SWOT calval joint slides

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Let's use a hokey device to go over calval

- WHY / POURQUOI
- WHO / QUI
- WHERE / OÙ
- WHEN / QUAND
- WHAT / QUOI
- HOW / COMMENT
- FAQ / QUESTIONS

WHY

- Formally, to assess SWOT performance relative to Science Requirements
- Formally, to inform SWOT data processing and data products
- Informally, because everyone is working hard and needs to know that SWOT is doing what it is supposed to

WHO

CNES
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Muriel Berge-Nguyen

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Curtis Chen
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Camryn Kluetmeier
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Kevin Larnier, …

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Daniel Moreira
Marielle Gosset
Fabrice Papa
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Juan Gabriel Leon
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Jean-François Cretaux
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Muriel Berge-Nguyen
Tilo Schöne
Manuela Grippa, …

Europe
Luciana Fenoglio-Marc
Angelica Tarpanelli
Karina Nielsen

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
Maroni River
Garonne River
Rhine River
Rhine Valley lakes
Pyrénées lakes

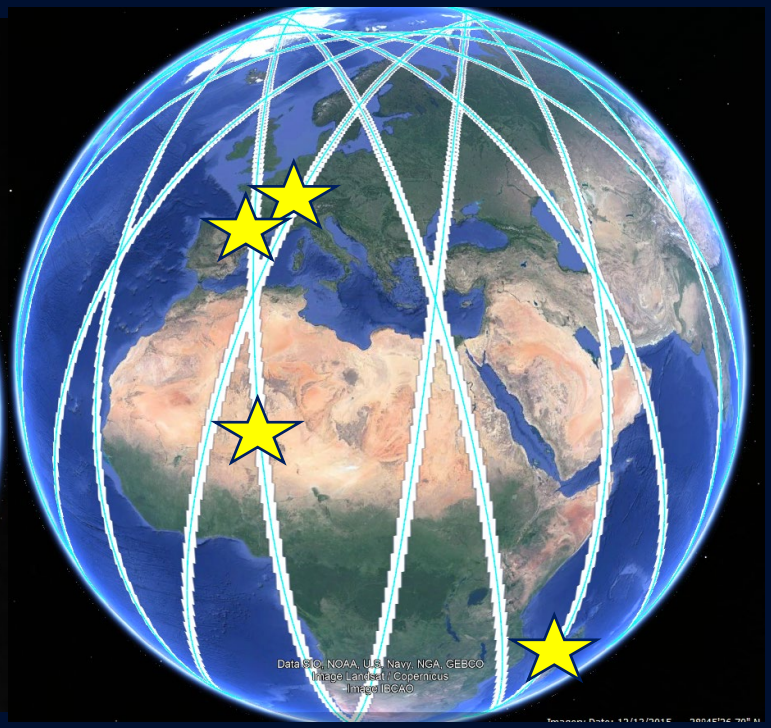
In international cooperation
Madagascar Tsiribihina river
Kyrgyzstan lake Issykkul
Brazil: Amazon (& Negro) rivers

CNES/IRD Tier 2

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

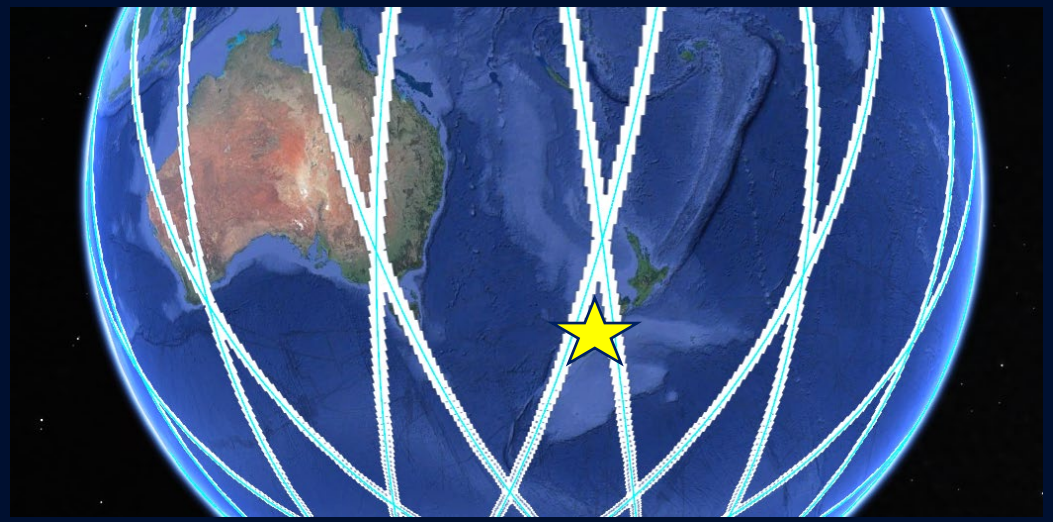
During & after the fast sampling

WHERE

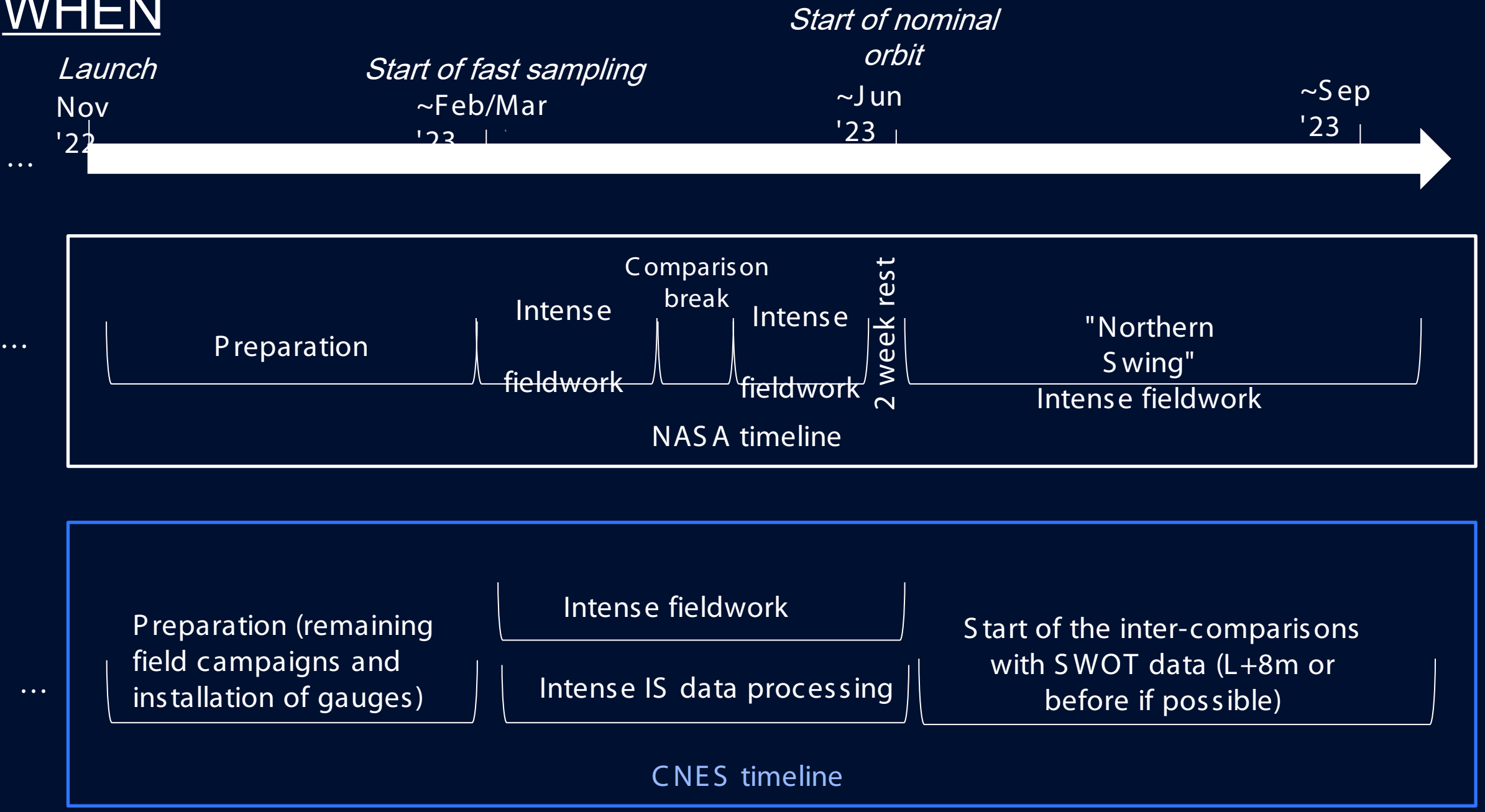


Lake Fagnano, Chile

Tier 1 sites



WHEN


Launch
Nov '22
Start of fast sampling
~Feb/Mar '23
Start of nominal orbit
~Jun '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
...

WHAT

We are "validating" these data products

- RiverSP reach WSE
- RiverSP reach slope
- RiverSP reach width
- RiverSP node WSE
- RiverSP node width
- LakeSP lake WSE
- LakeSP lake area

"validate" has a specific definition to the project

We'll "characterize" a lot more data products

WHAT

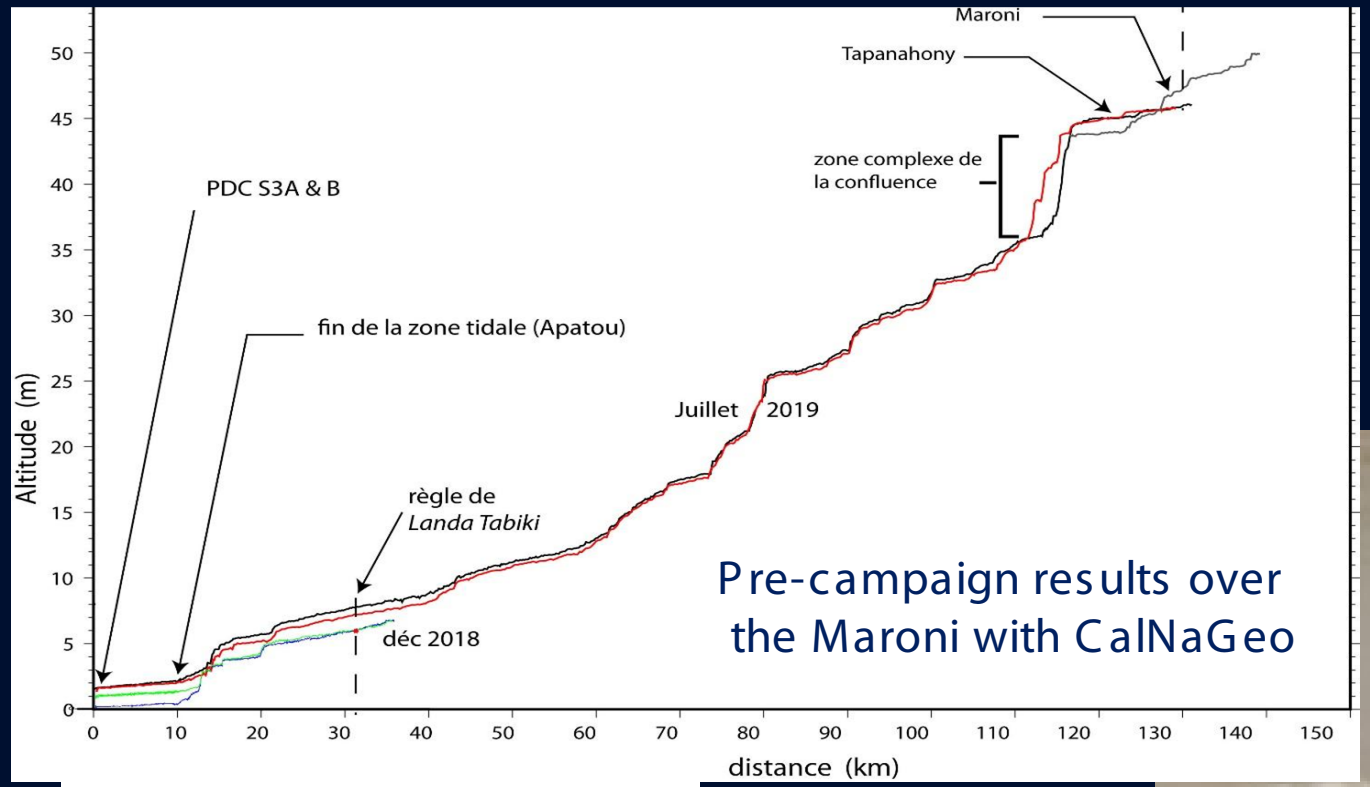
- **Water Surface Slope:**
  - 1.7 cm/km over a 10 km reach for river widths greater than 100 m
- **Water Surface Elevation (WSE):**
  - 10 cm error per 10 km reach >1 km^2
  - 25 cm error for 250 m^2 – 1 km^2 or per 10 km reach
- **Water Surface Extent:**
  - less than 15% relative error

HOW

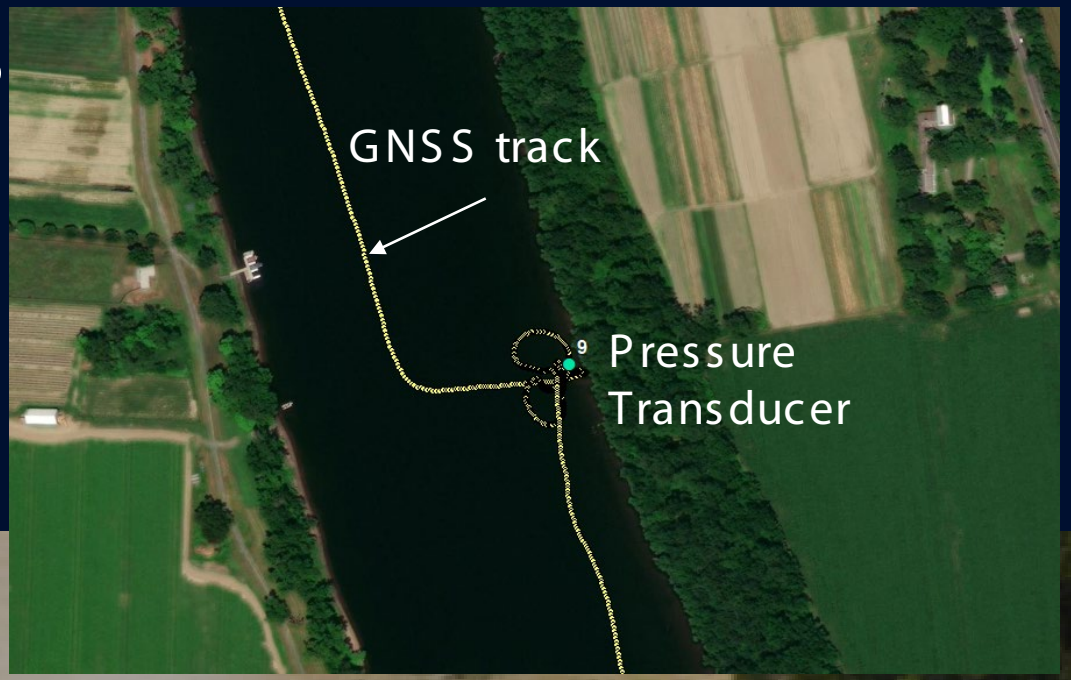
Tools of the trade: Pressure transducers

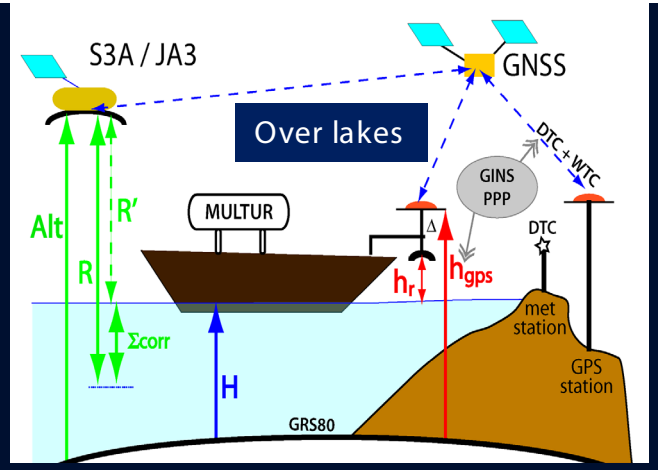
HOW

Tools of the trade: Surface GNSS



Pre-campaign results over the Maroni with CalNaGeo



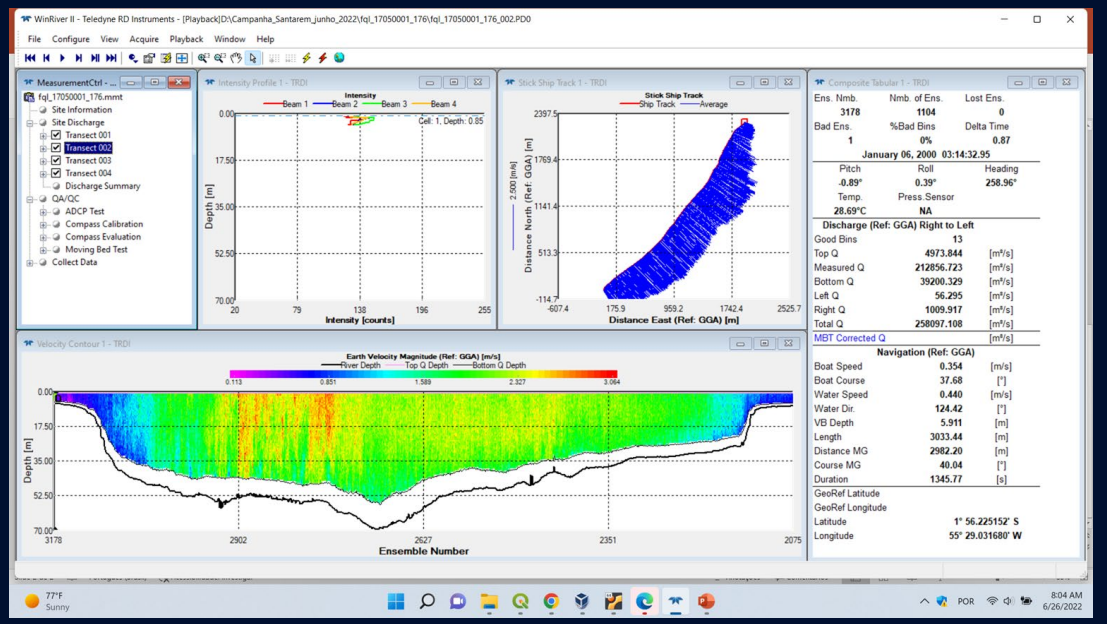


HOW

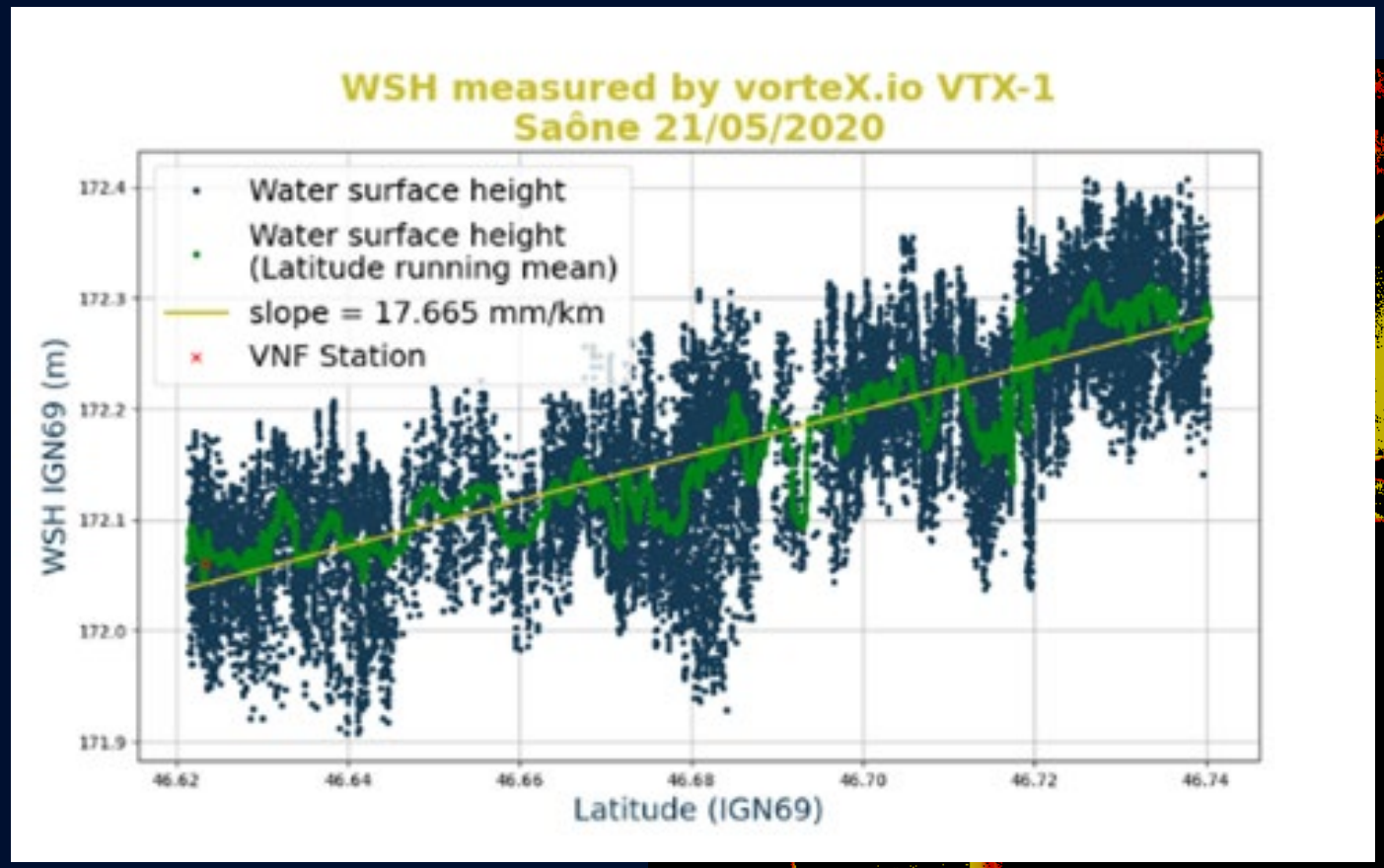
Discharge measurements in support of the Cal/val over the river sites : Madagascar, South America, France, India

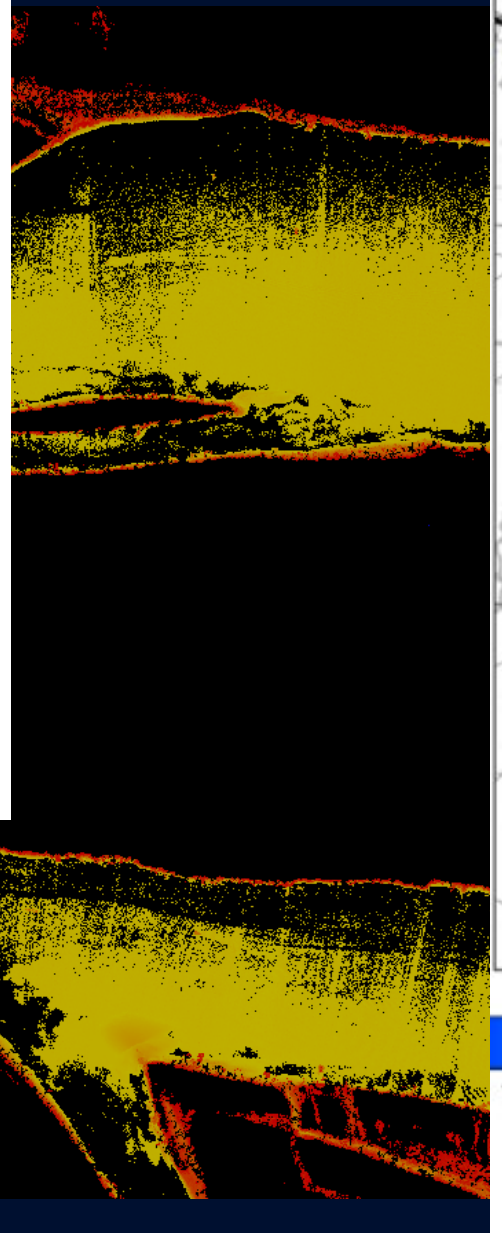
Coincident Cal/NaGeo & ADCP along several cross sections

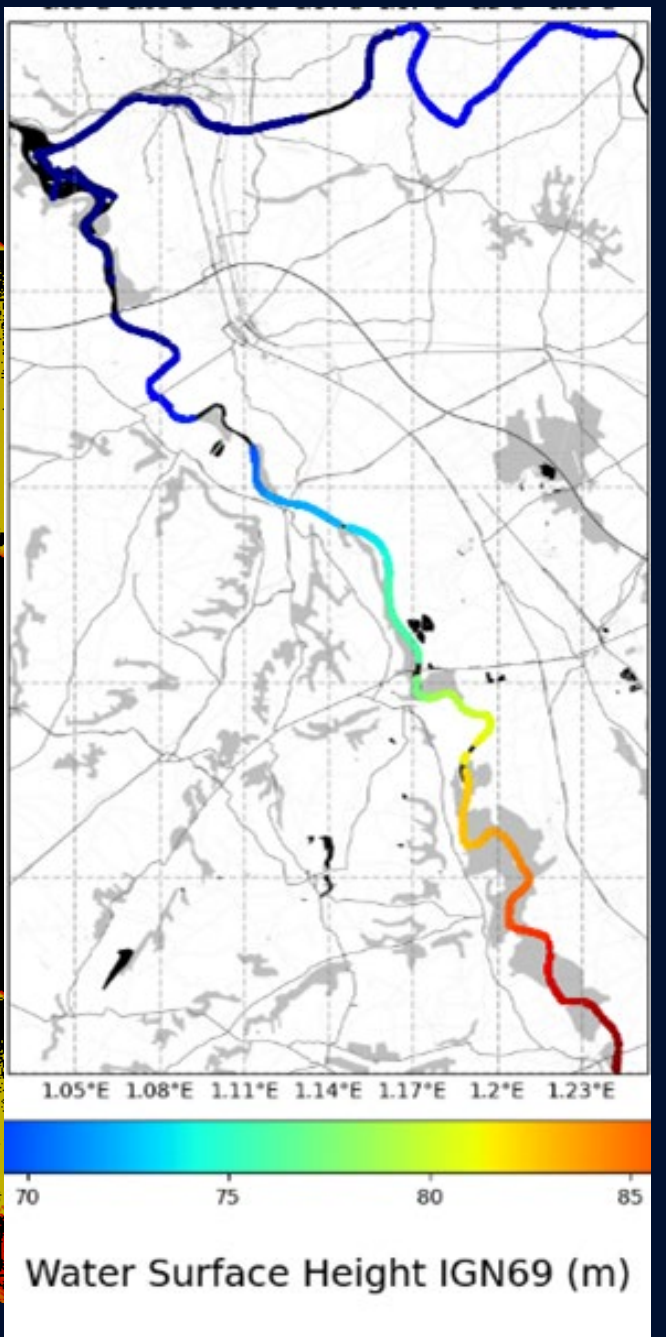
Tools of the trade: ADCP



HOW Tools of the trade: lidar





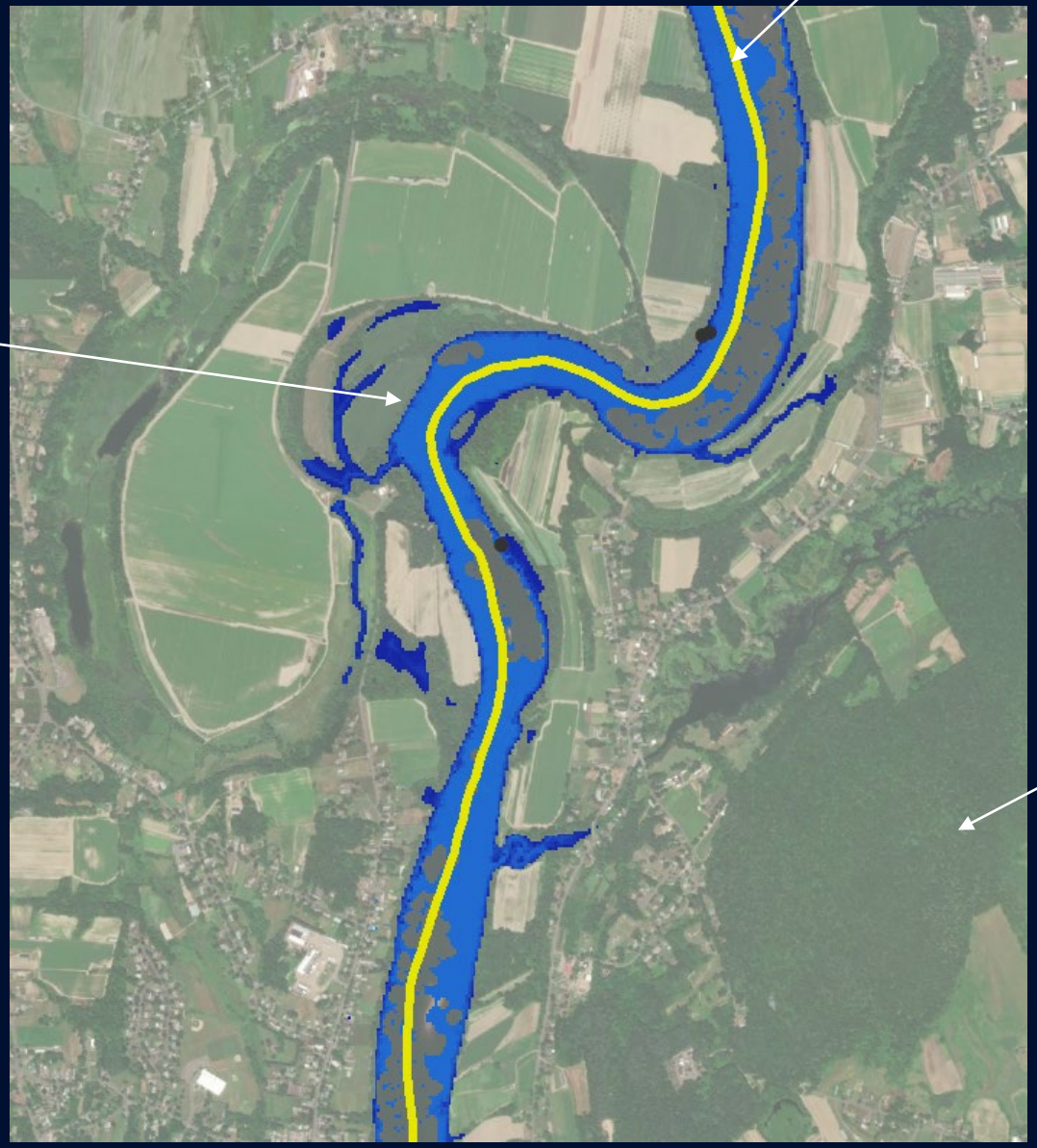


HOW

Tools of the trade: Airphotos

Airborne Lidar

GNSS long profile

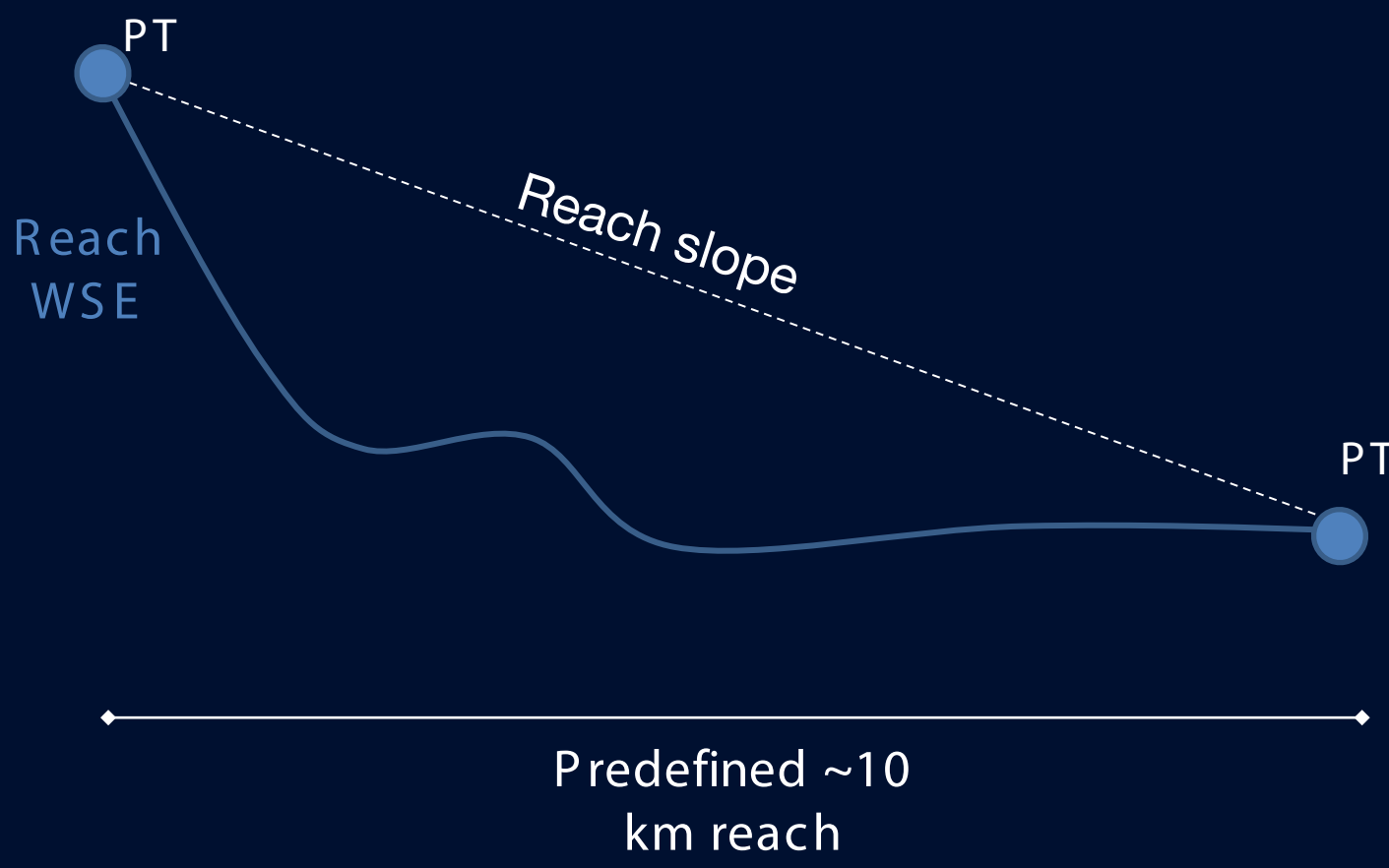


Aerial Imagery

HOW

Water Surface Slope

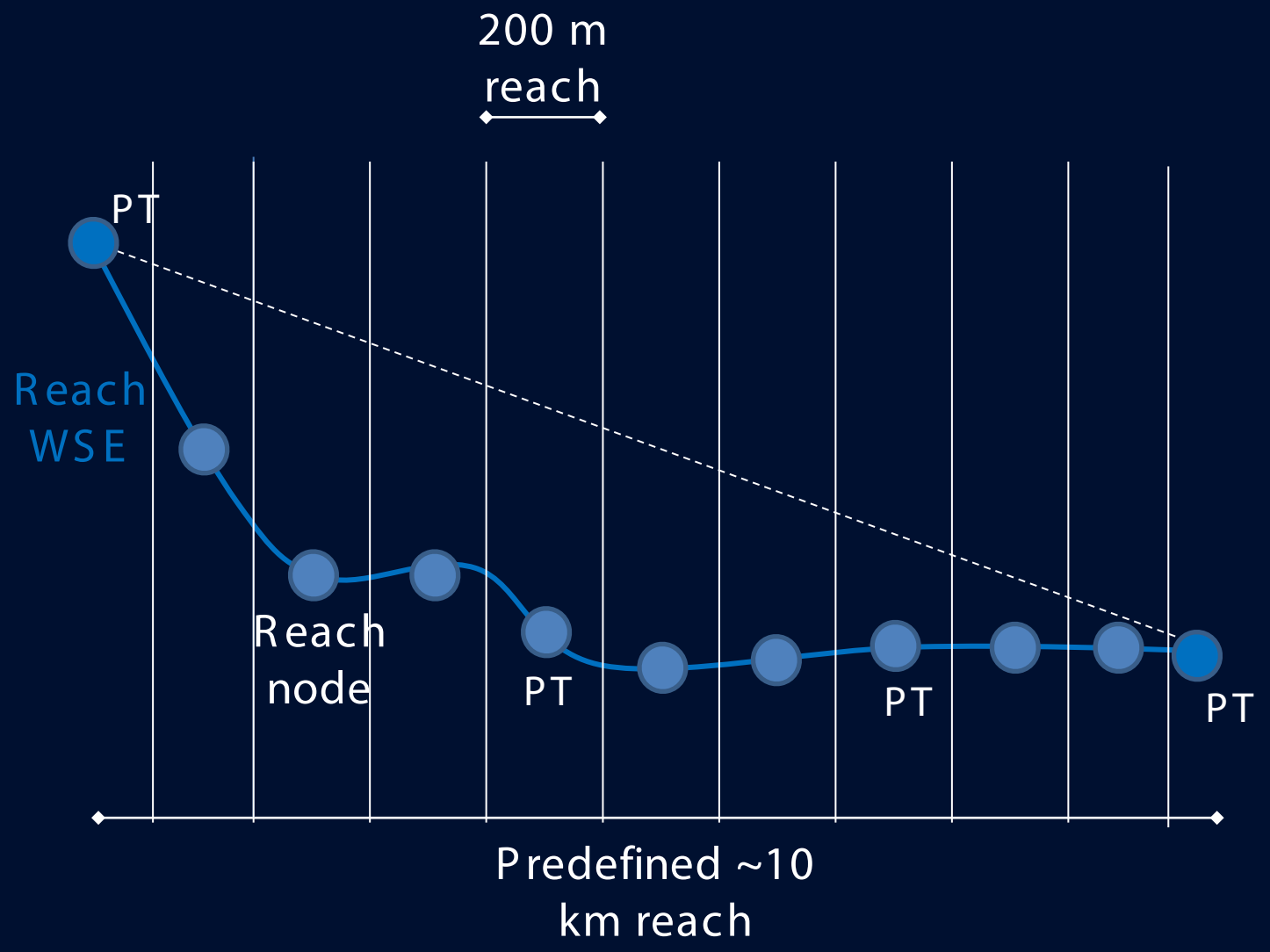
- Calculated per 10 km reach with node averages
  - GNSS long-profiles
  - Array of pressure transducers (3-4/reach)
  - Airborne lidar flights



HOW

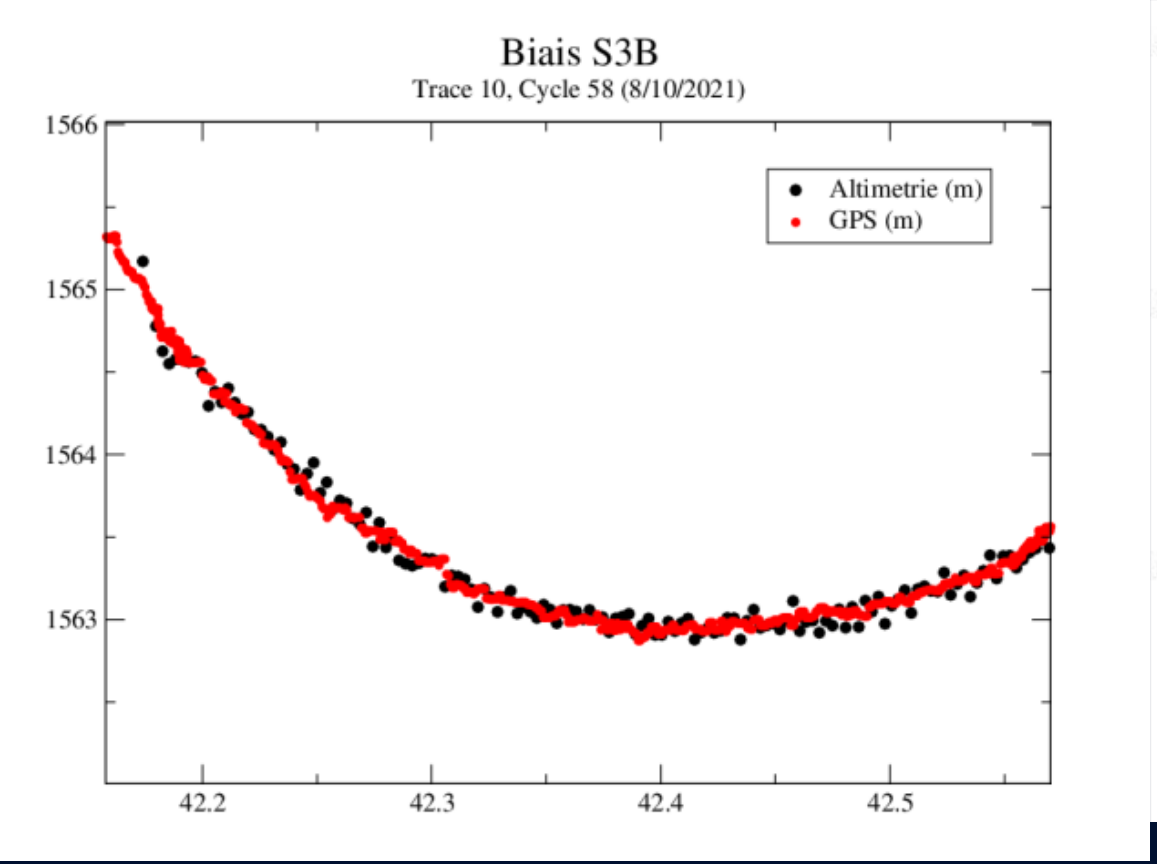
Water Surface Elevation

- Calculated per 10 km reach AND per 200 m node
  - GNSS long-profiles
  - Array of pressure transducers (3-4/reach)
  - Airborne lidar flights

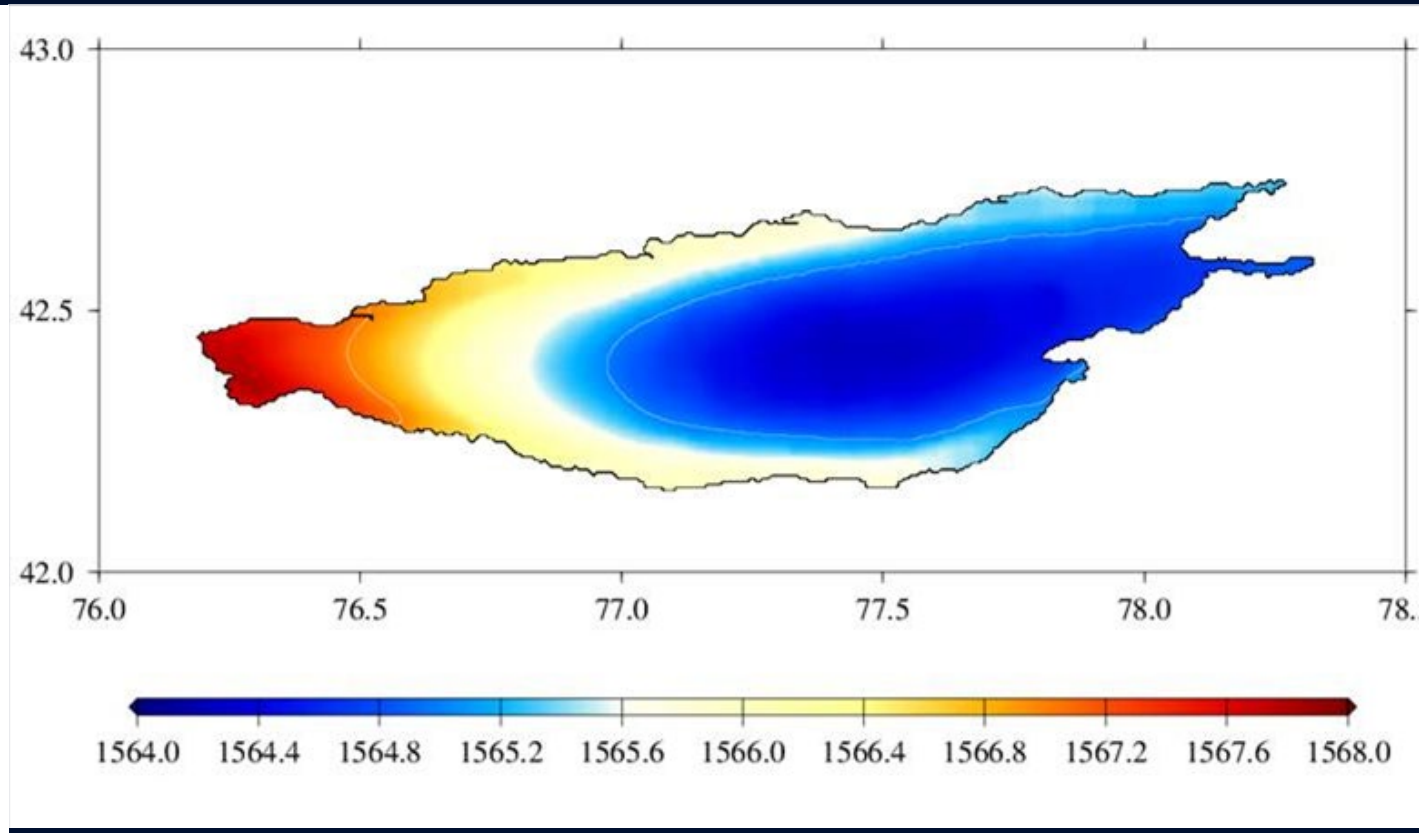


HOW

LakeSP WSE & Raster products



Intercomparison with instantaneous kinematic GNSS



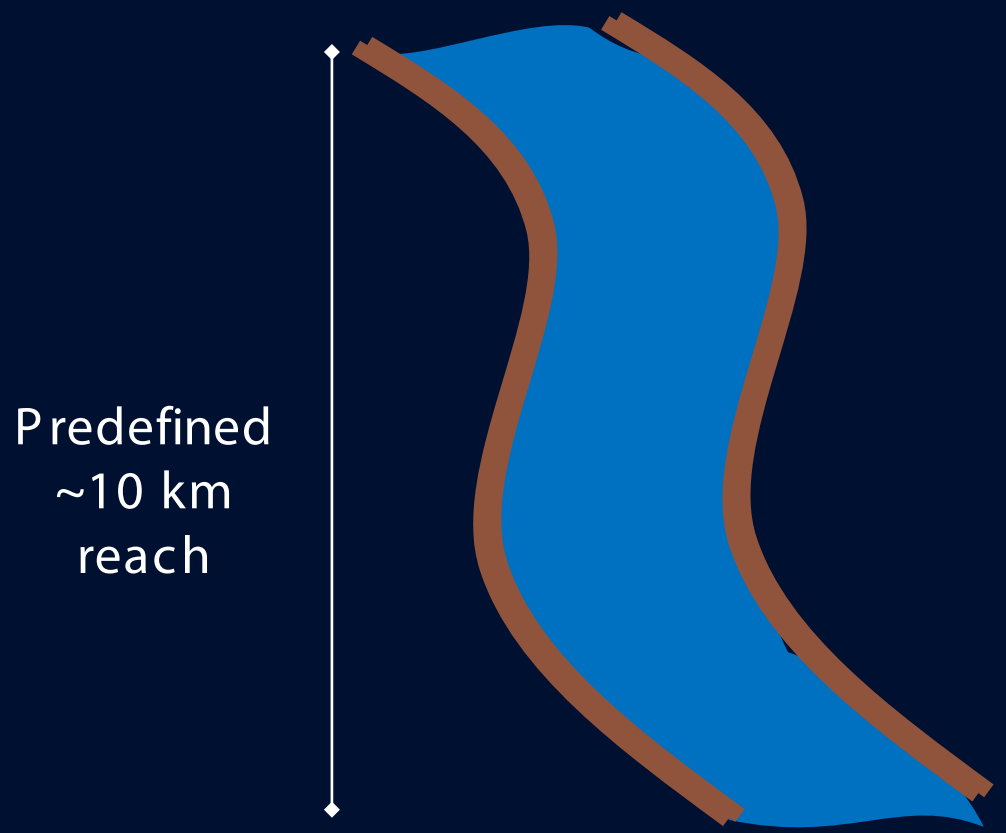
Intercomparison with A priori Mean lake surface

GNSS transects
Pressure transducers
Airborne lidar flights

HOW

Water Surface Extent

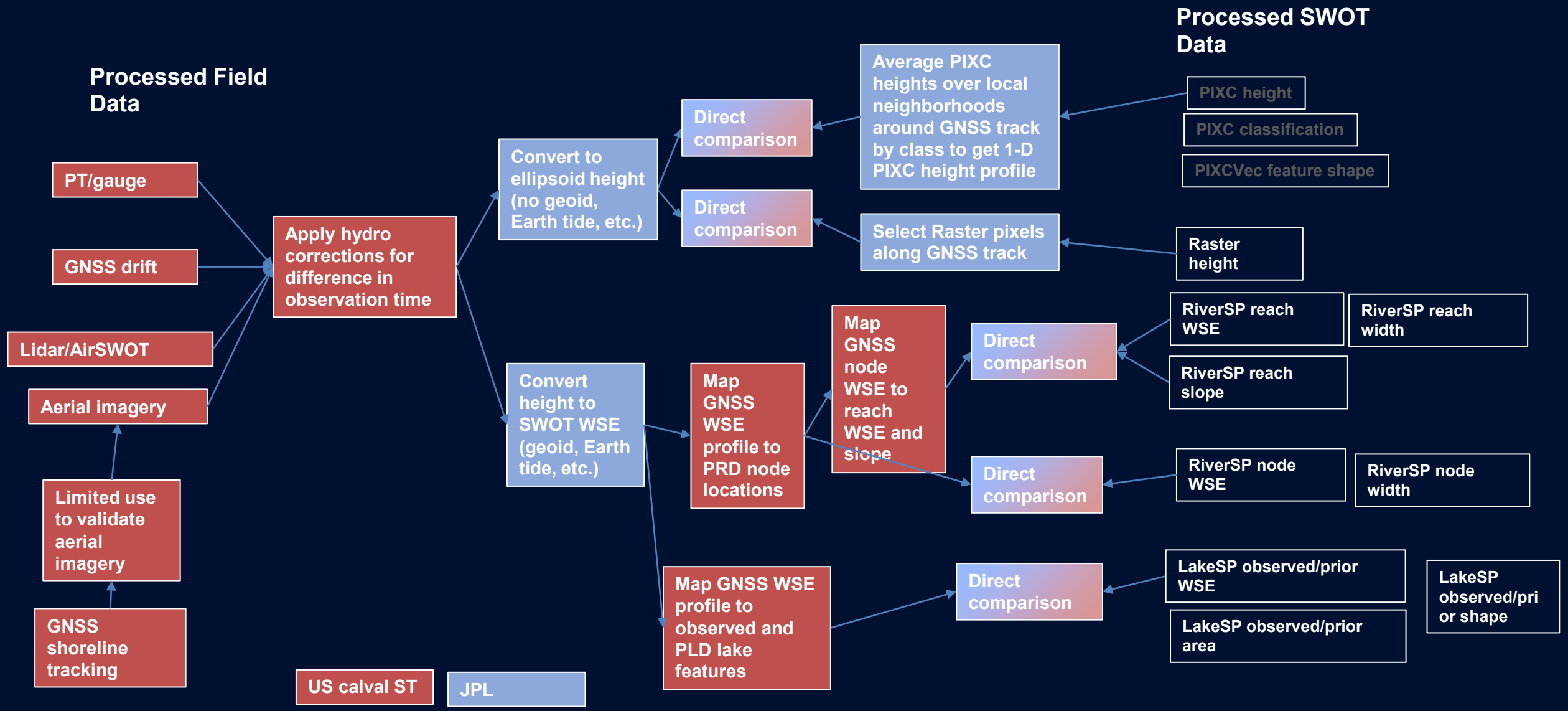
- Calculated per 10 km reach
  - Shoreline walks
  - Airborne Imagery
  - Airborne lidar flights



$$\text{Effective width} = \frac{\text{water surface area}}{\text{reach length}}$$

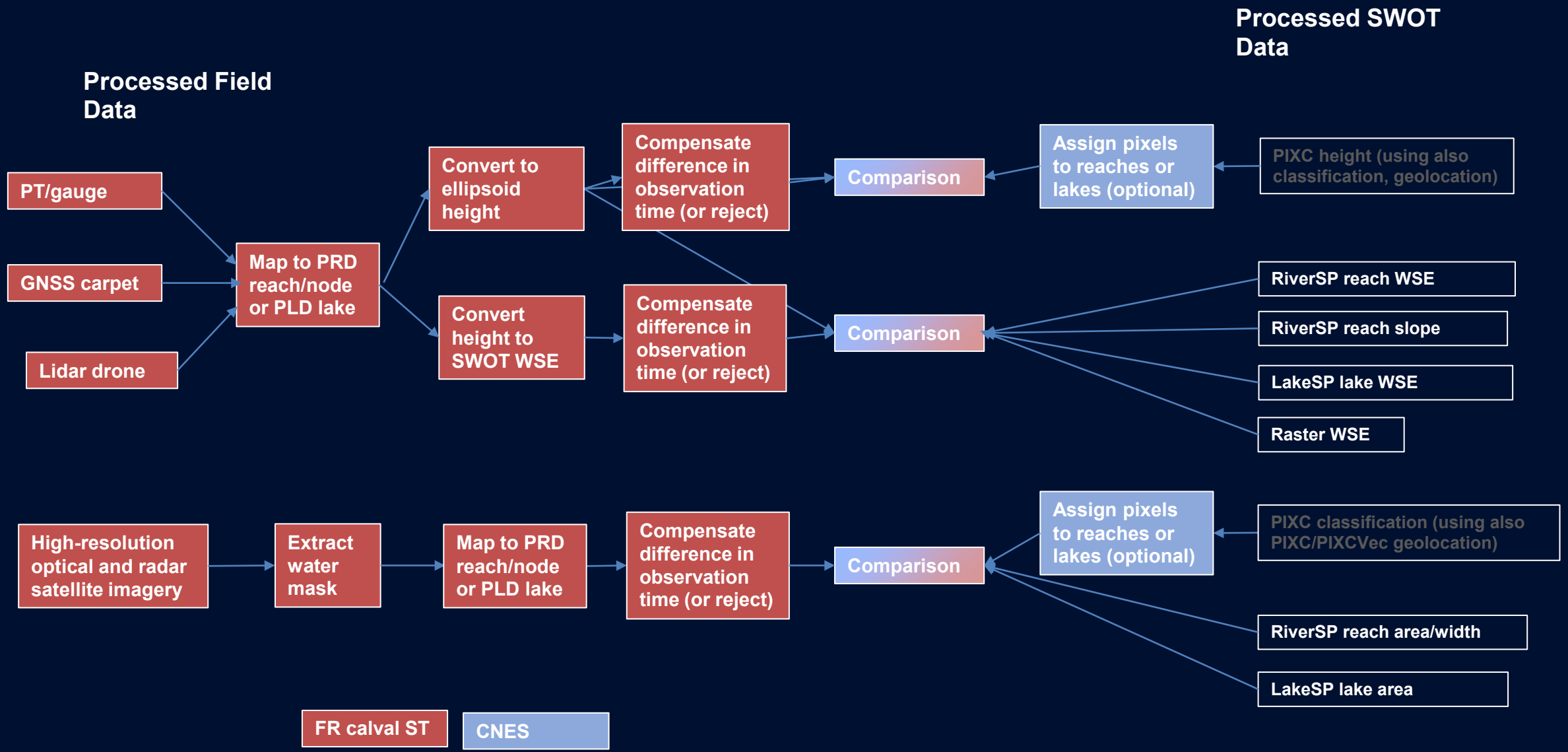
HOW

NASA validation workflow



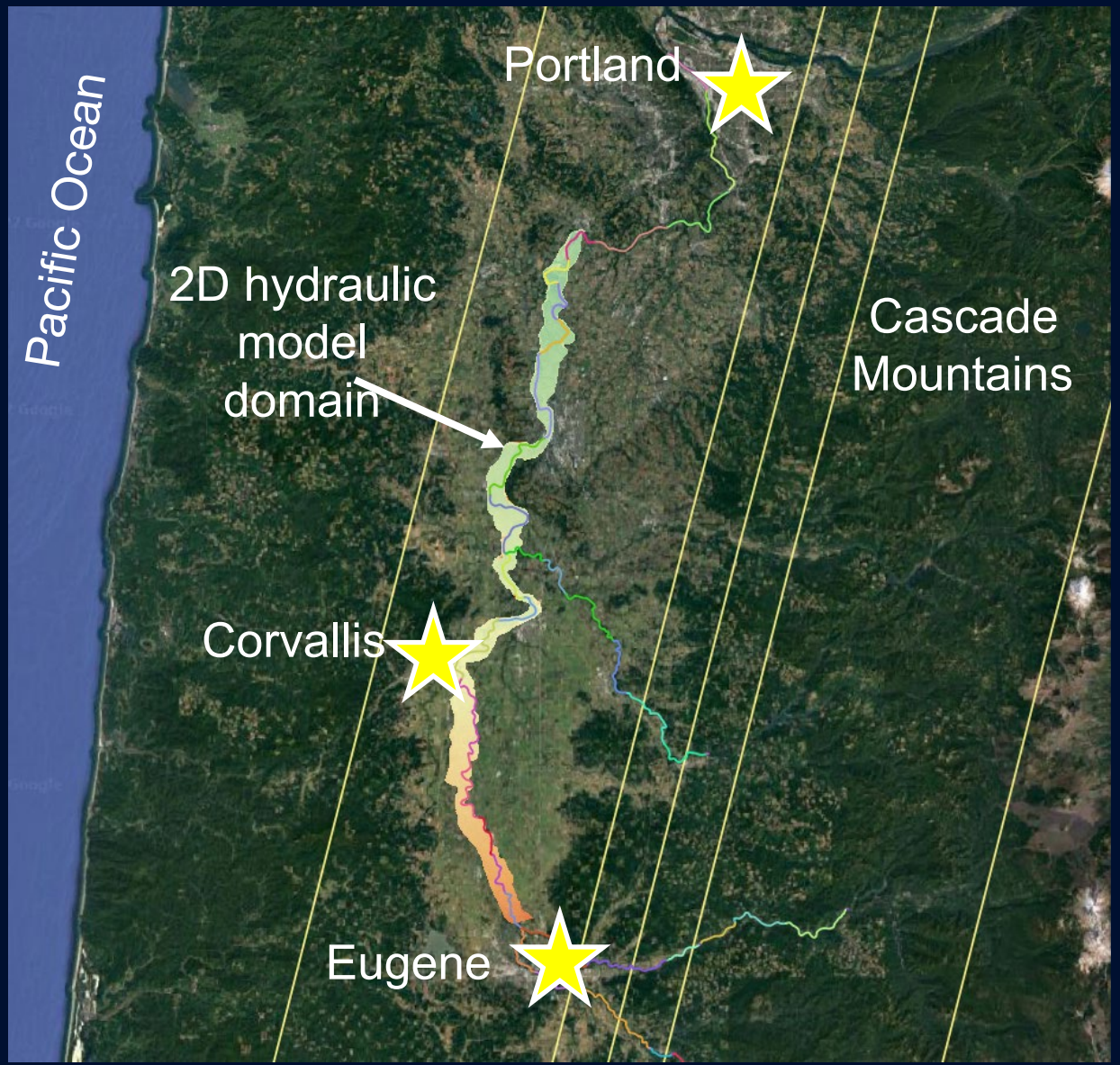
HOW

CNES validation workflow



HOW Joint Willamette campaign

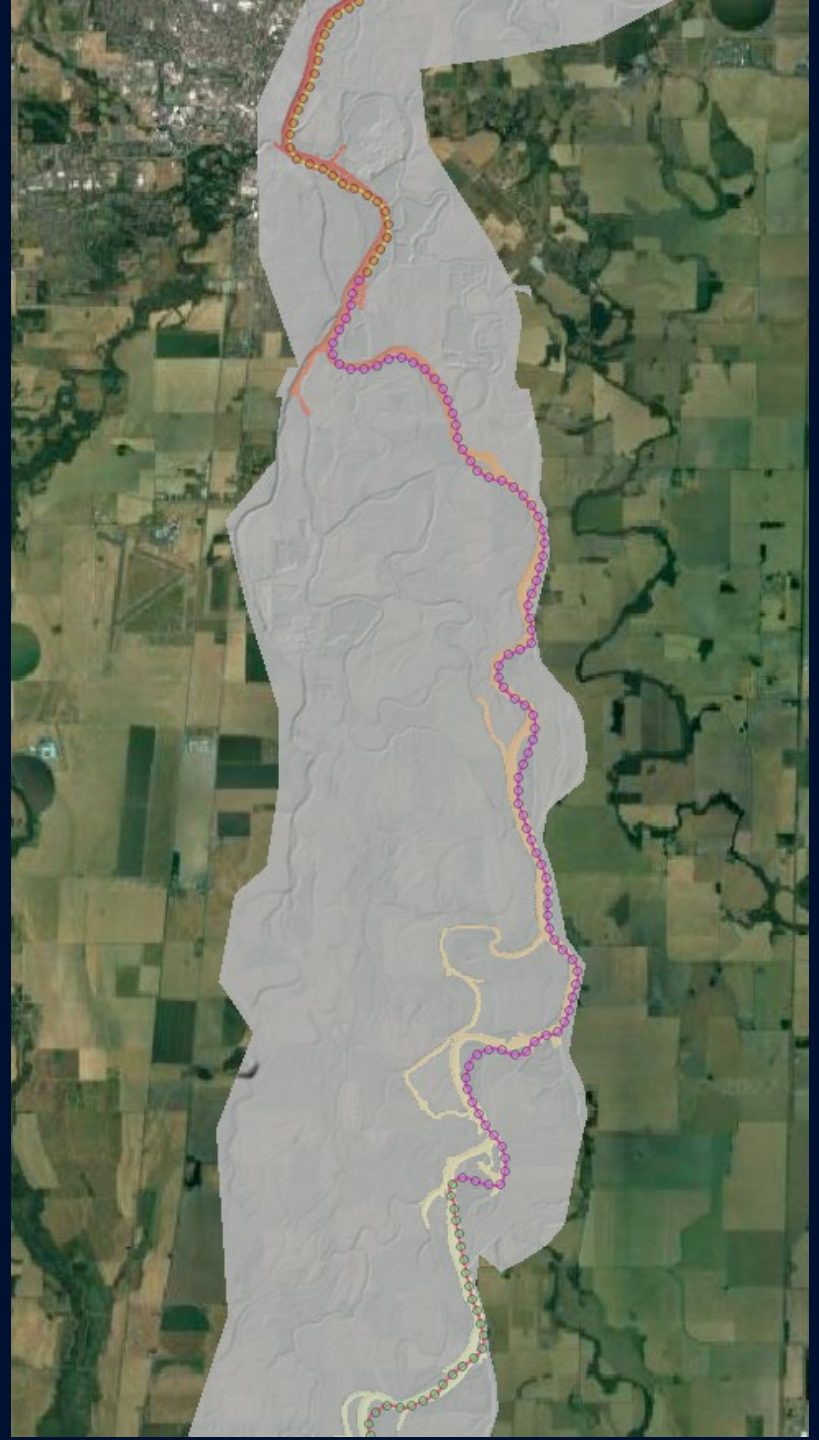
- Willamette River Tier 1 CalVal site
- Based on 2D hydraulic model
- ~200km
- 16 SWORD reaches
- Range of modeled WSE from 100 m^3/s to 450 m^3/s



Slide Courtesy Toby Minear

HOW Joint Willamette campaign

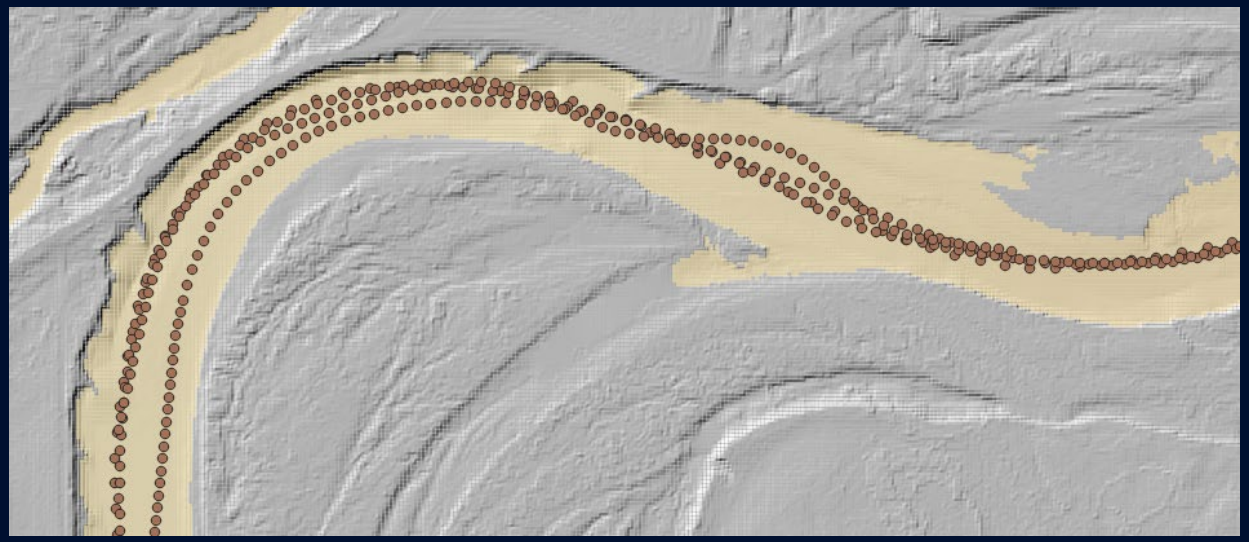
- Full suite of SWOT products being produced
- Useful for comparison to CalVal field data
  - Existing (2015, 2022)
  - Planned (2022 ‘dry run’)



Slide Courtesy Toby Minear

HOW Joint Willamette campaign

- Data: 2015 (existing), 2022 (existing and planned)
- Pressure transducers, long profiles, ADCP cross sections



Detail of longitudinal profile GNSS (2015), multiple passes at varied flows

Slide Courtesy Toby Minear

Pressure transducers (2015)

Longitudinal profile GNSS (2015)

FAQ

I have field data. Can you use it for calval?

Not yet! We have a strictly defined calval task focused on making it to the validation meeting (~14 mo after launch) ready to assess SWOT performance with confidence. This doesn’t mean you can’t use it for your own validation

Why aren't you using site xxx?

There are >200,000 rivers and millions of lakes in the SWOT data product. We have selected sites that cover a range of latitudes, morphologies, and flow regimes while maximizing calval orbit overlap and considering seasonality and 'edge cases' for SWOT as a sensor. We're confident that the picture that emerges from this work will be adequate for official SWOT validation.

FAQ

When would I be able to get the SWOT data products at my site?

The objectives from the project is that these data will be available as soon as possible once they would have been validated by CNES & JPL.

I want to do calval. Can I?

Yes! CNES/NASA have clearly defined the scope of Mission CalVal, but that doesn't mean other efforts aren't welcome. You know your science best, so do what calval works for you and share it with the community.

FAQ

Will SWOT work out of the box?

JPL is expecting errors and surprises after we start looking at data, and this may change some things. Calval is therefore a living practice

French/US points to discuss in our joint session