

A Priori River & Lake Datasets

Jean Francois Cretaux
Tamlin Pavelsky

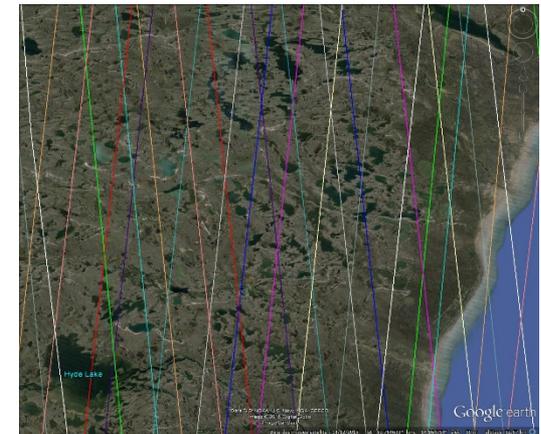
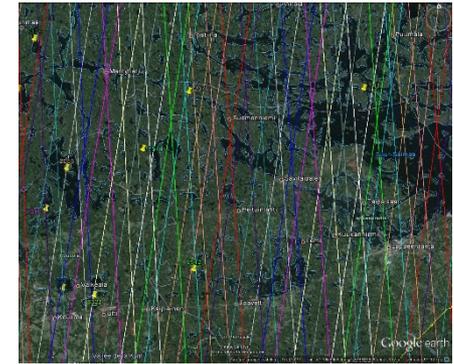
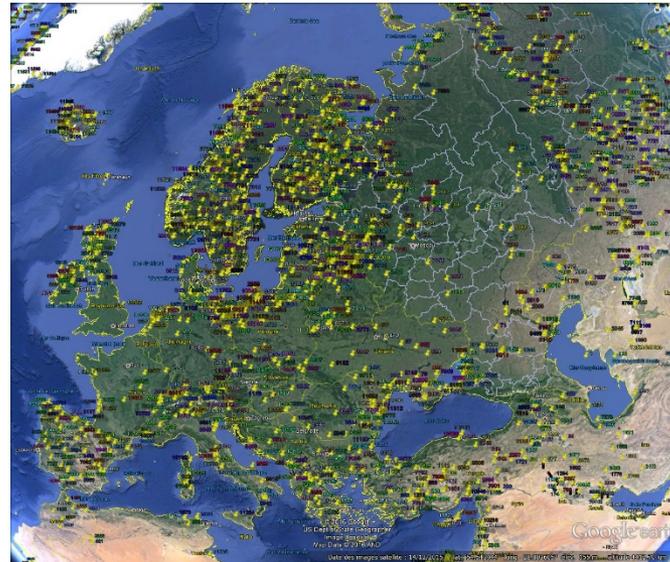
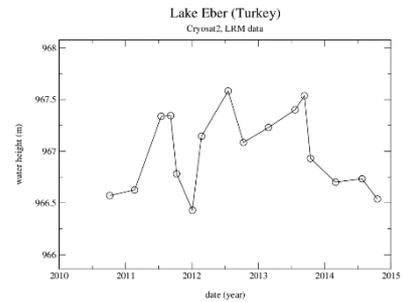
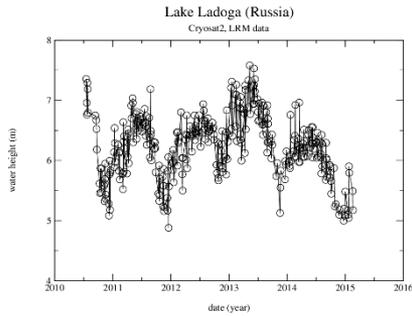
June 15, 2016

Lake a priori database: which purpose?

- Reference height of lakes worldwide for phase unwrapping
 - ✓ How to estimate the a priori lake height for millions of lakes?
 - ✓ How to link height a priori value to lakes contours?
- A priori lakes polygons for vector data products:
 - ✓ How to choose an adequate a priori database?
 - ✓ Which work tbd before the launch?
- A priori mean lake surface for vector product generation for large lake
 - What is the current knowledge on mean lake surface and their accuracy?
 - How to improve them?
- A priori lake database for Cal/Val
 - How to aggregate different in situ and satellite measurements on the lakes chosen for cal/val?
 - Which global database for cal/val?

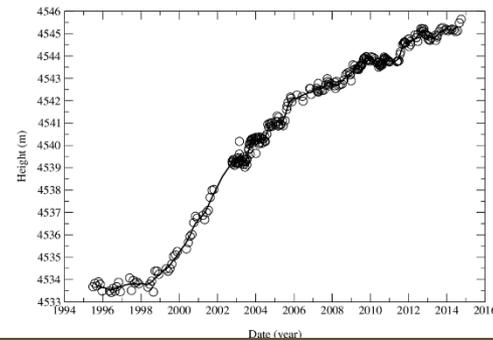
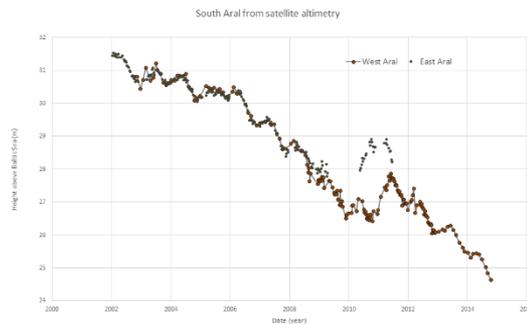
A priori lake height database ?

Use of satellite altimetry (Cryosat-2, Icesat, JS, S3)
The need is a reference level at 3-4 m of accuracy



What are we going to do with such lakes?

Ziling



Will it be possible to update new release during the mission using the SWOT lake height?

A priori lake Mask? (1/2)

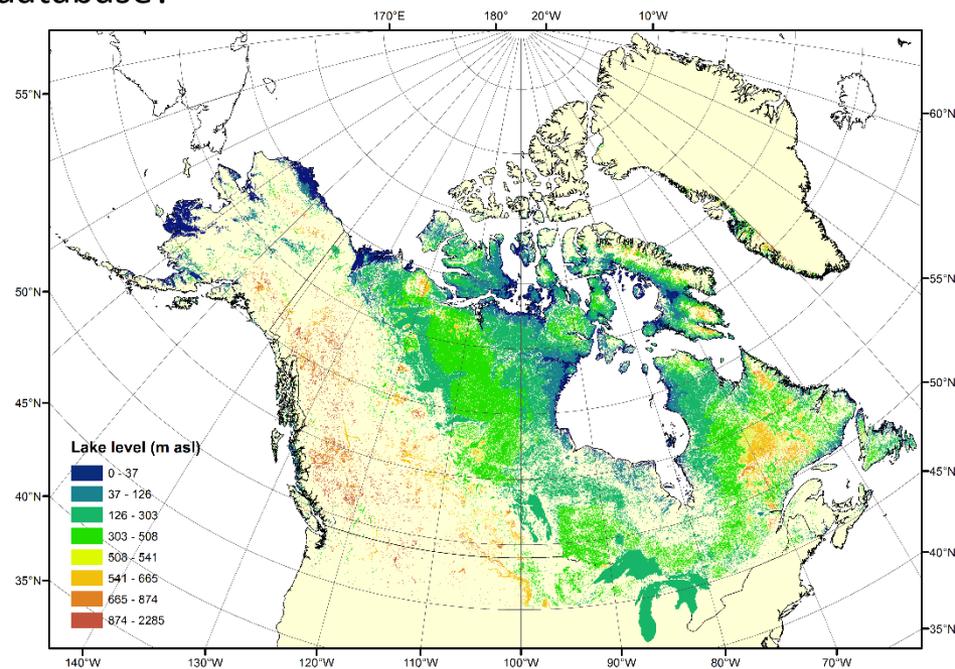
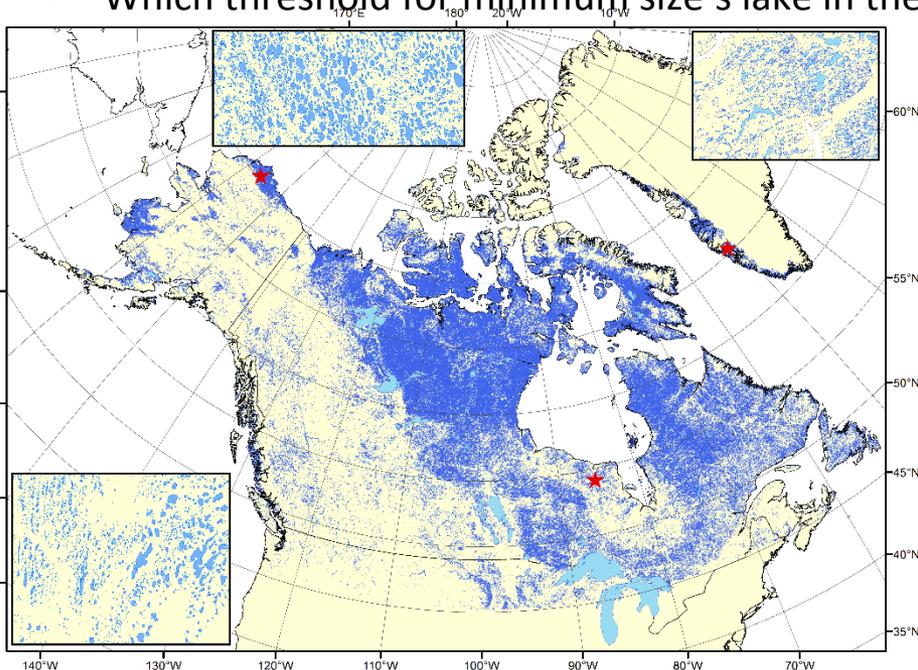
- We already have a great deal of information about where lakes are, globally.
 - Global Lakes and Wetlands Database (Lehner and Doll, 2004)
 - Landsat-derive databases (**Sheng, in prep**; Verpoorter et al, 2014)
- Before launch, we should develop an *a priori* lakes database that contains:
 - All lake features likely to be detectable by SWOT, with each lake having a unique identification code
 - A nominal height extracted from a DEM or altimetry data
 - A flag for whether each feature is likely to experience ice cover.
- This *a priori* mask should be updated during the mission using SWOT data.

A priori lake Mask? (2/2)

Two worldwide lake mask a-priori database exist based on landsat imagery

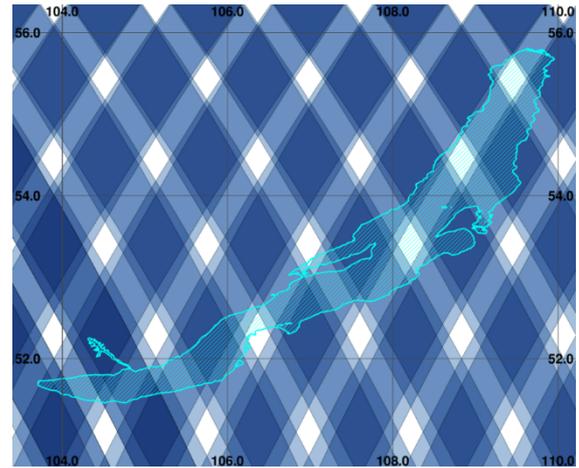
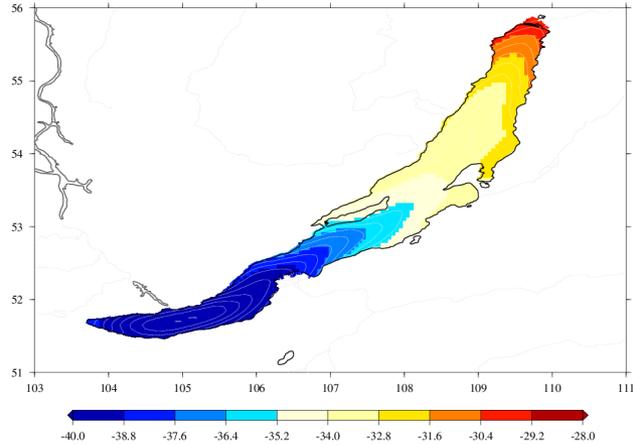
Work to be done:

- Comparison of the masks
- Comparison on some specific target with:
 - Precise national maps
 - High resolution contemporary satellite imagery (Pleiades, S2, LDCM)
- Merging mask with height: what is the best strategy?
 - Which data? Release before the launch? During the mission for reference height?
- Which threshold for minimum size's lake in the database?

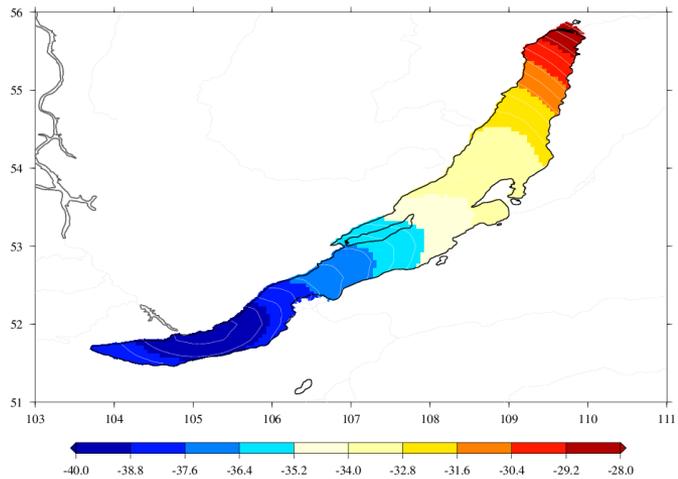


A priori Mean Lake Surface?

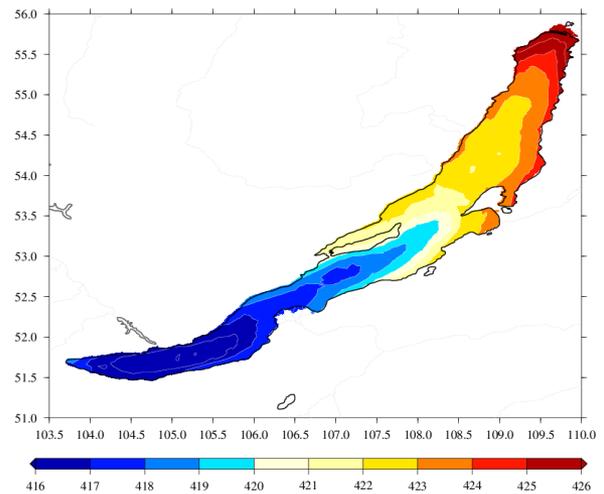
Geoide EGM2008 (Interp 100m)



Geoide EIGEN (Interp 100m avec Trigid)

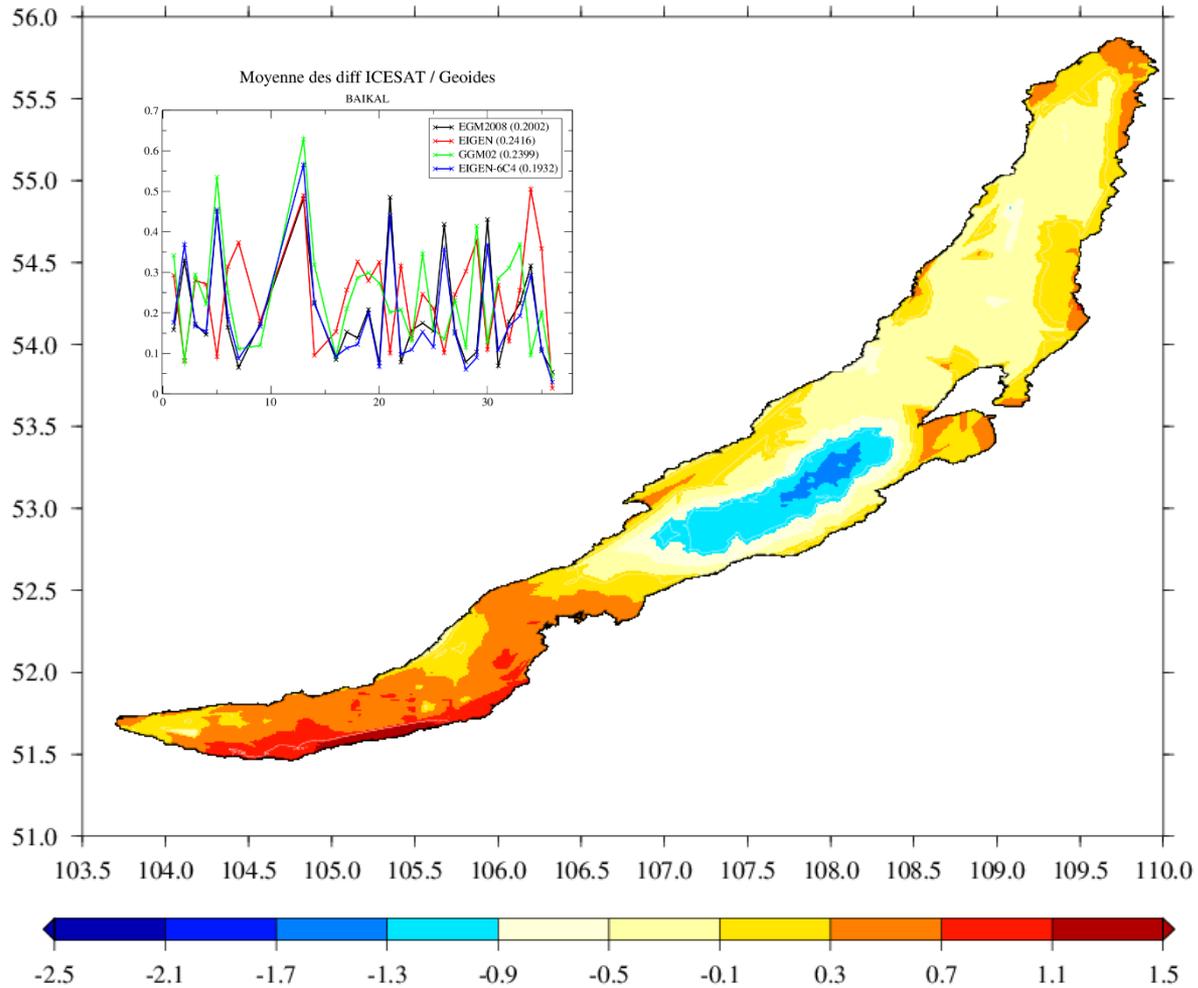


Surface Moyenne BAIKAL : ICJ (MED)



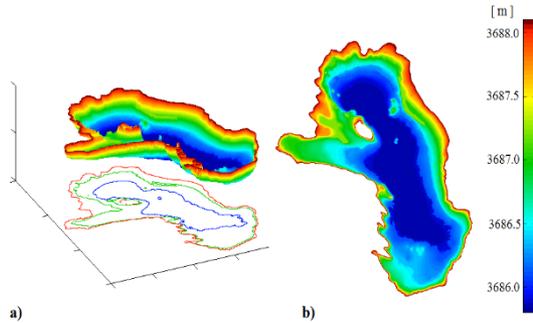
A priori Mean Lake Surface?

Diff BAIKAL : ICJ / EGM2008



A priori Lake database for Cal/Val?

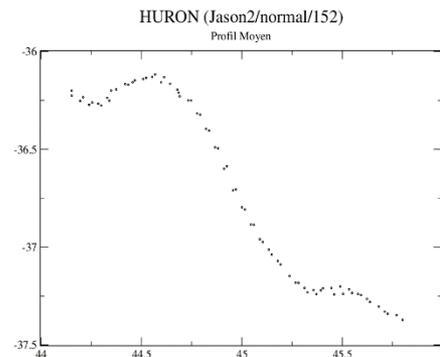
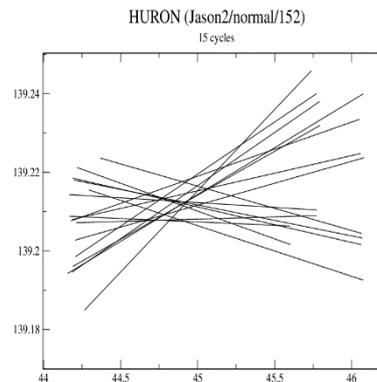
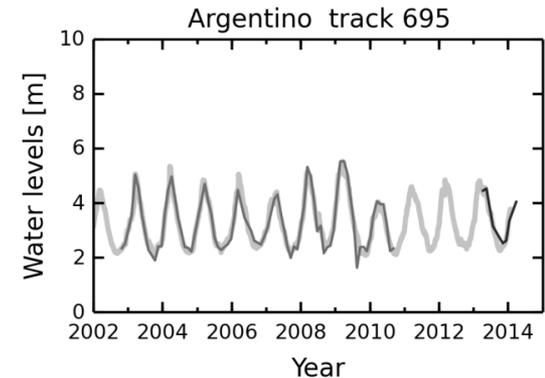
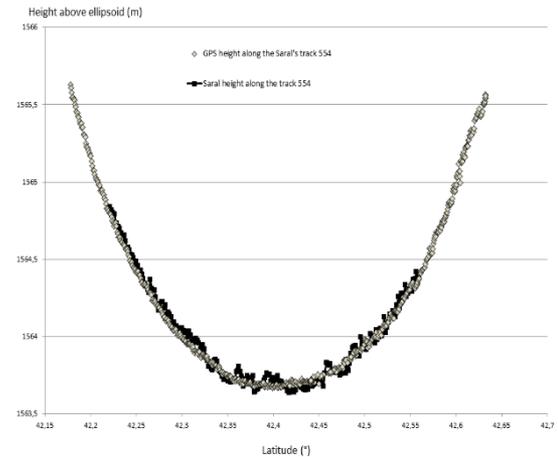
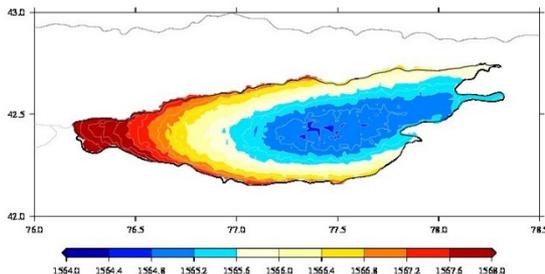
Data stored for all individual lakes in the Cal/Val selection (In situ, GPS profiles, bathymetry, Airswot Medium, large lakes, geographically distributed)



Global lake database for height level variation from:

in situ
radar altimetry

Mean lake surface and specific mean vertical profiles



A Priori Datasets for Rivers

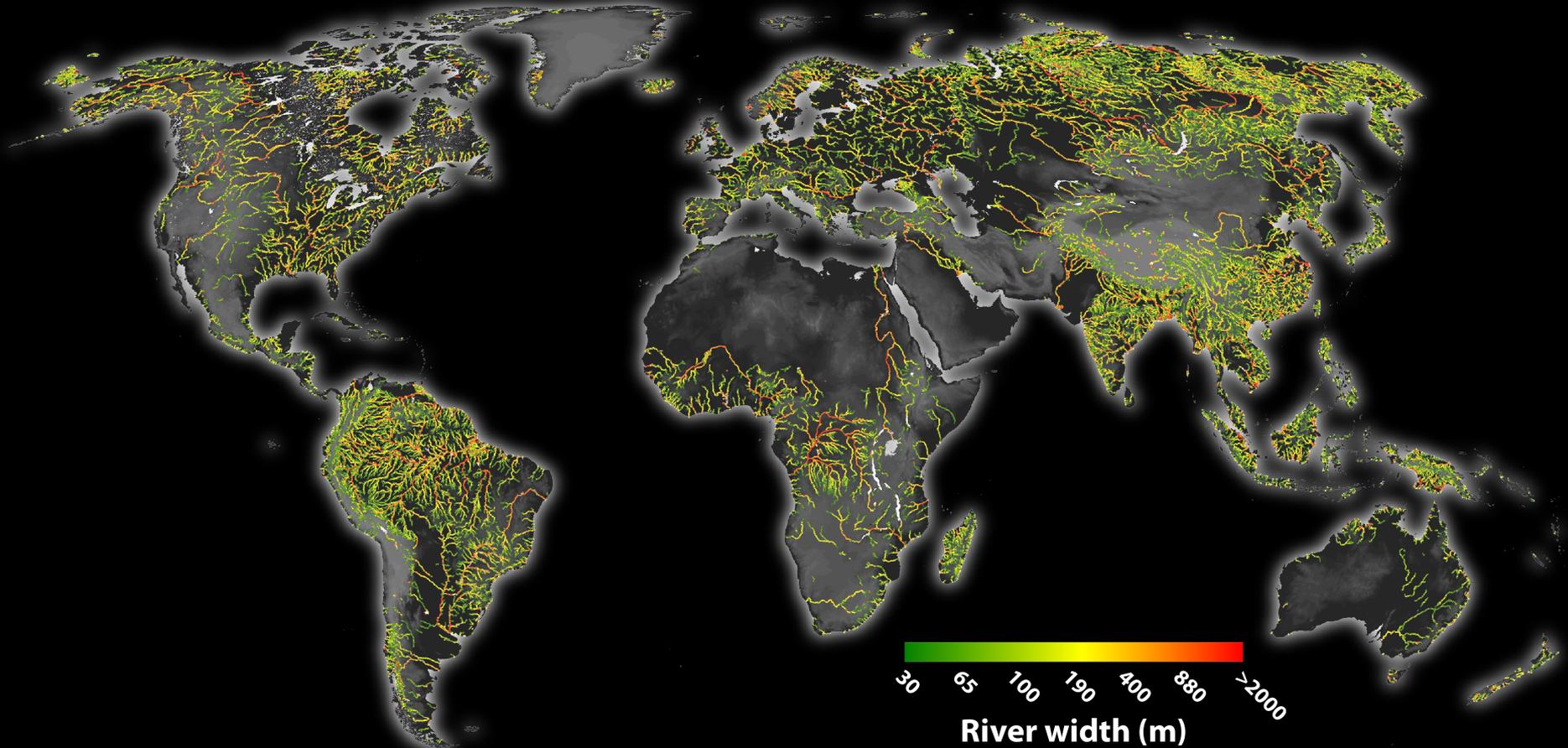
- 1. Provide a system to allow dynamic recalculation of a priori river reach boundaries that can take in a large number of different variables, including:**
 1. River centerline location
 2. River width
 3. River slope
 4. Tributary junctions/changes in basin area
 5. Braiding index
 6. Reservoir/Lake extents
 7. Dam locations
 8. Stream gauge locations
 9. SWOT swath boundariesEtc, etc.
- 2. Use this system to provide a preliminary set of a priori reach boundaries for the SWOT river vector product.**

Note: there is also work being done on priors for discharge algorithms by Guy Schumann and Mike Durand, which will not be discussed here.

SWOT River Reaches

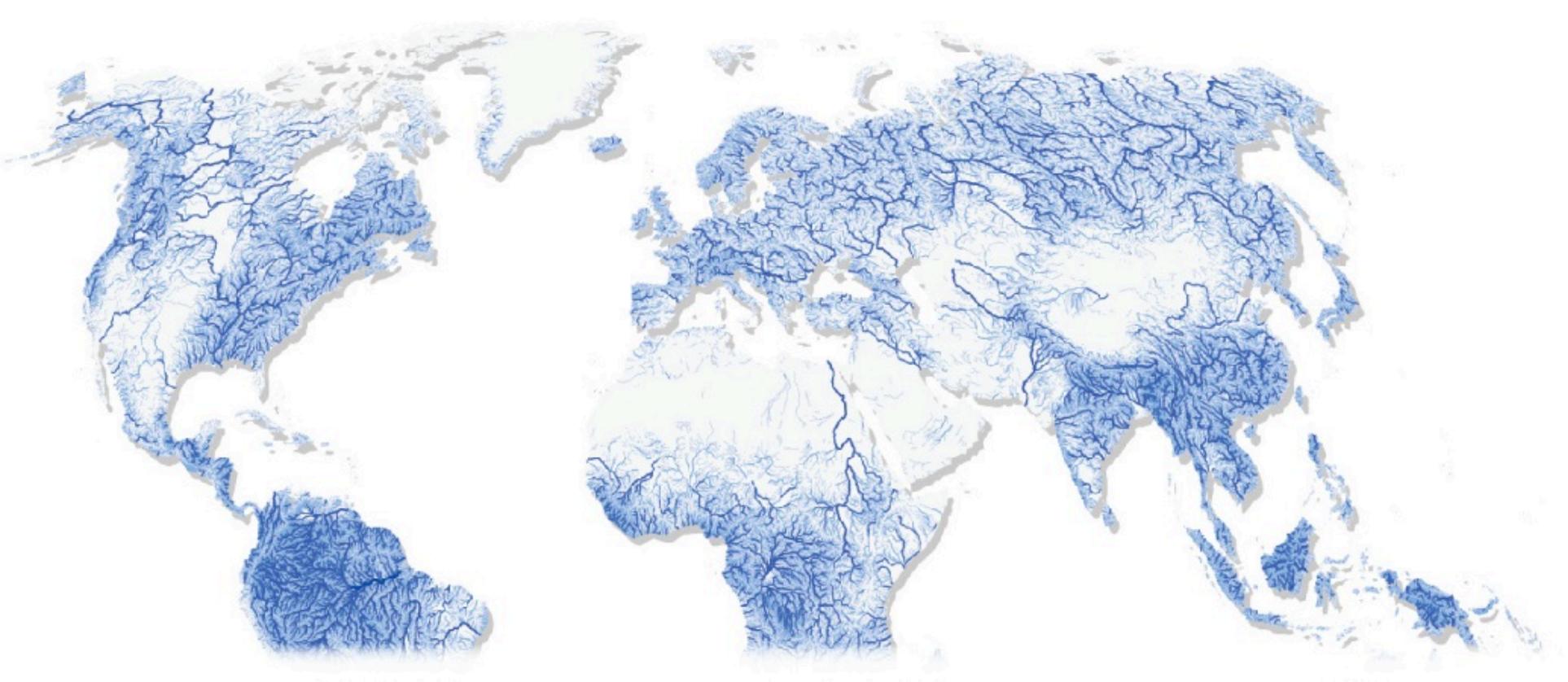
- Science requirements all assessed against 10 km reaches
 - This does NOT mean that all of the reaches we produce data for should be exactly 10 km.
- General principles (for now):
 - Reaches should not cross tributary junctions.
 - Reach length should vary with width, slope, etc. but should generally be between 8 and 18 km.
 - Reaches, whenever possible, should not cross SWOT swath boundaries
 - Reaches should not cross dams or waterfalls.
 - Dams and waterfalls should have independent “mini” reaches that only show the drop in elevation.
 - All of the world’s SWOT-observable rivers should be included.

Global River Widths from Landsat (GRWL)



- 2.1 million km of rivers measured (58M measurements)
- more than 600,000 km² of river surface area
- 10% contain more than one channel
- 20% north of 60°N

HydroSHEDS: Global Stream Data from SRTM*



Provides information on river height and slope
Modified by Ed Beighley to provide robust river topology
Available from SRTM globally south of 60 N.

*distribution of Pan-Arctic data (N of 60N) from other sources long rumored

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Preliminary Reach Database: South America

~40,000 unique river reaches

Incorporates a priori information
from GRWL, SRTM, GRaND, etc.

Derived using software designed
to allow recalculation according
to changing priorities.



150 km

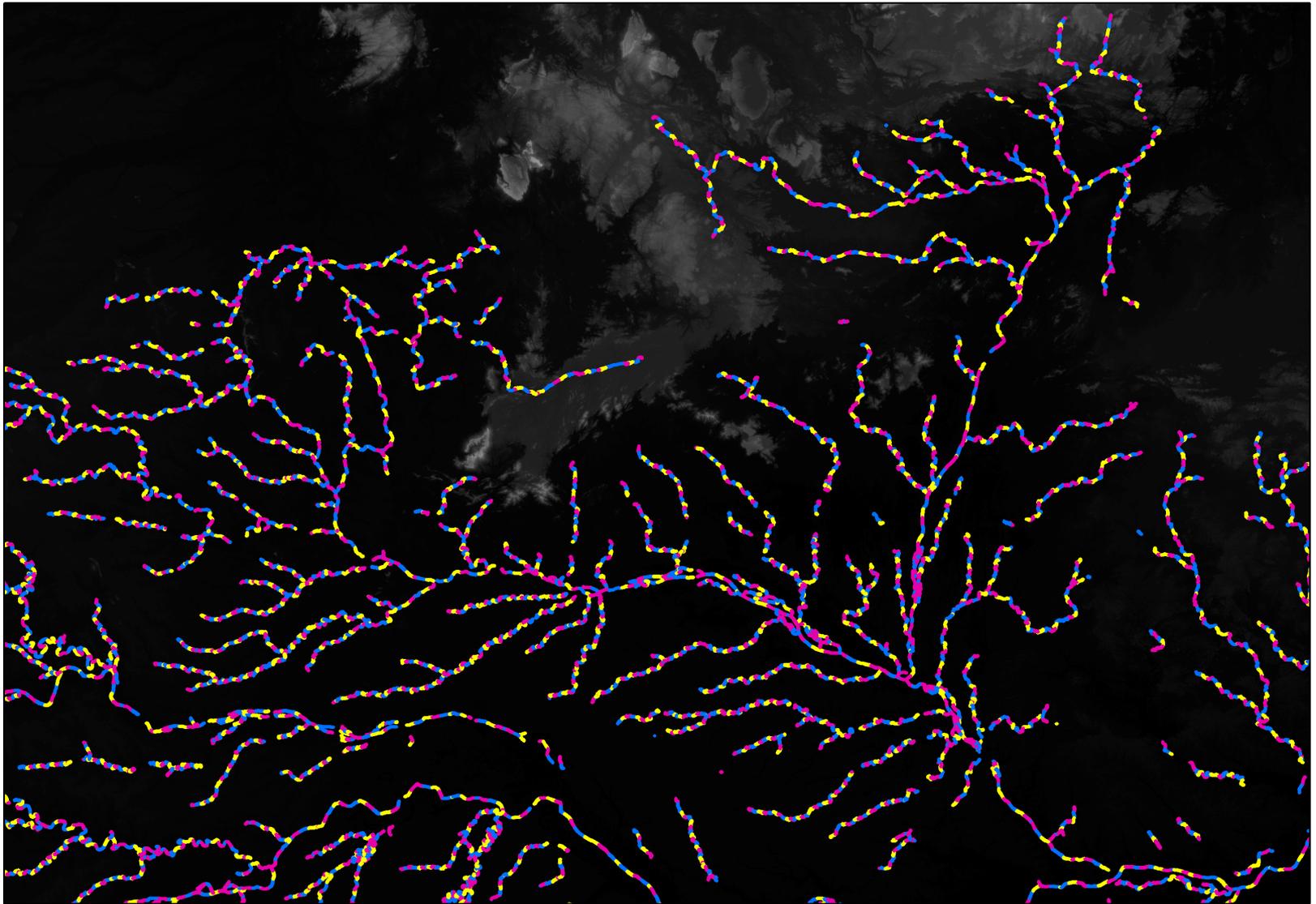
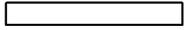


Figure courtesy C. Lion, UNC

50 km

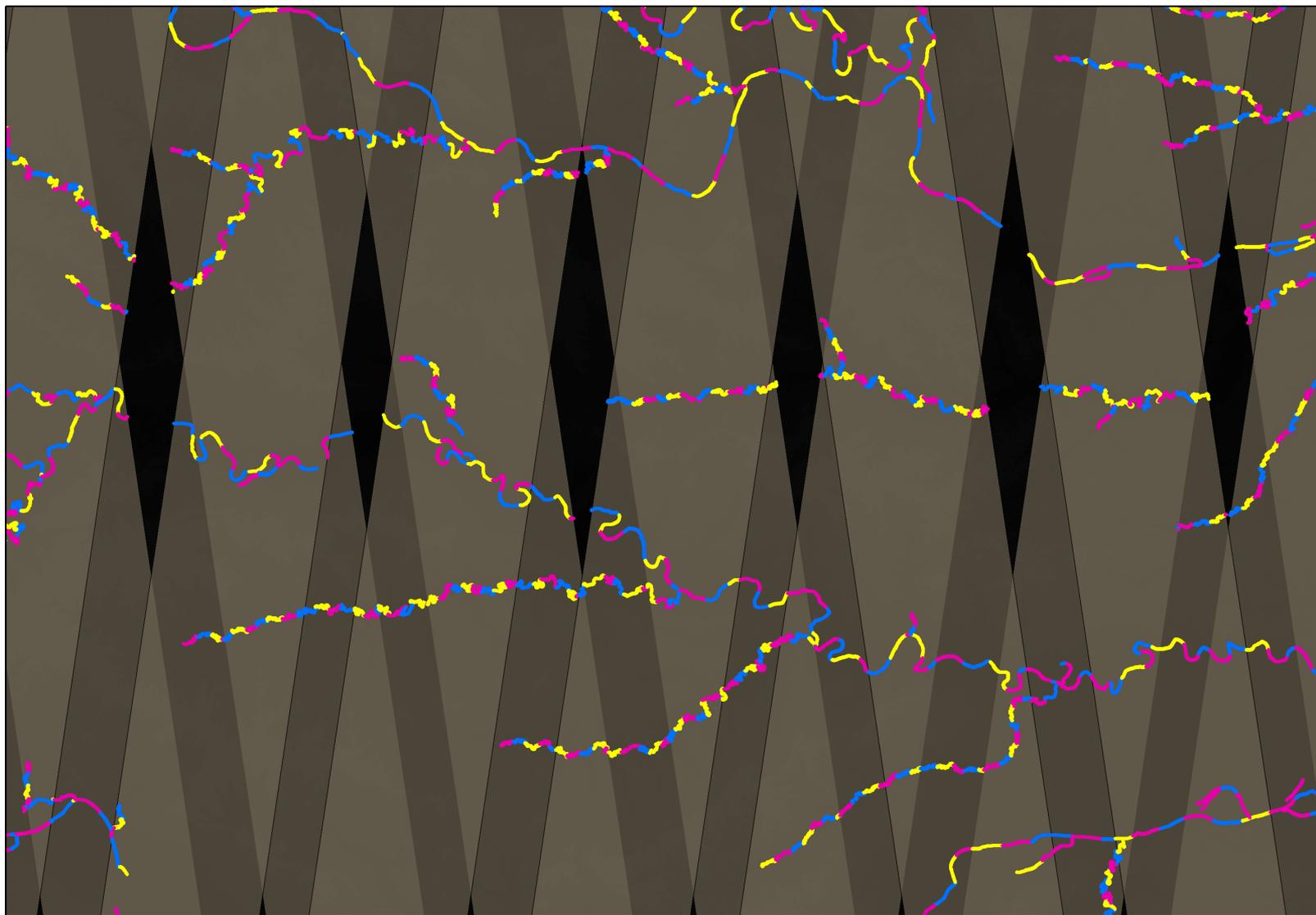
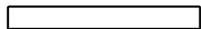
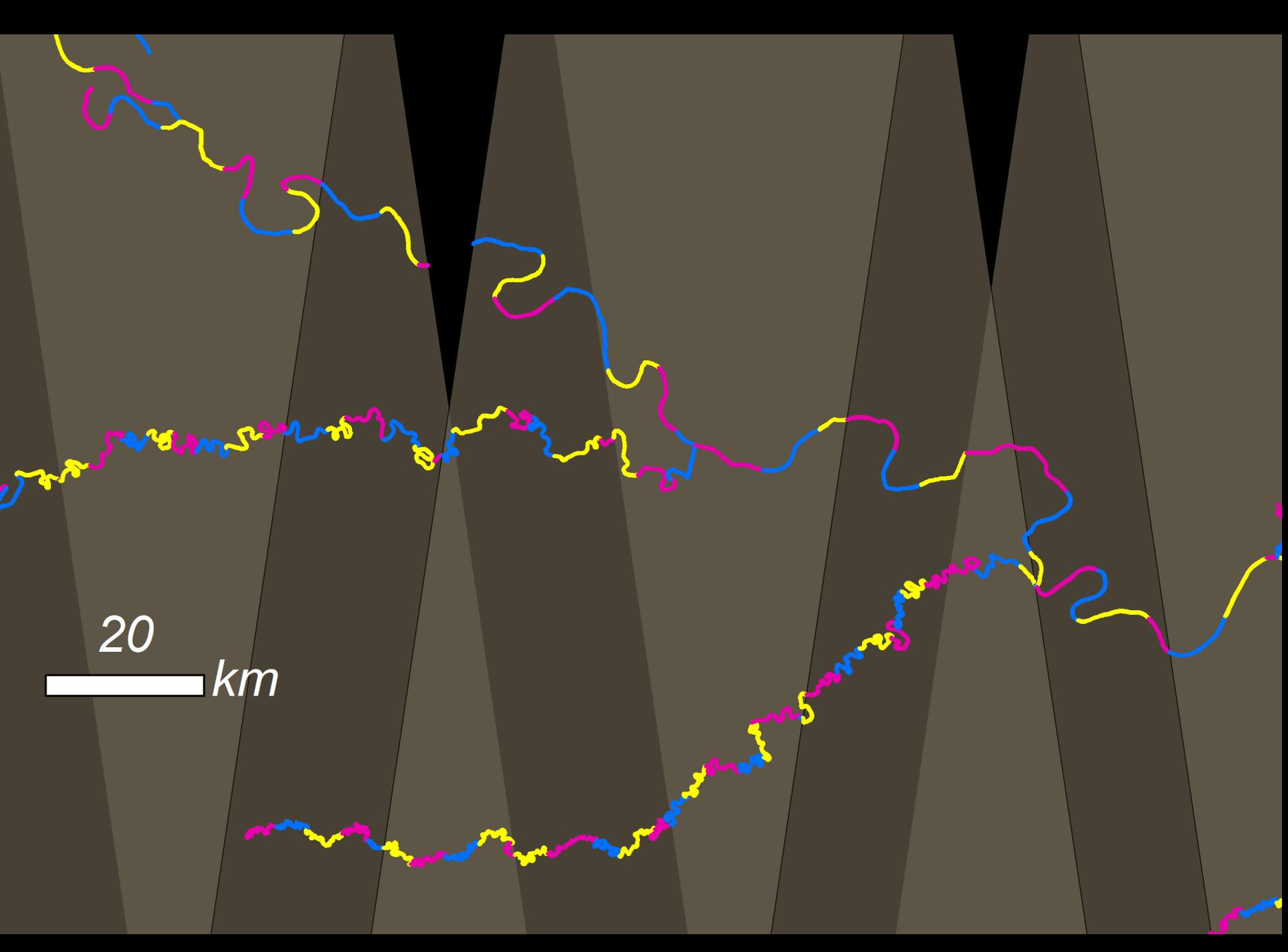
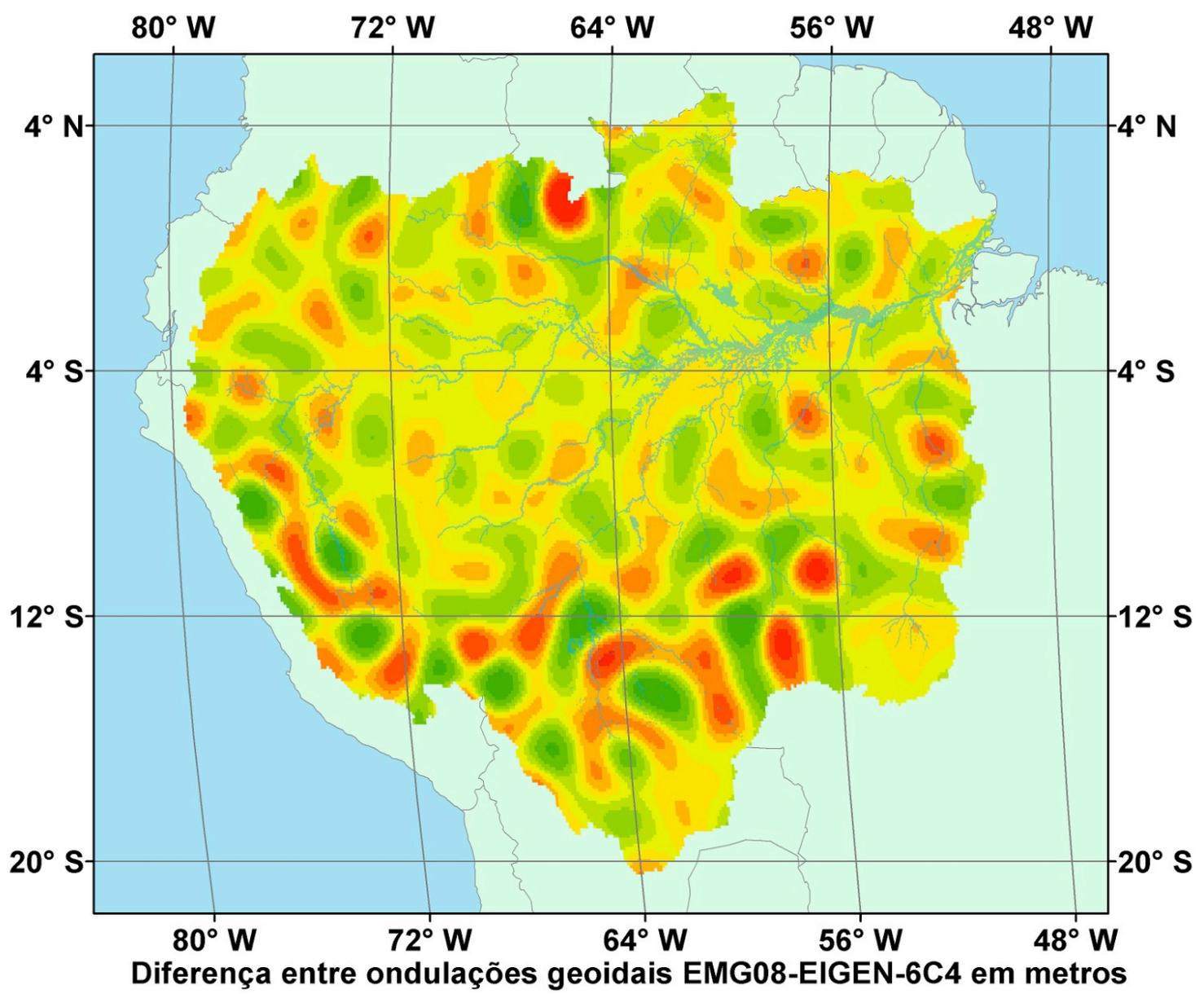


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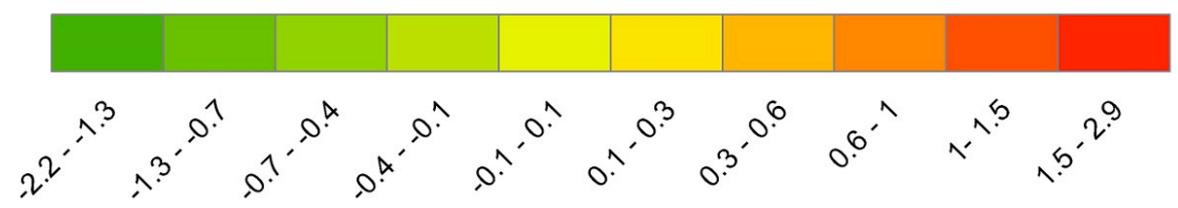


20

km



Diferença entre ondulações geoidais EMG08-EIGEN-6C4 em metros



Priorities Going Forward for Rivers

- Complete North America, Eurasia, Australia
- Discuss with science team members whether alternate reach definitions would be preferable
- Incorporate stream gauge location information
- Complete QA/QC
- Make data & software available to the ST & ADT
- Geoid issues