

Update on SWOT A Priori Databases



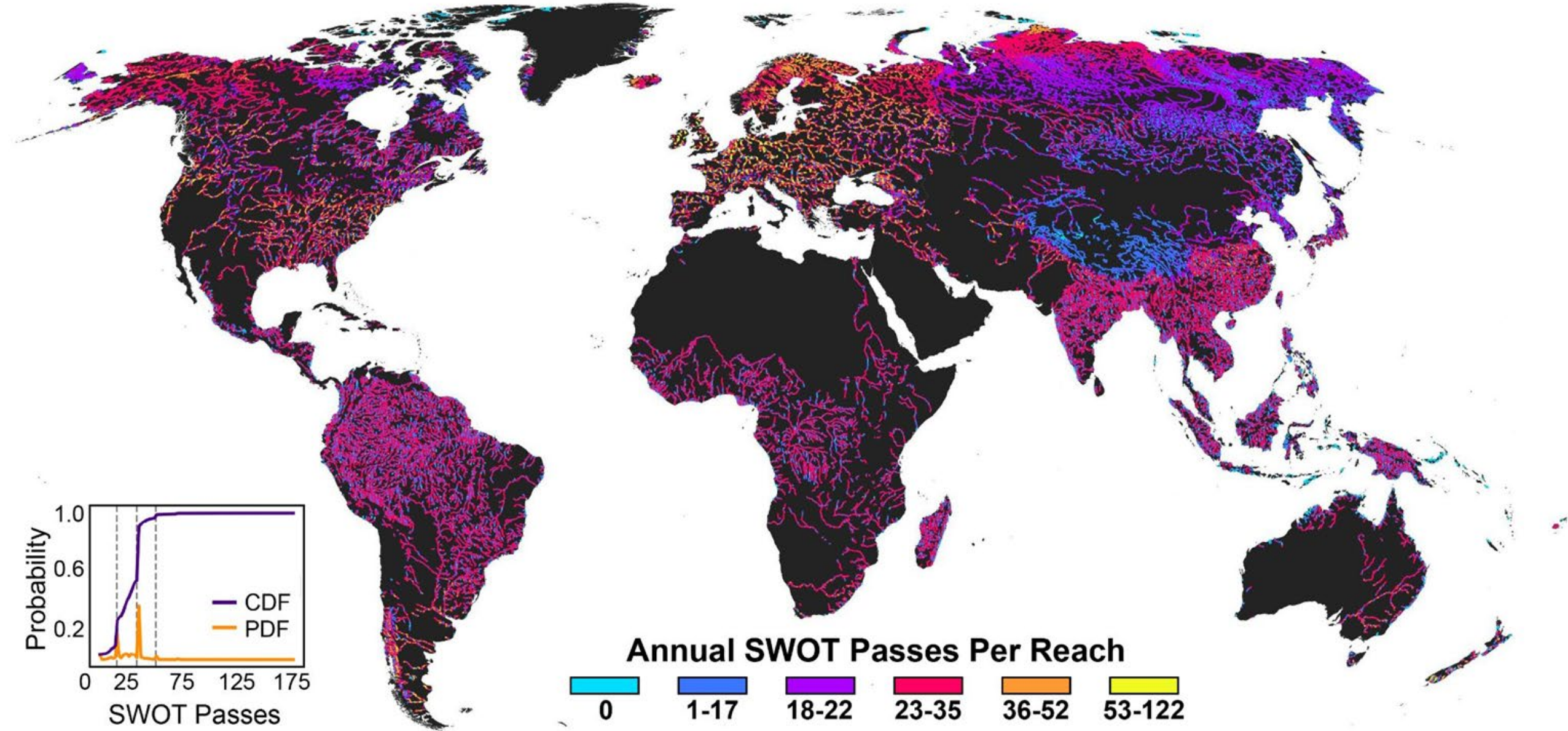
SWOT Science Team Meeting
June 28, 2022

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A Priori Hydrology Products Status

- SWOT River Database (SWORD):
 - Current version is v12, can be downloaded at:
<http://gaia.geosci.unc.edu/SWORD/>
- SWOT Prior Lake Database
 - Current version (v1.0) is available by emailing Claire Pottier
Claire.Pottier@cnes.fr
 - Just received permission from Yongwei Sheng to release the PLD to the broader SWOT community (link to come)
- SWOT Prior Wetland Database
 - An idea that has come out of the SLEW group and is still in formulation

SWORD: Current Status



SWORD: Identified Issues

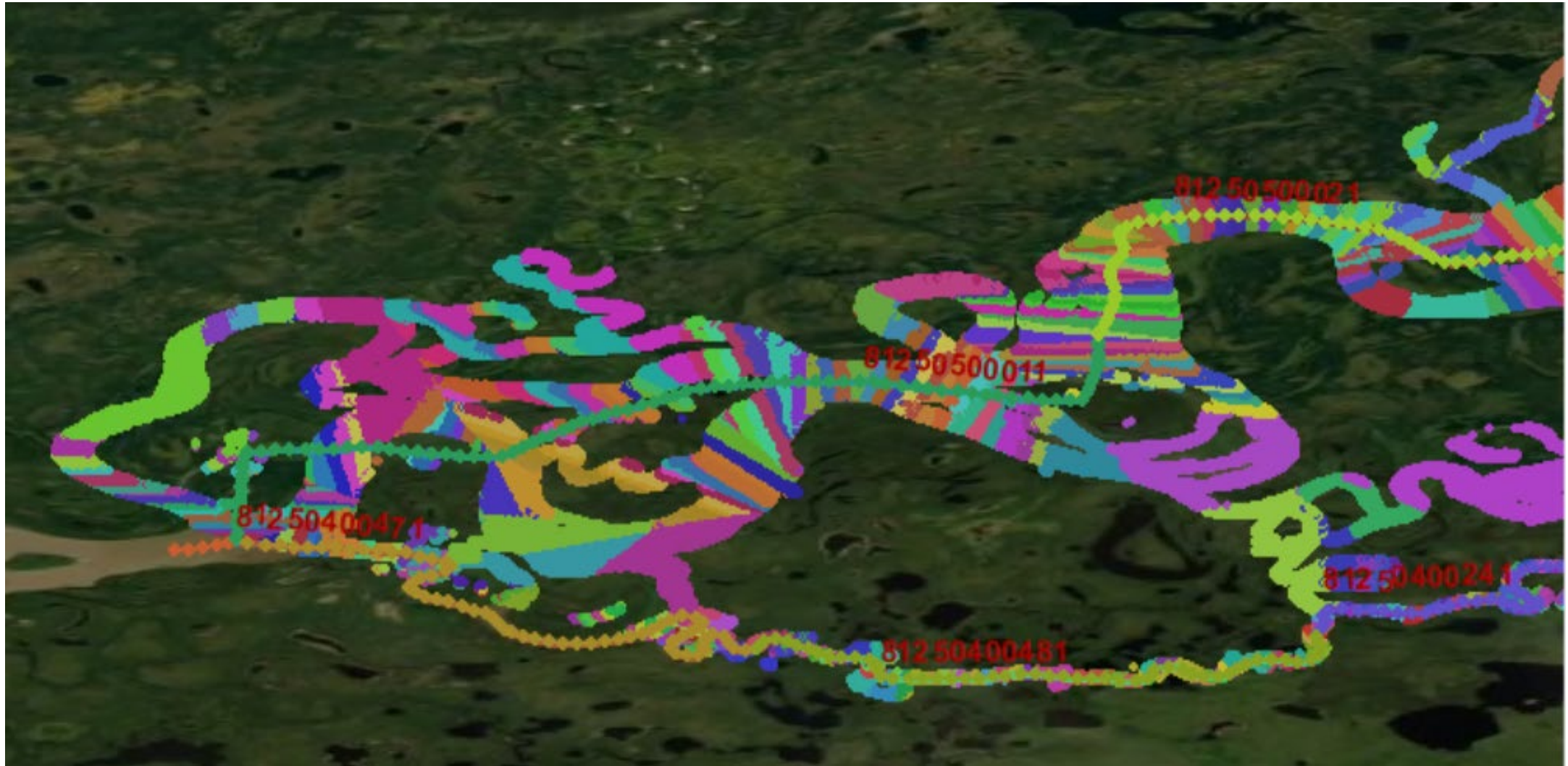
- Errors in flow direction, especially in low-slope areas
 - Node IDs erroneously progress from downstream to upstream
 - Also includes issues with distance to outlet
 - Upstream/downstream reaches are also misidentified
- Reach definition over multichannel rivers can be problematic
- Issue at continent boundaries (especially Europe/Asia) with duplicate SWORD reaches
- Reaches sometimes stop short of lakes/rivers
 - SWORD sometimes omit (large) lakes

Pixel Assignment Issues in Complex Rivers

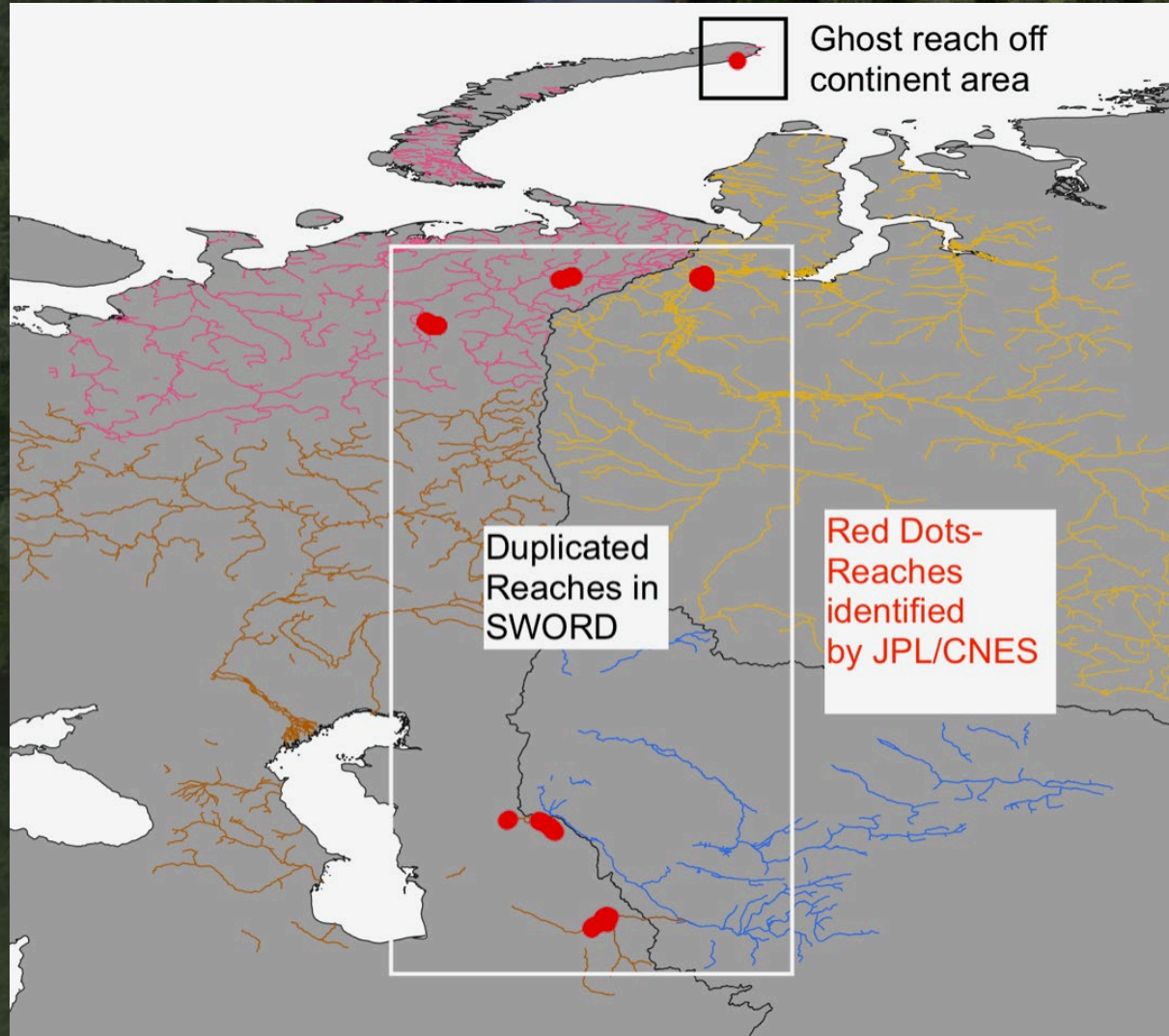


Problems can arise when attempting to correctly assign pixels to reaches in multichannel cases. We may need to alter reach definitions in a few very complex areas worldwide.

Problems with pixel assignment with a main channel and side channel

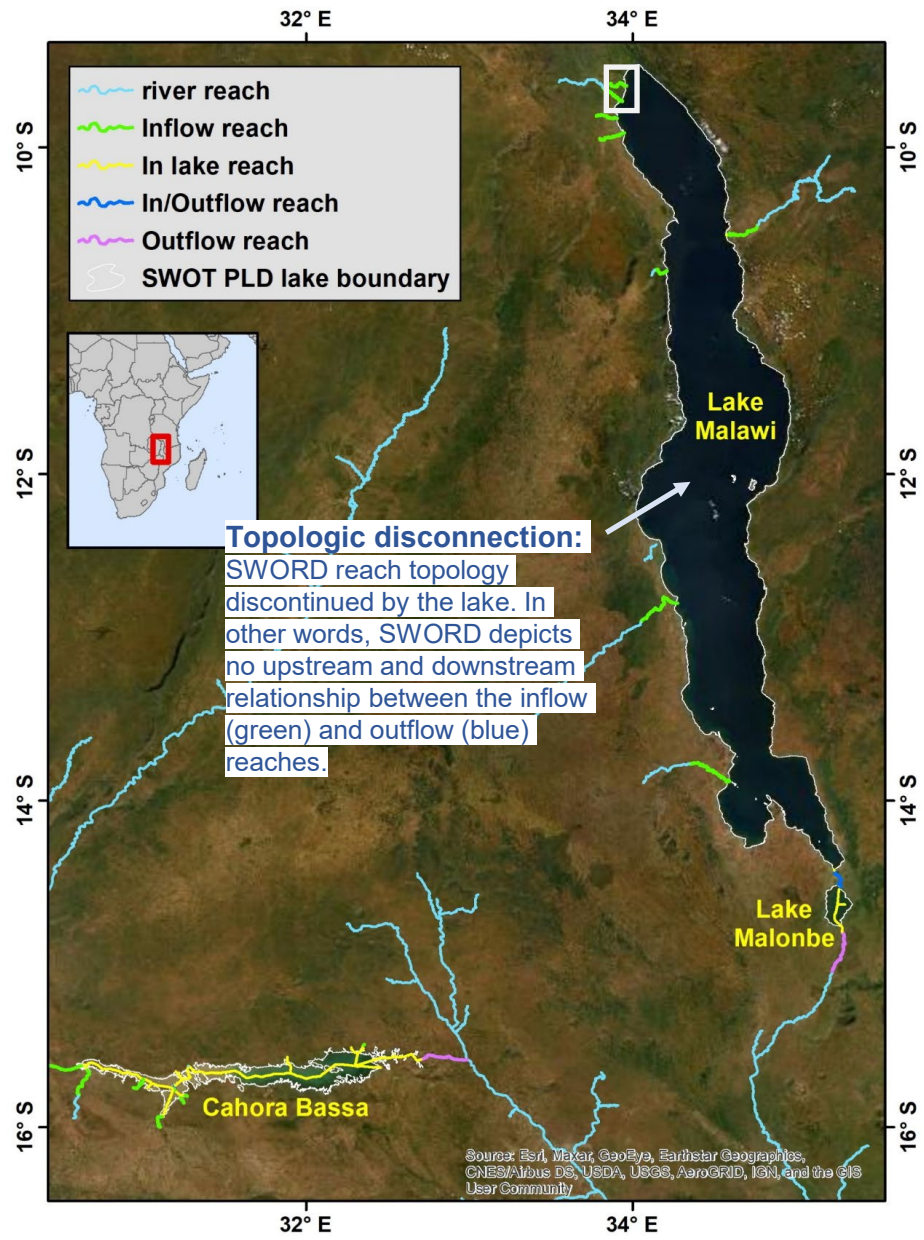


Problems along Europe/Asia boundary

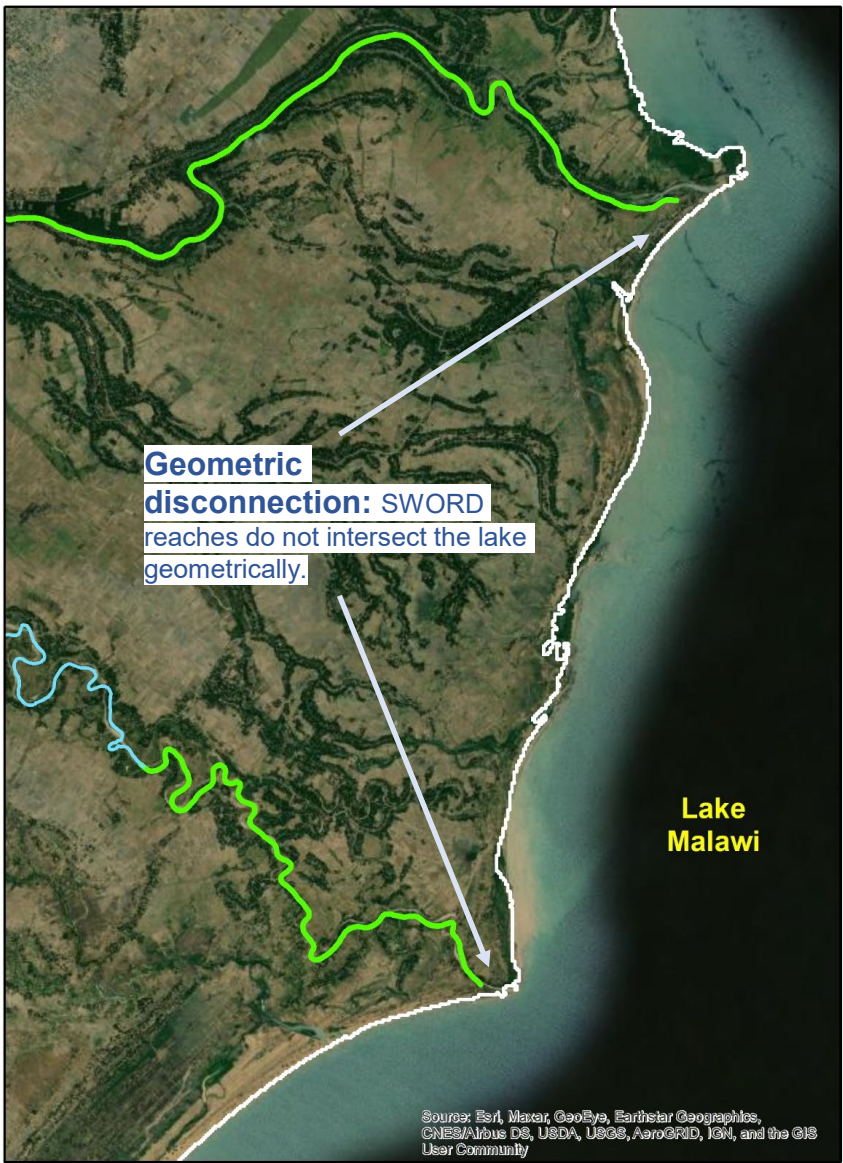


- Errors in basin definition in some cases
- Some duplicate reaches between Europe and Asia
- Exact causes still need to be determined

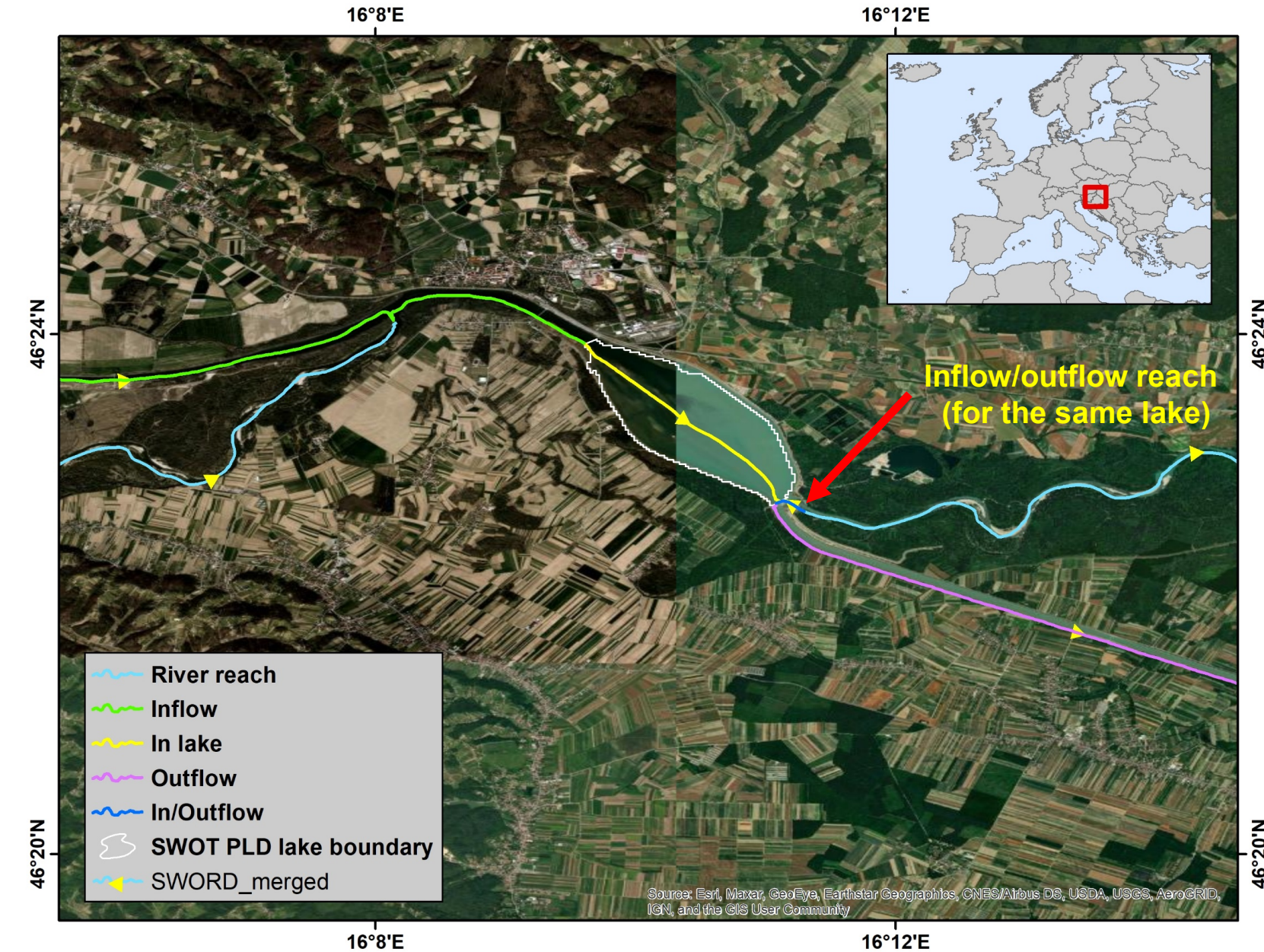
Connectivity between SWORD reaches and on-SWORD lakes



Note: Inflow and outflow reaches have been extended for a few SWORD reaches to make it visible



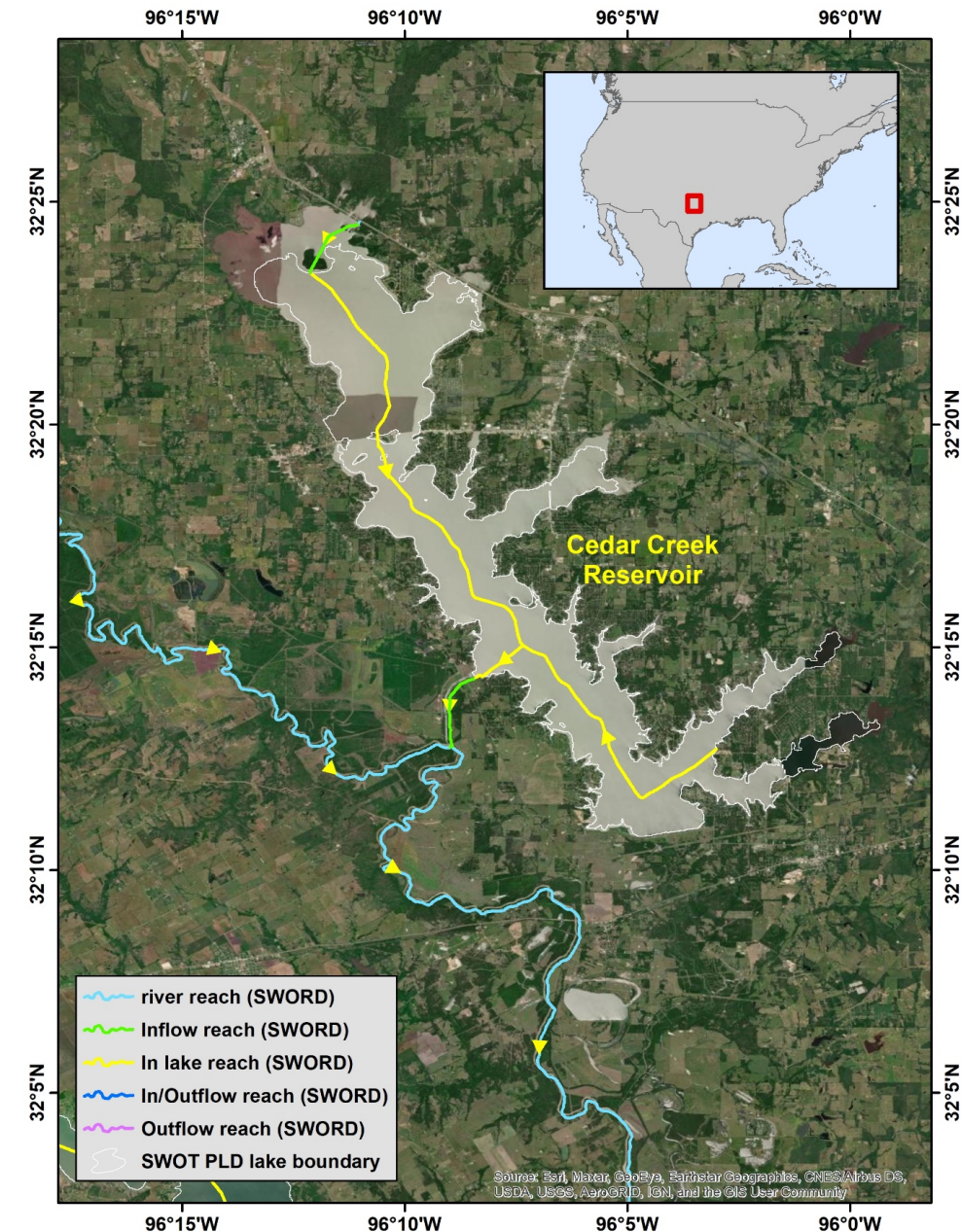
QA flags for SWORD issues: error 1



Flag error when the algorithm couldn't decide whether the reach is inflow or outflow of the same lake:

- Based on SWORD's reach topology, the blue reach is a headwater reach flowing to the cyan reach, so the blue reach is an outflow reach of the lake.
- But based on SWORD's node topology, the blue reach flows away from the cyan one (see the arrow), so it's an inflow reach of the lake.
- The algorithm was confused and labeled this reach as an In/Outflow reach with a QA flag of "Error1" in the "check" attribute.
- Here the blue reach should be an outflow reach based on the hydrography context.

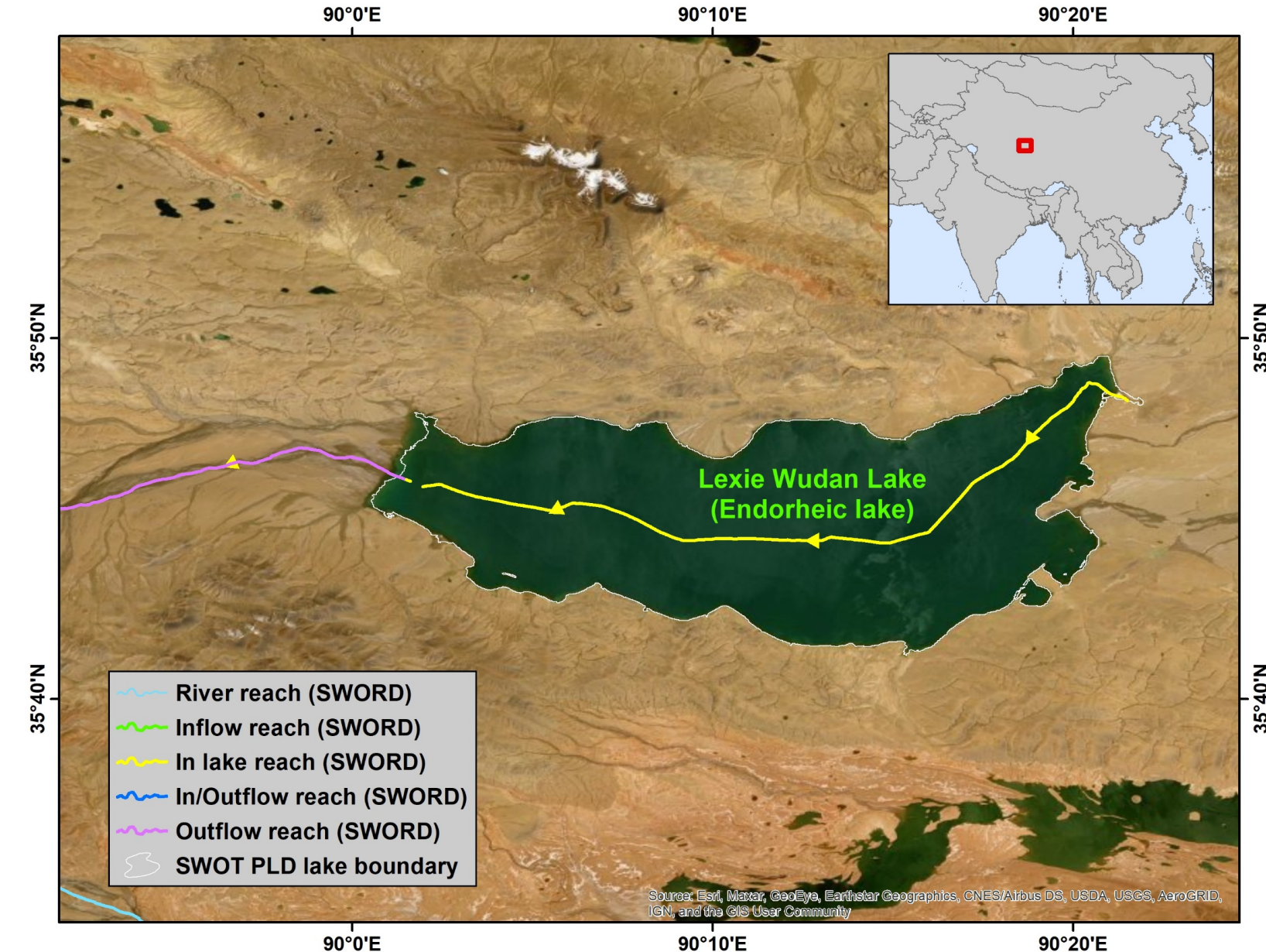
QA flags for SWORD issues: error 2



Flag error when the algorithm wrongly identified a lake as an endorheic lake (i.e., no outflow reaches):

- According to SWORD's node topology, the lower green reach flows from the yellow reaches (as indicated by the arrow), so it is an outflow reach of the lake.
- But according to SWORD's reach topology, the lower green reach flows to the yellow reaches, contradictory to the reach topology. As a result, this lake has no outflow reach (endorheic).
- This lake is actually not an endorheic lake.
- So, the algorithm labeled a QA flag of "Error2" in the "check" attribute.

QA flags for SWORD issues: error 3



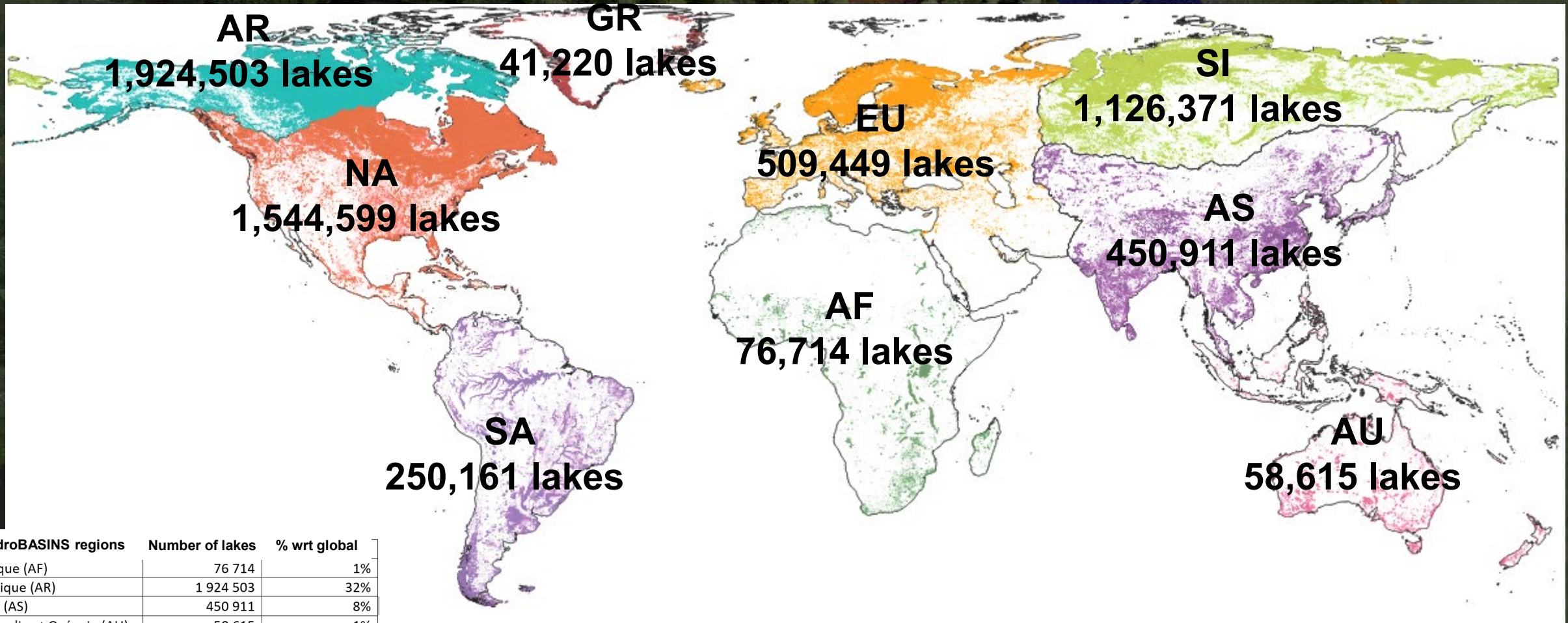
Flag error when the algorithm was unable to recognize an endorheic lake:

- This time, SWORD's reach and node topologies are consistent, and all reaches drain westward.
- The purple reach was identified as an outflow reach (as indicated by the arrow).
- The lake is actually an endorheic lake, meaning there should be no outflow reach.
- The algorithm labeled a QA flag of "Error3" in the "check" attribute.

SWORD: Plan Going Forward

- Prelaunch:
 - address the issues listed earlier in this presentation (work will begin in earnest in August)
 - Identify locations of all major tributaries not included in SWORD but that may be SWOT observable under some circumstances (using MERIT-Hydro)
- Postlaunch:
 - 1 Day orbit data: examine the consistency between SWORD and actual SWOT data
 - Science orbit data: Update SWORD to include new reaches where SWOT-observable rivers are consistently present.
 - No rivers will be removed
 - Update river geometry so that it matches SWOT-observed rivers rather than historical Landsat imagery.

Prior Lake Database Current Status



PLD is based on Circa 2015 UCLA lake database (from Yongwei Sheng), and has been designed to include all SWOT-observable lakes.

PLD: Plan Going Forward

- V1:
 - V1.0: Basic version available
 - PLD.table geometry from UCLA CIRCA-2015 lake mask [Sheng *et al.*] + PLD.lake_influence computed from them
 - PLD.lake_reach: on-going work with each new version of SWORD river DB [Altenau, Pavelsky *et al.*]
 - V1.n: On-going improvement until launch; emphasis over CalVal sites and other sites covered by CalVal orbit, and other specific sites => version available for SWOT launch
 - Include new lake influence areas from TopoCat (from Jida Wang)
 - → on-going brainstorming on the PLD update process
 - V1.n+: temporary working versions available to experts in the Expertise center
- V2: T0+15m, before L2 products reprocessing
- V3: T0+27m, before L2 products reprocessing
- V4: At the end of the mission, before the global reprocessing