

VORTEX-10

cnes



SWOT SCIENCE TEAM MEETING

SINGLE CHANNEL RIVERS

Toulouse - 20/09/2023



CALVAL ACTIVITIES

1. VALIDATION OF SWOT PRODUCTS



- Automatic vortex-io Micro-Stations
- Drone and Airplane lidar profiles
- PTs
- Existing gauges (Vigicrues, EDF, etc...)



Process in-situ
data

- **GNSS processing**
- **Height and format harmonization** (w. r. t. EGM08)
- Managing **time delta and positioning**
- Using local and **independent centerline** to complement SWORD



Compute
Ground truth

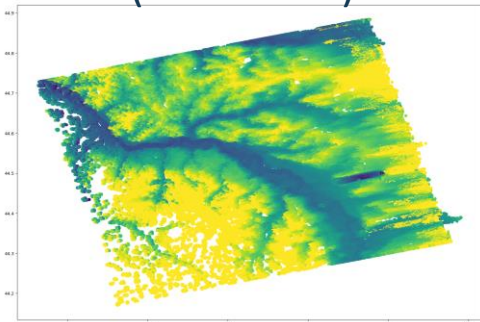
- **Independent** from the **SWOT processing**
- **Comparable** to **SWOT products**



Compare
to SWOT
Products

2. SWOT PRODUCT AND MEASUREMENT ANALYSIS

SWOT MEASUREMENTS
(PIXC DATA)



MIMIC SWOT
PROCESSING

- And changing parameters for analysis purposes
- And/or changing centerline for SWORD analysis purposes



SWOT
ANALYSIS
PRODUCTS

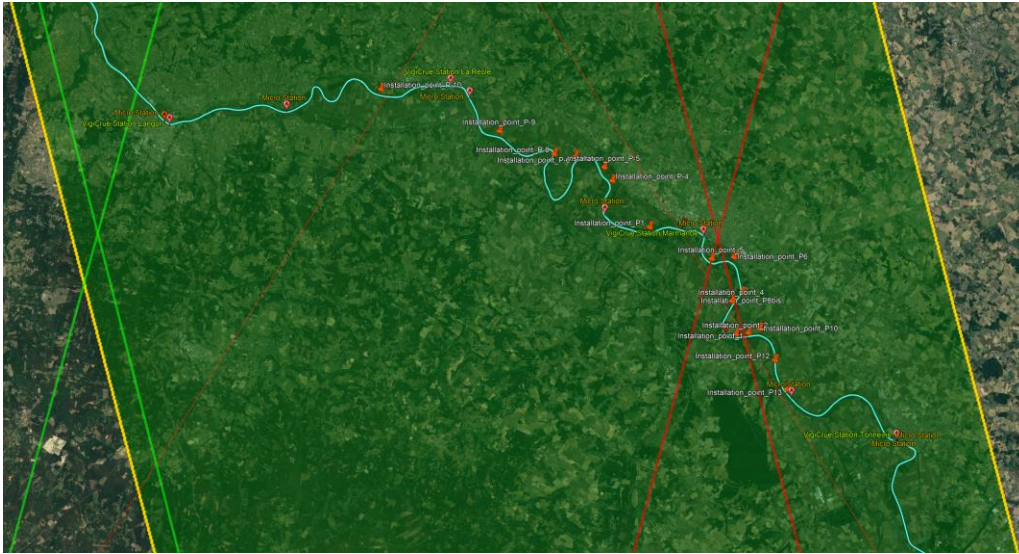


Compare
to
Ground
truth

FIELD DATA

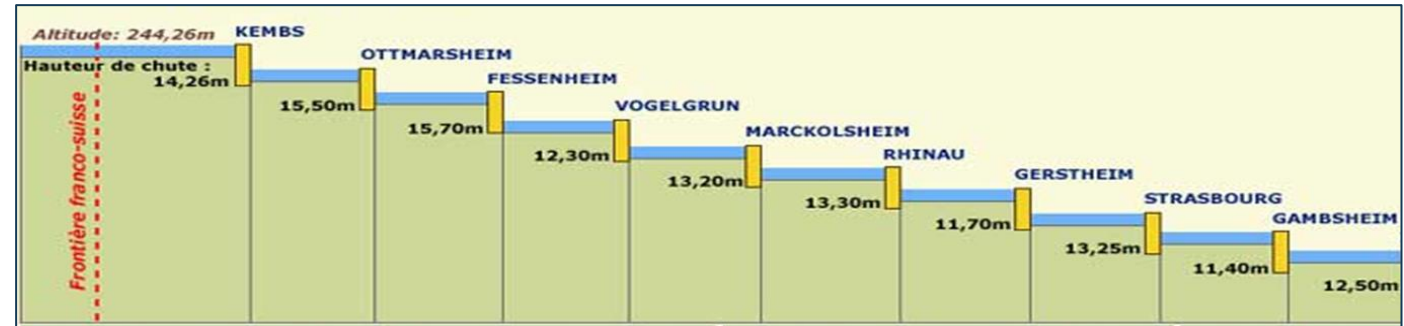
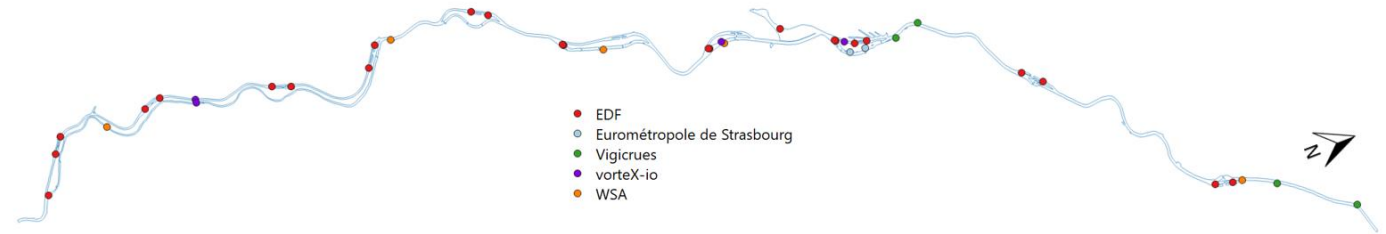
- 2 “Super Cal/Val” Sites: Garonne River (Marmande) and Rhine River fully instrumented

Garonne River (Marmande)



- 7 vorteX-io Micro-Stations
- 18 PTs
- 4 drone profiles
- 1 Airborne LiDAR
- 2 Sentinel-3A tracks
- 1 Sentinel-6 track (allowing river profile computation)
- 4 Vigicrues gauges
- Use of existing in-situ data elsewhere

Rhine River (French part)

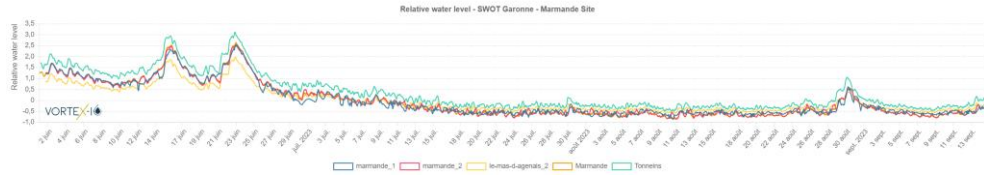


- 4 vorteX-io Micro-Stations
- 24 EDF gauges
- 4 Vigicrues gauges
- 2 EMS gauges
- 5 WSA gauges
- 4 drone profiles
- 1 Sentinel-3A track
- 1 Sentinel-6 track

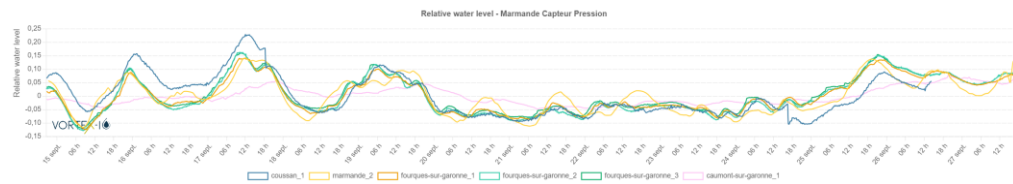
EXAMPLE OF FIELD DATA

In-situ gauges

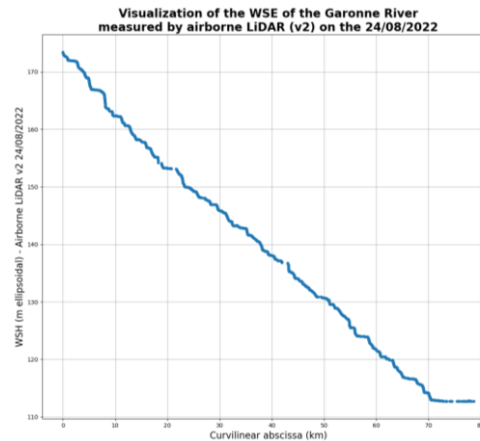
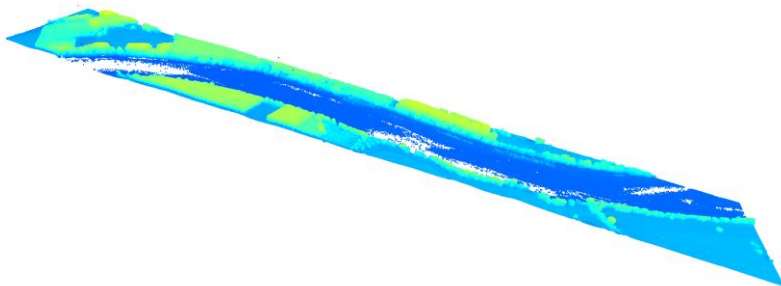
(vortex-io and from national networks)



Pressure sensors

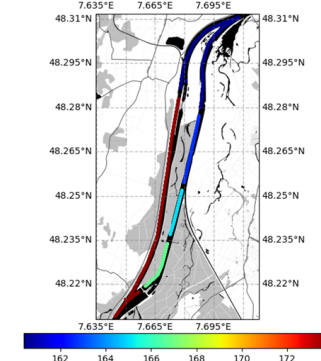


Airborne LiDAR



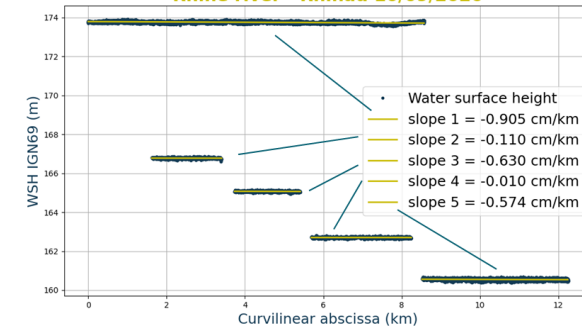
Drone profiles on the Rhine River

WSH measured by vortex.io VTX-1
Rhine river - Rhinau 10/09/2020



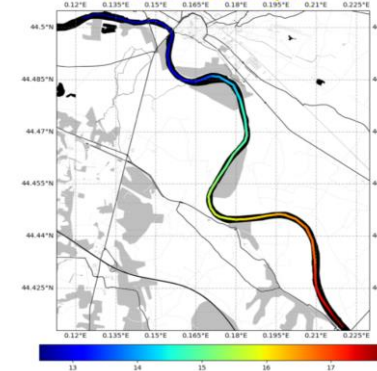
Water Surface Height IGN69 (m)

WSH measured by vortex.io VTX-1
Rhine river - Rhinau 10/09/2020



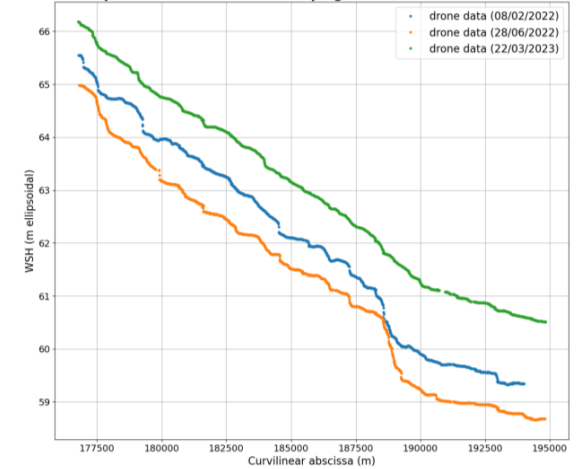
Drone profiles on the Garonne River

WSH measured by vortex.io VTX-1
Garonne River 8 February 2022



Water Surface Height IGN69 (m)

Comparison between drone campaigns over the Garonne River



PROCESSING OF FIELD DATA

Generation of In-situ measurement to compare to a SWOT node

1 Get the reference height

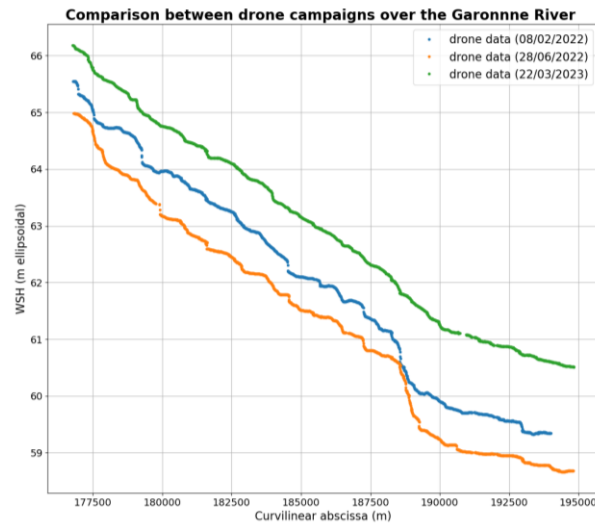
- ❖ Select the closest in-situ sensor from the node
- ❖ Select the water altitude measured at the same time as **SWOT measurement**
→ reference height

Water level - marmande_2



2 Select the height profile measurement

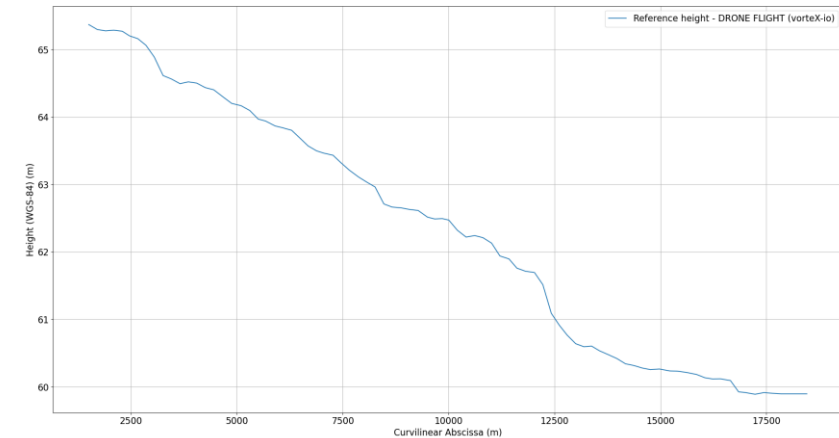
- ❖ Use the drone flights (river profile)
- ❖ Use airborne LiDAR campaign (river profile)



Select the **height profile measurement** performed at the **closest water elevation** to the reference height

3 Combine fixed and moving in-situ measurements

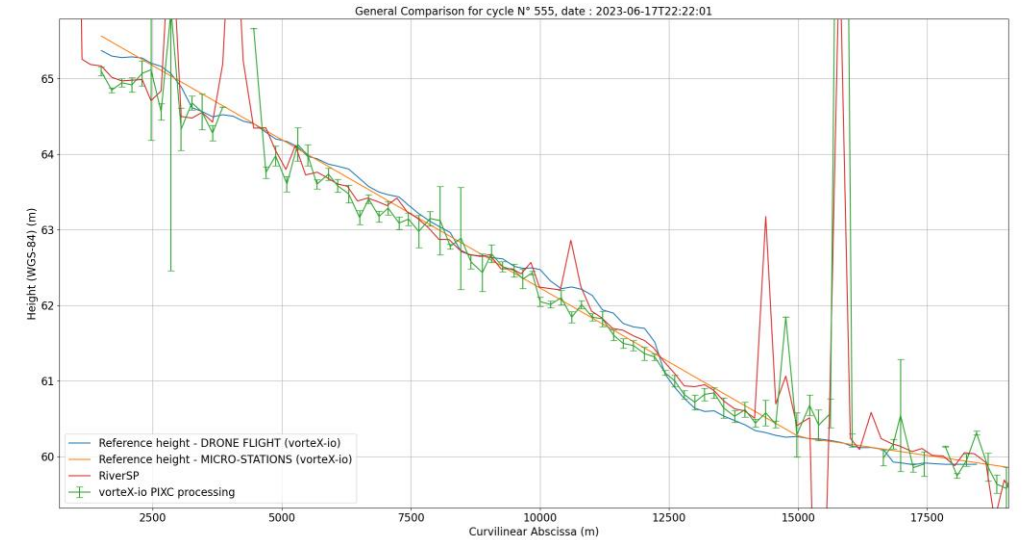
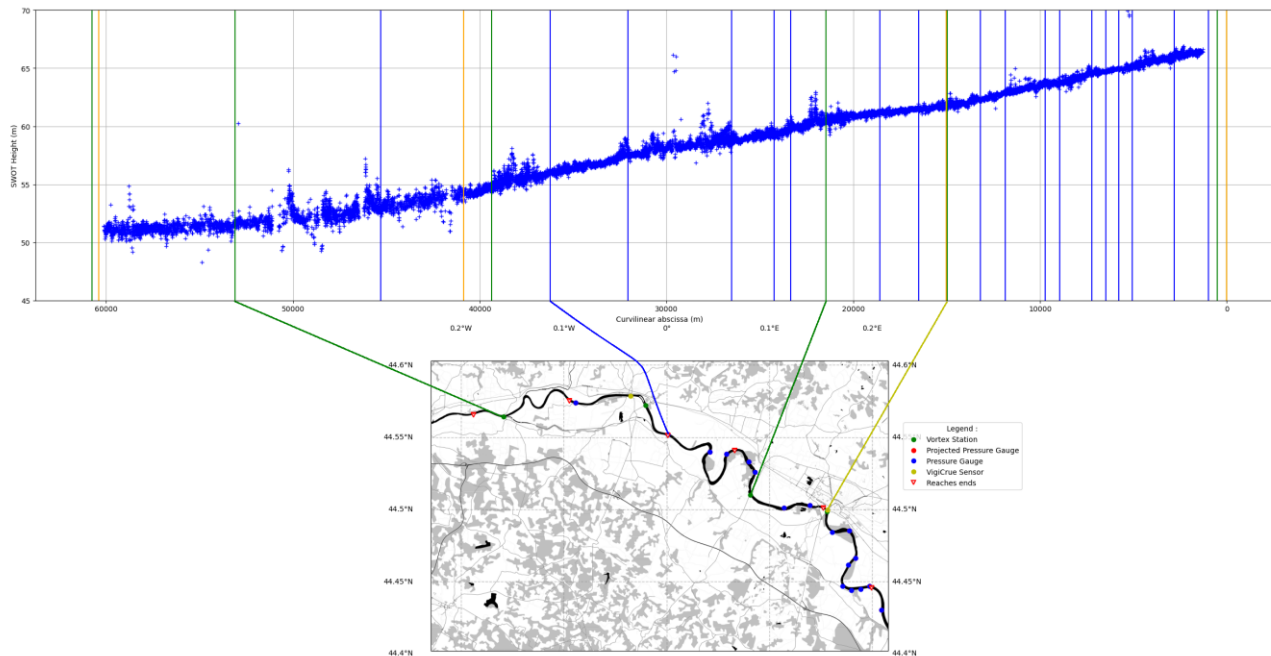
Compute the **water elevation** at the **node position**



We correct the **reference height** using the **selected height profile**

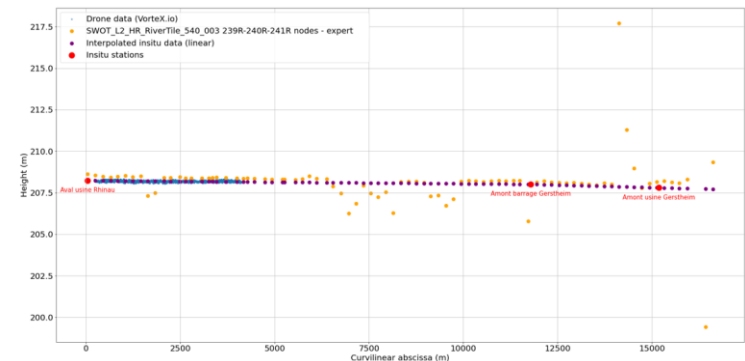
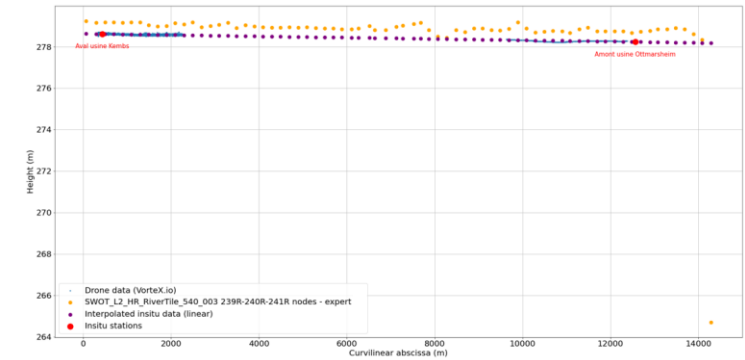
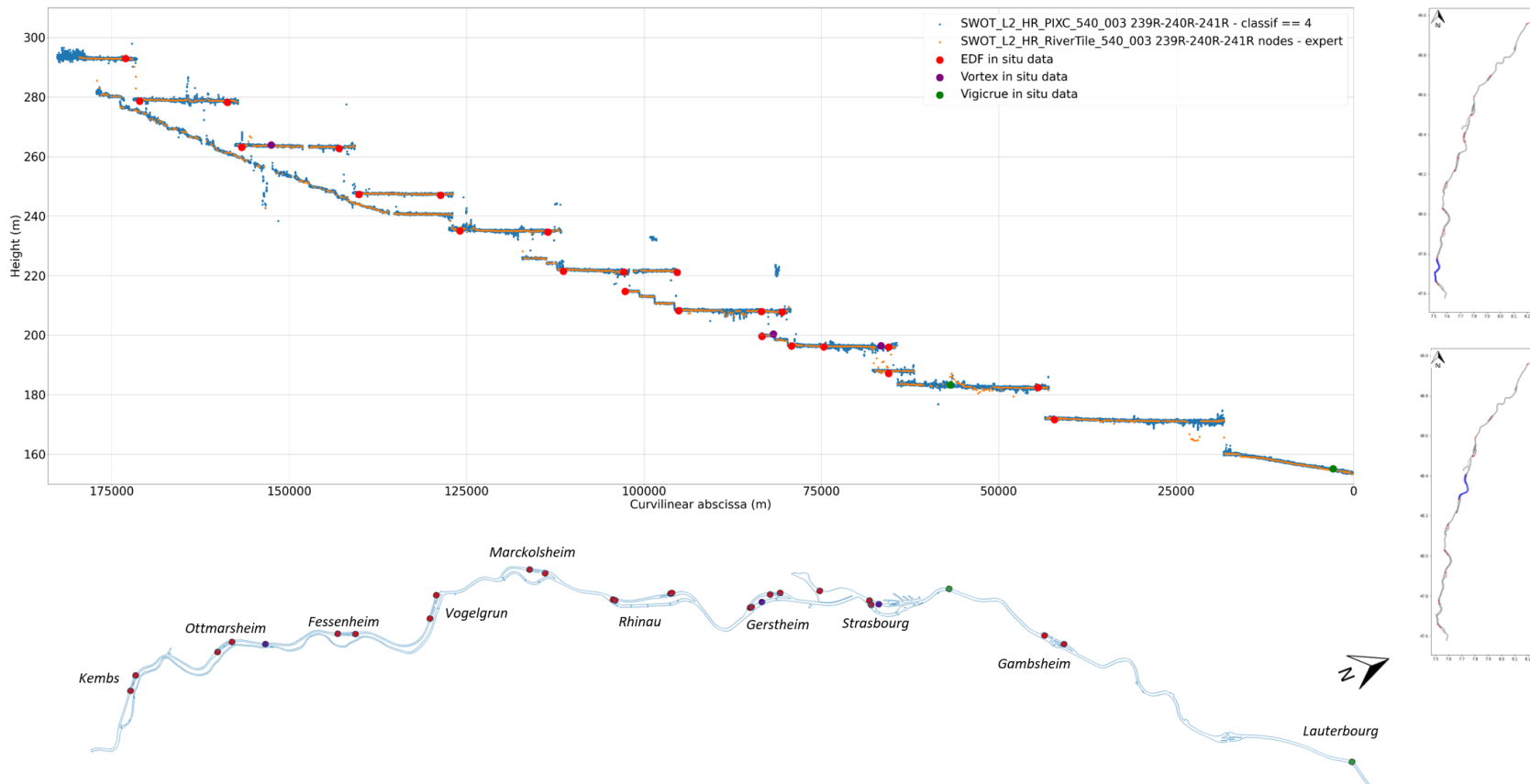
COMPARISON OVER THE GARONNE RIVER

- ❖ Promising agreement between SWOT and in-situ data
- ❖ Discrepancies are noticeable in SWOT data due to **issues in pixel classification** and potential **SWOT centerline approximations**
- ❖ Analysis still ongoing (and will continue during Science Orbit phase)



COMPARISON OVER THE RHINE RIVER

- ❖ **Promising agreement** between SWOT and in-situ data even in such difficult area (large dams, river arms close together and at different elevation), using an expert centerline (poorer agreement when using SWORD)
- ❖ **Discrepancies** are noticeable in SWOT data, potentially due to **issues in pixel classification**.
- ❖ Analysis still on going with additional gauges and applied on more SWOT cycles.



CONCLUSIONS

- ❖ **Field data collection is going well** with automatic vorteX-io Micro-Station, in-situ gauges from EDF (data transmission on a weekly basis, regular drone campaigns)
- ❖ **Very good collaboration with Cal/Val teams** (CNES, CLS, SERTIT, CS, vorteX-io)
- ❖ **First Cal/Val results are very promising w.r.t. SWOT performances**
- ❖ **Promising agreement** between SWOT and in-situ data **even in difficult areas**
- ❖ **Discrepancies** are noticeable in SWOT data due to **pixel classification issues, dark water** and potential **SWOT centerline** approximations
- ❖ Analysis still on going for fine validation