lidar, NIR		2 2 days of lidar flights, 1 NIR flight
7/6/2023	7/6/2023	CR		9 NIR		3 NV5 NIR imagery
6/5/2023	??	YR		26 PT		2 only 2 PTs, one at top, one at bottom of all reaches, need PT key file
6/5/2023	6/8/2023	YR		26 GNSS drift		2 up and backs
6/6/2023	6/6/2023	PY		26 GNSS drift		2 PT on YR is at the base of Porcuppine (1x up and back, ~2 reaches both times)
3/31/2023	5/7/2023	WK		4 PT		2 limited PTs, interpret with caution due to braiding nature
3/31/2023	5/7/2023	WK		4 GNSS drift		3 ~7 drifts
3/31/2023	6/30/2023	WK		4 lidar		2 11 lidar flights, some lidar flights have been fully processed, also include water masks
3/14/2023	4/30/2023	PW		13 PT		3
4/24/2023	7/19/2023	PW		13 PT		3
6/12/2023	6/22/2023	PW		13 NIR		3 NV5 NIR imagery, processed for two days: 6/12/23 and 6/22/23
5/15/2023	6/27/0203	PP		11 PT		3

Overview of calval in the fast sampling phase: FR Inland Water

N. Picot



Where did we focus?

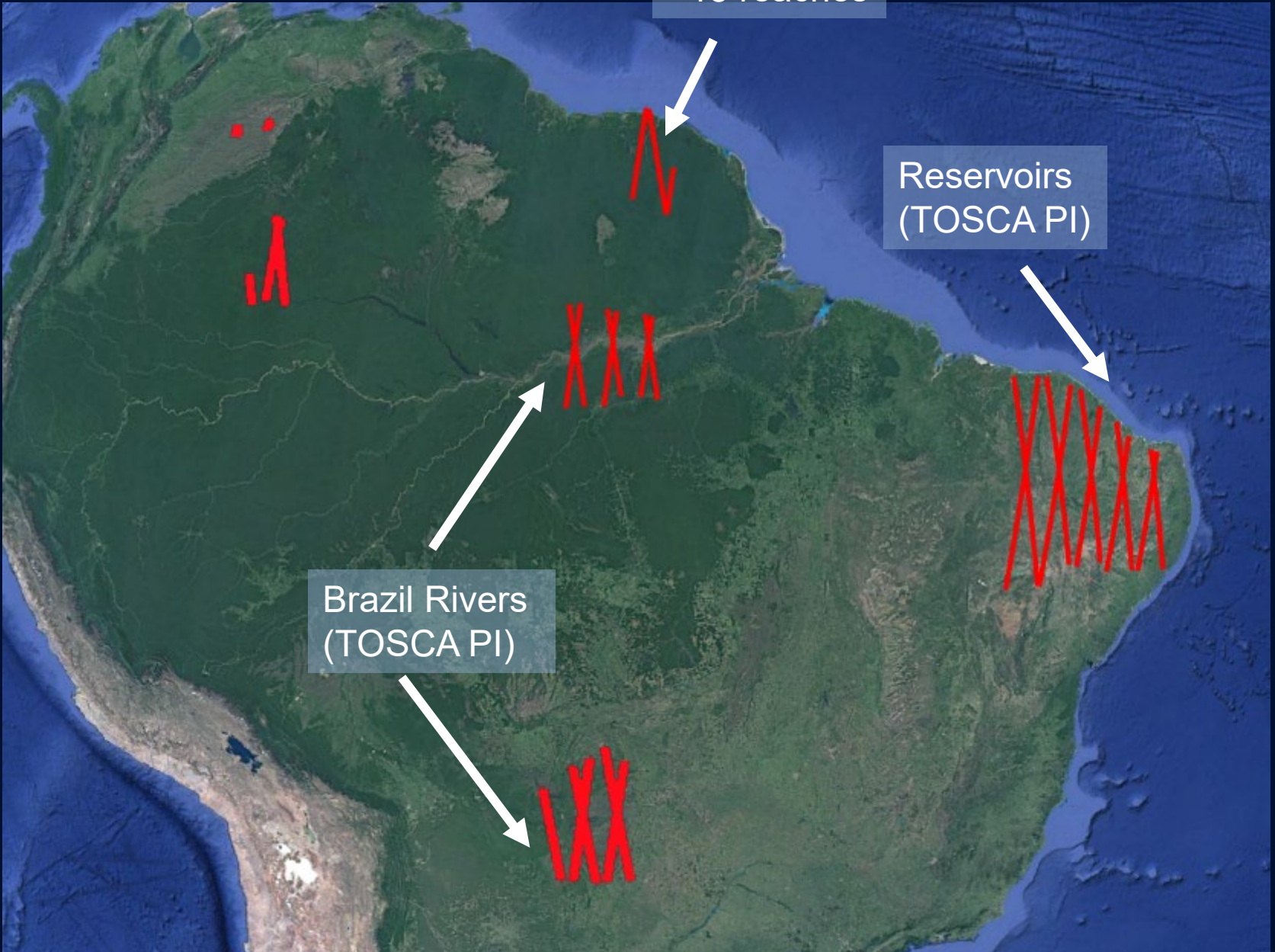


Where did we focus?

Maroni
~15 reaches

Reservoirs
(TOSCA PI)

Brazil Rivers
(TOSCA PI)



Status of Fast Sampling data on French side

- PTs logging the entirety of FS orbit installed in various places
- Vortex.io micro stations installed over Garonne and Rhine sites
- Drones Lidar flight performed
- GNSS carpet and/or Cyclopee campaigns performed
- Surfwater water masks produced routinely over many sites, complemented by Pleiades and radarSat imageries
- SWALIS flights performed
- Various other sensors used (GoPro cameras, wind sensors, ...) depending on the sites
- Etc ...

- Most of them in a data base on CNES HPC computer

Data processing

- Just starting
- The interesting and ... tricky part !!
- On going field campaign processing (with some times some difficulties)
- Start of the comparison with SWOT flight data. You will see various promising results in different presentations, but it's just the beginning and not all have access to SWOT flight data yet !

Calval data processing

Identical approach for all teams

