



## Context & Objectives

- **Fundamental** role of **Lakes** in the basin of the **Yangtze River** in regional **bio-geochemical cycles**.
- Assess the capability of **SWOT** for **monitoring** complex hydro system with intra-annual sub-lake behaviours.
- **Focus on Poyang lake** and its **hanging sub-lakes** for their extreme spatio-temporal variability, isolated and low and high connectivity (Fig.1).
- **Validation** of SWOT's heights with in-situ water levels.



## Data

- SWOT L2 Lake products : **PIXC** and **LakeSP** (PGC0 and PIC0 products), mid-July 2023 -May 2024
- Exploited passes: **Poyang Natural Reserve (PLNR)** : 534 with partial coverage for 228 and 493; **Nanjishan Natural Reserve** of Poyang Lake, 1 pass, 228.
- Lake Water level (**LWL**) time series based on **IceSAT-2** and **Sentinel-3**.
- **In-situ water levels** of DuChang station in Wusong datum system.



## Methods

- **Evaluation** of the accuracy of the **PIXC classes** (water only, land and water, dark water, etc.)
- **Class 4 PIXC** extracted over lakes and sub-lakes to compute **mean heights**.
- Sub lake analysis - **LWL times series** with outlier removal.
- **Comparison** of SWOT water level elevations with LWL time series based on **IceSAT-2** and **Sentinel-3**.



## Results

- Very accurate water levels identifying behaviour characterisation of each sub-lakes in regards to the water level evolution within the main basin (Fig. 3 and 4).
- **PIXC heights** over the permanent water zone are very consistent with in situ but biased (1.48 m) since heights are in a different system (Fig. 3). Very good results after bias removed: **1sigma** = 0.13 m,  $\sigma = 0.06$ .

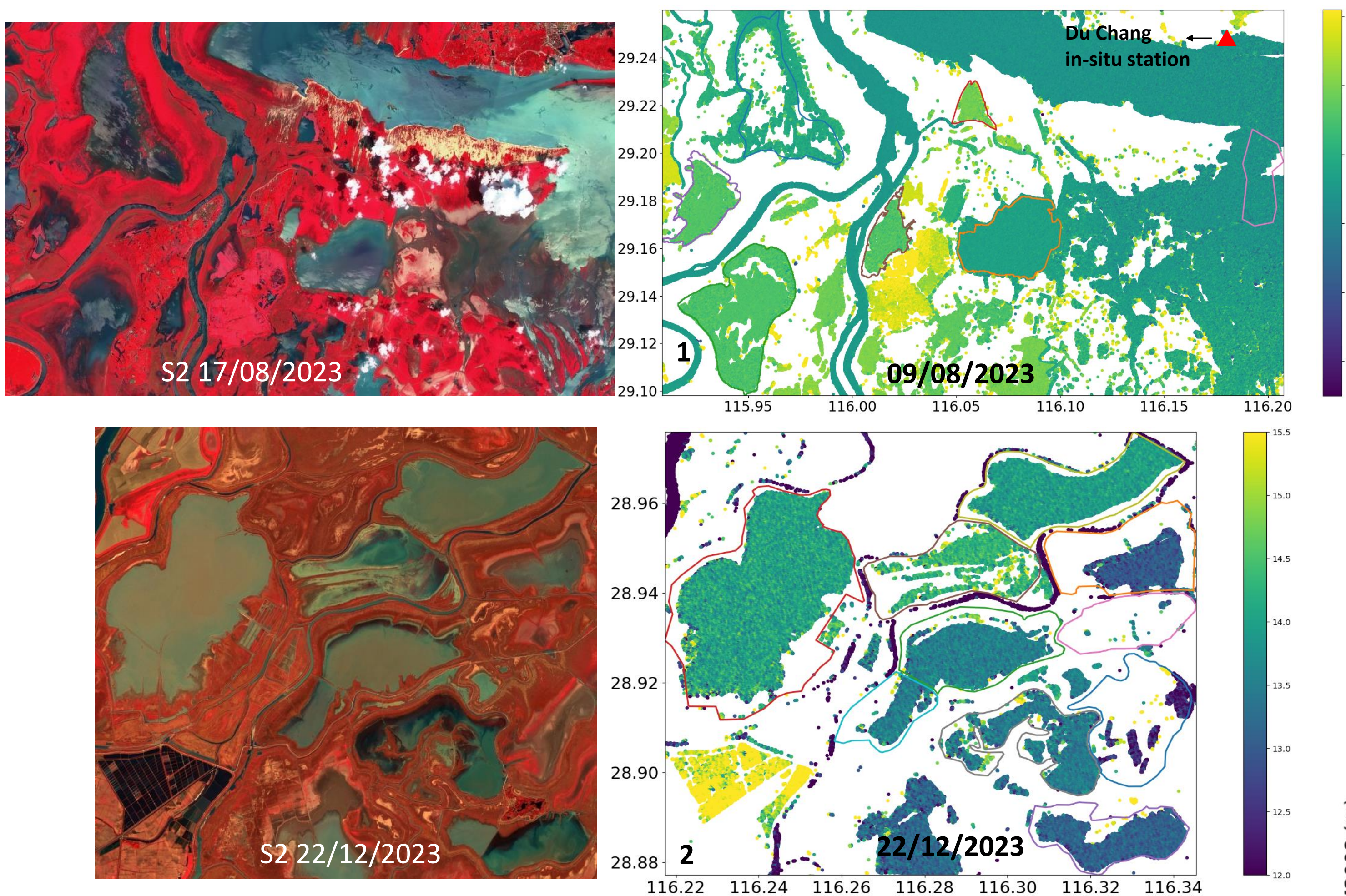


Fig. 2: Classical altimetry missions versus SWOT Spatial coverage (adapted from Biancamaria et al. 2016).

→ Sentinel-2 images and PIXC class 4 data illustrating the low connectivity condition in the recession period.



## Conclusion and perspectives

- **First exploitation** of **SWOT** products over Chinese sensitive and threatened ecosystems.
- SWOT allows a unique **monitoring** of **LWE** and **LWL** sub-lake by sub-lake with never **unreached accuracy** and **revisit**: a breakthrough in Earth Observation.
- Identification of **flood** and **drought** off episodes.
- Next step: results consolidation thanks to additional in situ water levels.

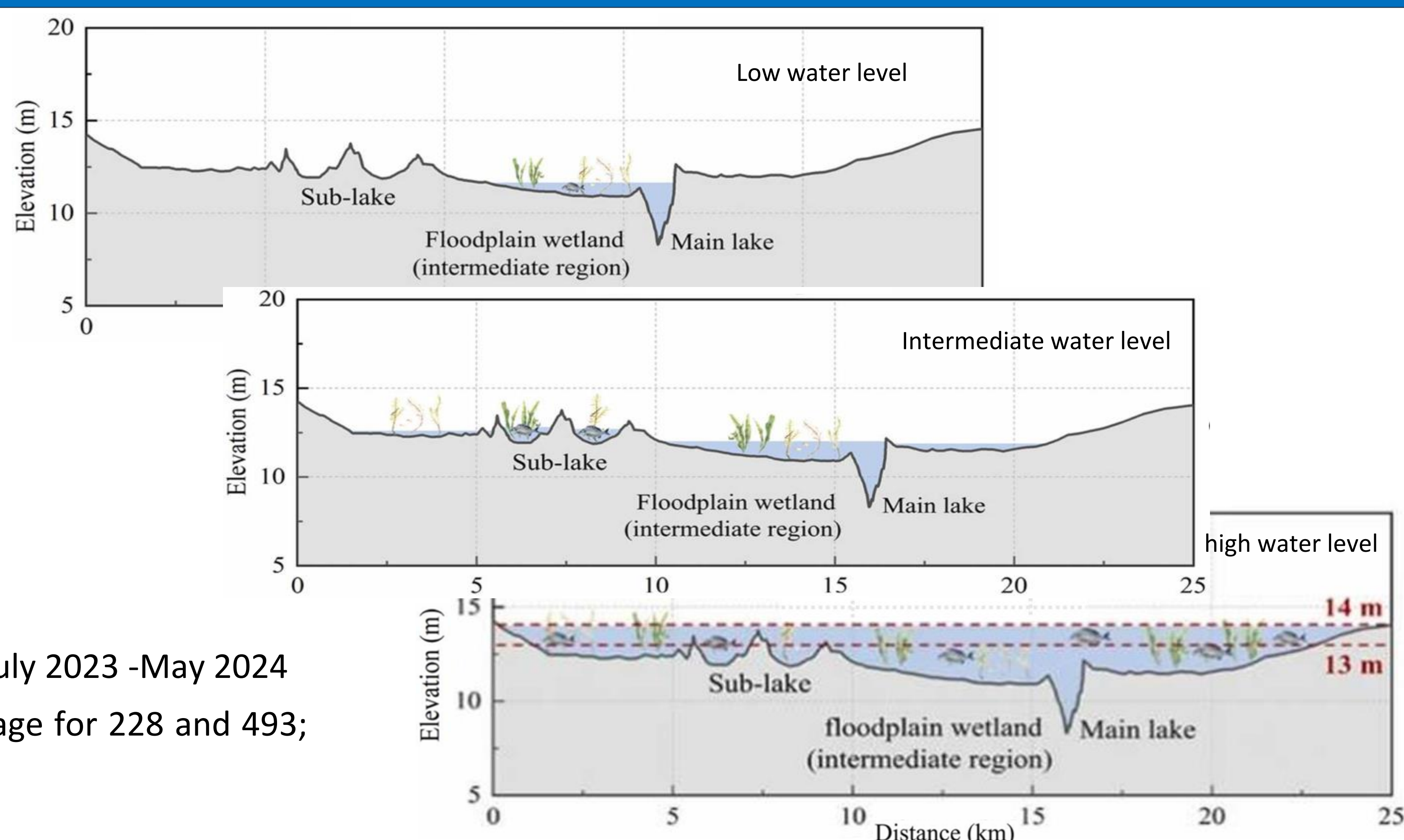


Fig. 1: Relationship between central depression and hanging lakes of Poyang Lake Natural Reserve (Wang, Z. et al.,2023).

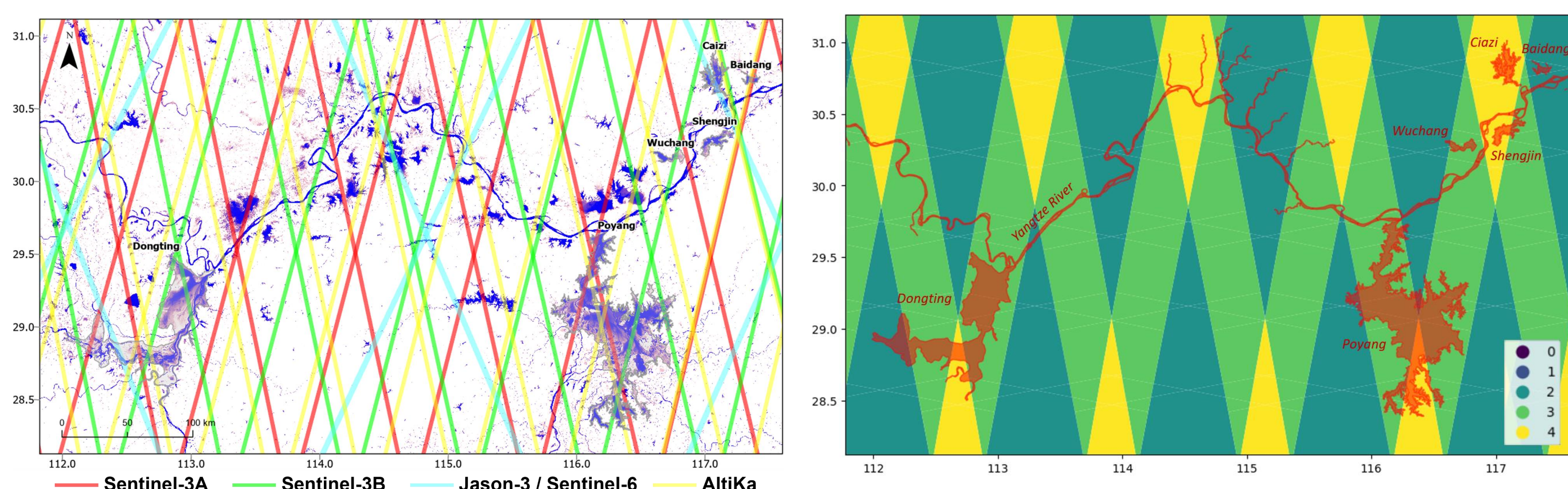


Fig. 3: SWOT PICX, mean altitudes (class 4) computed over six sub-lakes and the main part of Poyang Lake Natural Reserve versus Du Chang In-situ calibrated water levels.

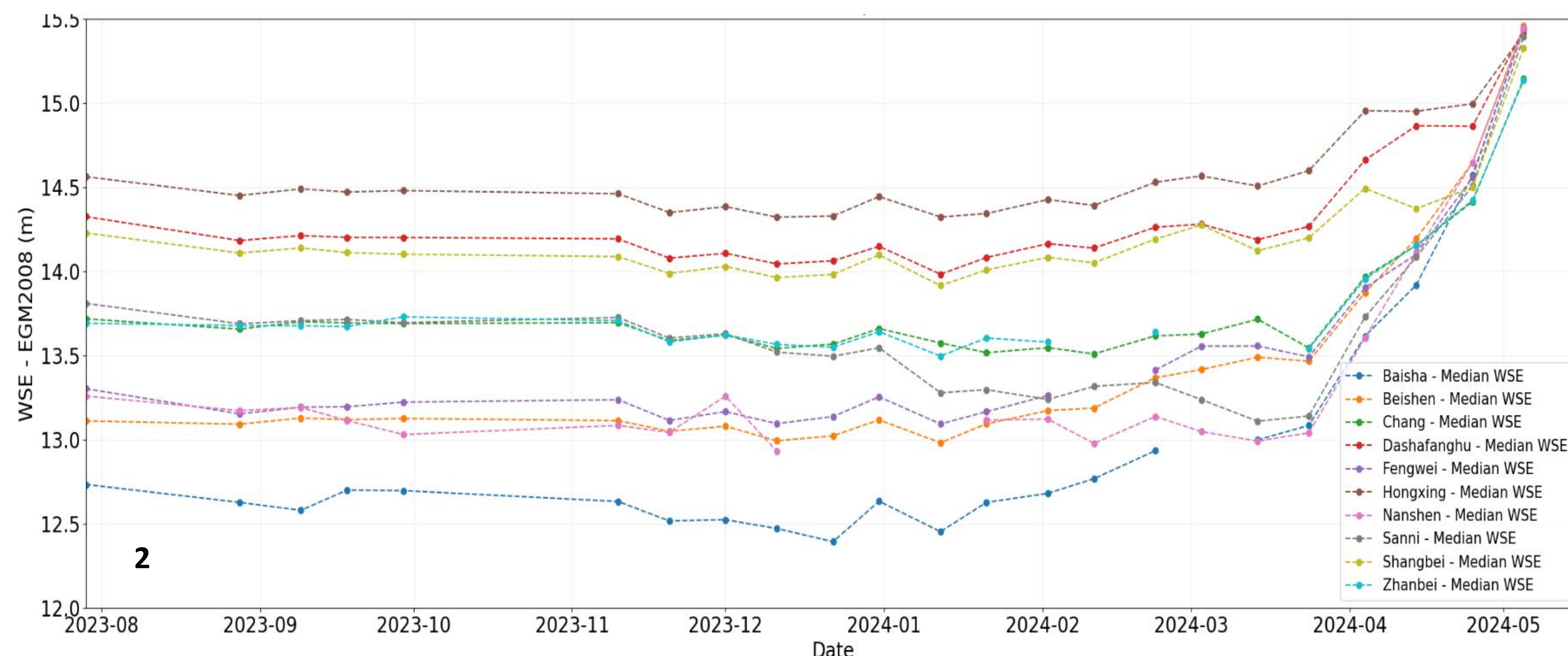


Fig. 4: SWOT LWL times series over 10 sub-lakes of Nanjishan Natural area.

### References:

- Biancamaria, S., Lettenmaier, D.P. & Pavelsky, T.M. The SWOT Mission and Its Capabilities for Land Hydrology. *Surv Geophys* 37, 307–337 (2016).
- Wang, Z., Xiao, Y., Zhang, T., Xu, C., Gu, R., Liu, J. (2023) "Effects of a proposed hydraulic project on the surface water connectivity in Poyang Lake floodplain system, China: Numerical simulation and geostatistical analysis", *Journal of Hydrology: Regional Studies*, Vol. 50, 101593, ISSN 2214-5818, <https://doi.org/10.1016/j.ejrh.2023.101593>; <https://doi.org/10.1029/2023GL107652>

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