

# Developing decadal high-resolution global lake products from LDCM and Landsat archive

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# Current Status of Lake Inventory

- ☑ Meybeck (1995) estimation:
  - 1.25 M lakes (>10 ha) in 2.6 M km<sup>2</sup>;
  - 7.2 M lakes (1-10 ha) in 0.2 M km<sup>2</sup>.
- ☑ Downing (2006) projection:
  - 304 million lakes and ponds in 4.2 M km<sup>2</sup>.
- ☑ GLWD (2004):
  - 0.25 M lakes (>10 ha);
- ☑ SWDB (SRTM Waterbody):
  - 0.58 M lakes;
  - 56°S – 60°N;
- ☑ No systematic inventory.

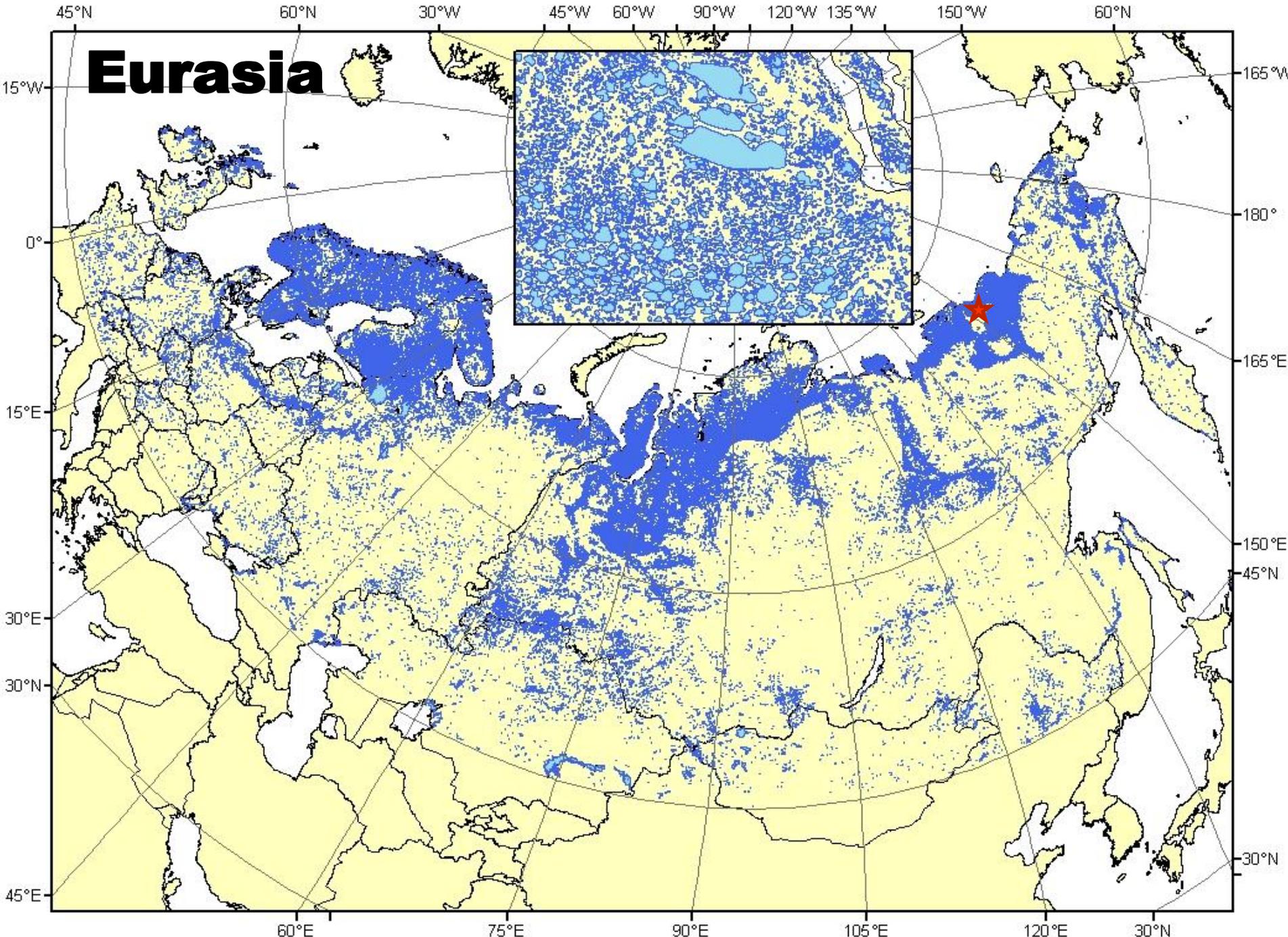
# Objectives

- ☑ To produce decadal high-resolution systematic global lake products using circa 2000 ETM+ and circa 2015 LDCM OLI images, respectively.
- ☑ To assess lake dynamics at global scales;
- ☑ Automated and replicable mapping:
  - Millions of lakes (>1 ha);
  - ~20,000 Landsat scenes acquired at appropriate seasons.

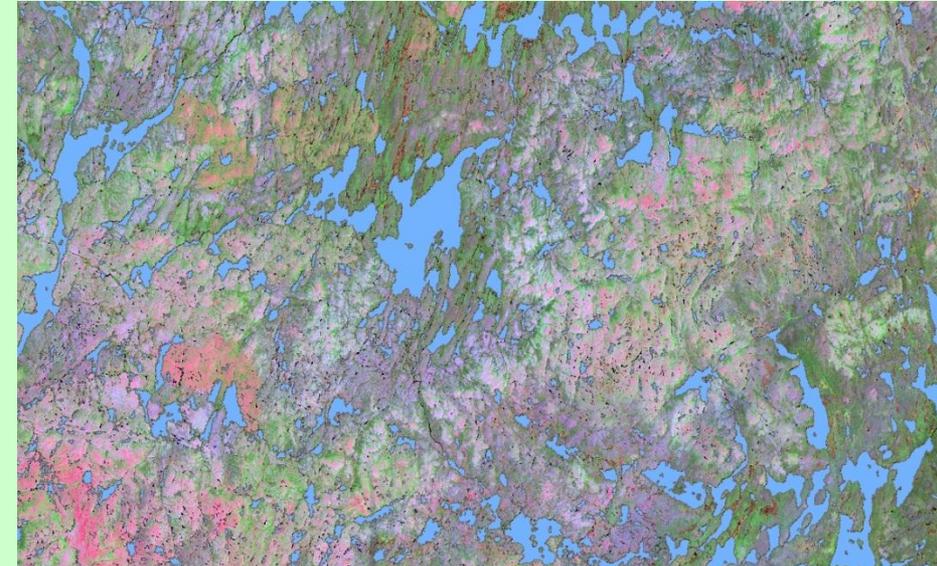
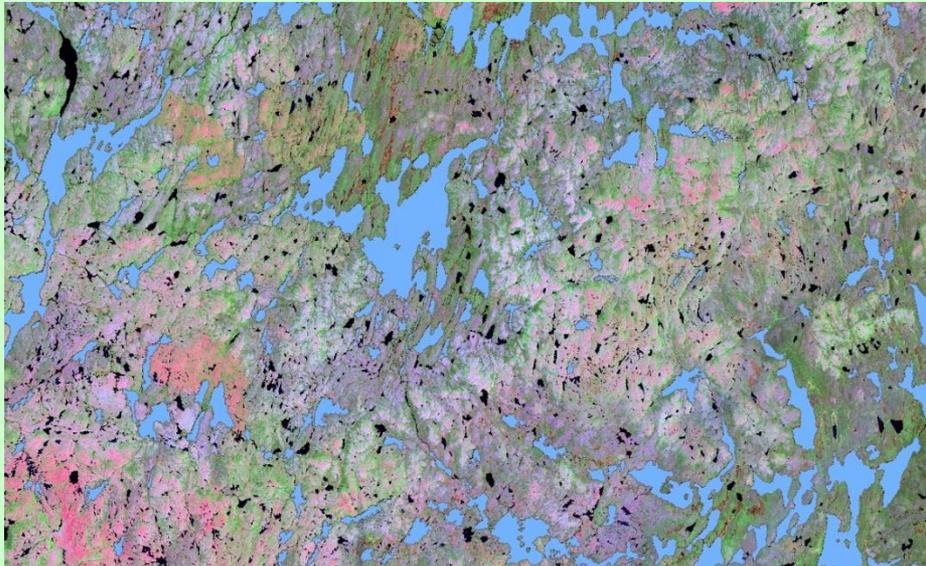
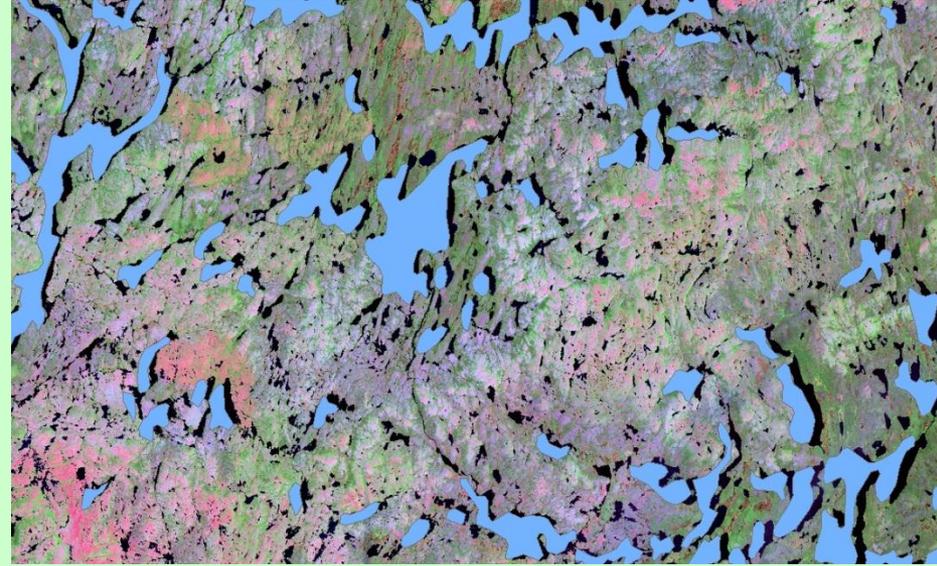
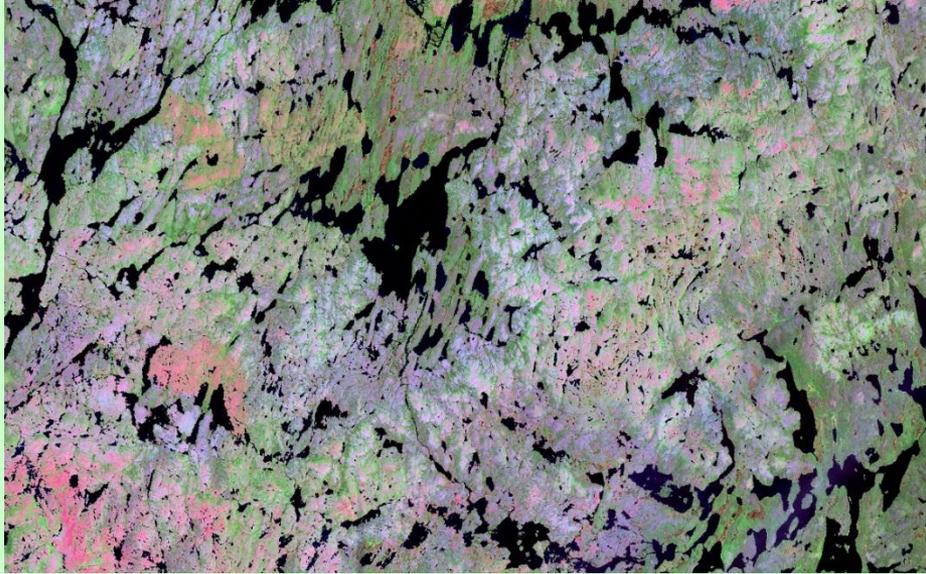
# Previous Accumulation

- ☑ West Siberia (Smith, Sheng et al. 2005)
- ☑ Tibetan Plateau (Sheng and Li, 2012)
- ☑ Himalaya (Li and Sheng, 2012)
- ☑ Pan-Arctic (45°N and north):
  - ~39 M km<sup>2</sup>;
  - 4,000 Landsat scenes;
  - >5 M lakes (>0.5 ha).

# Eurasia



# Quality Comparison



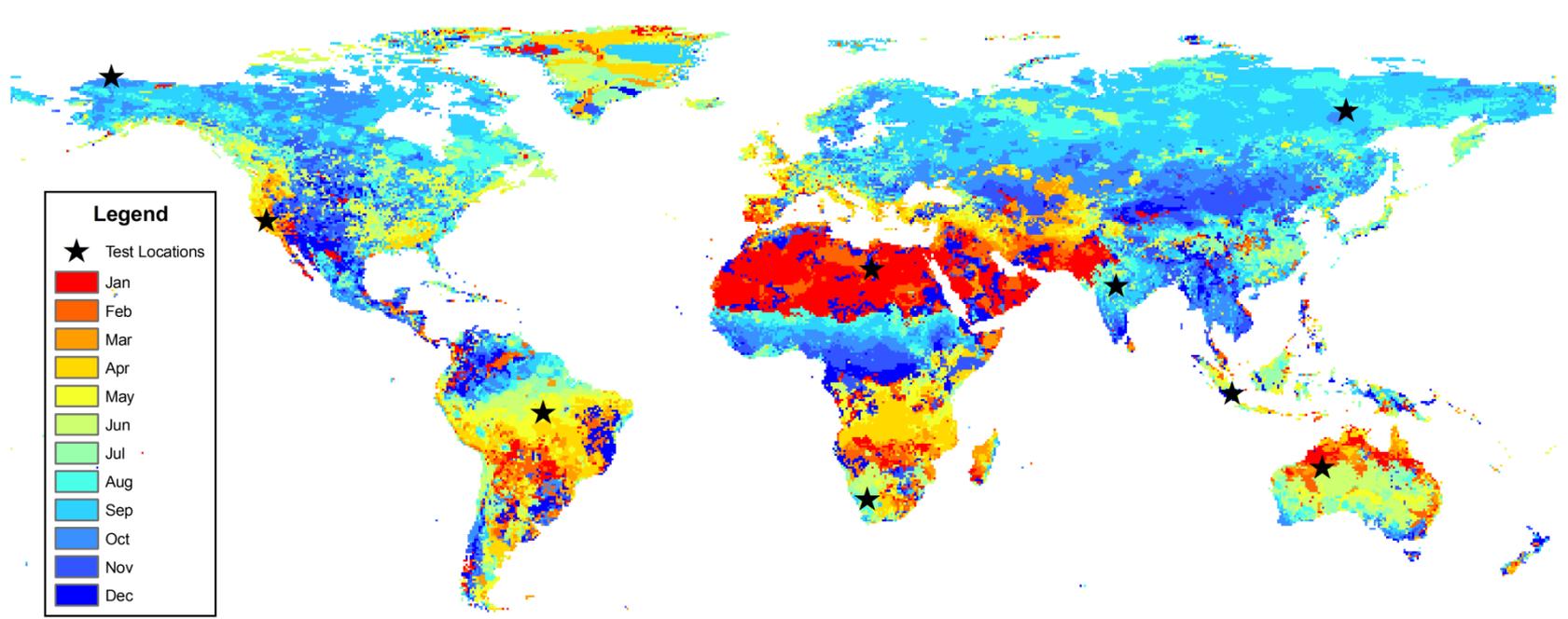
# Challenges to Remote Sensing of Global Lake Dynamics

## ☑ Characteristics of lakes:

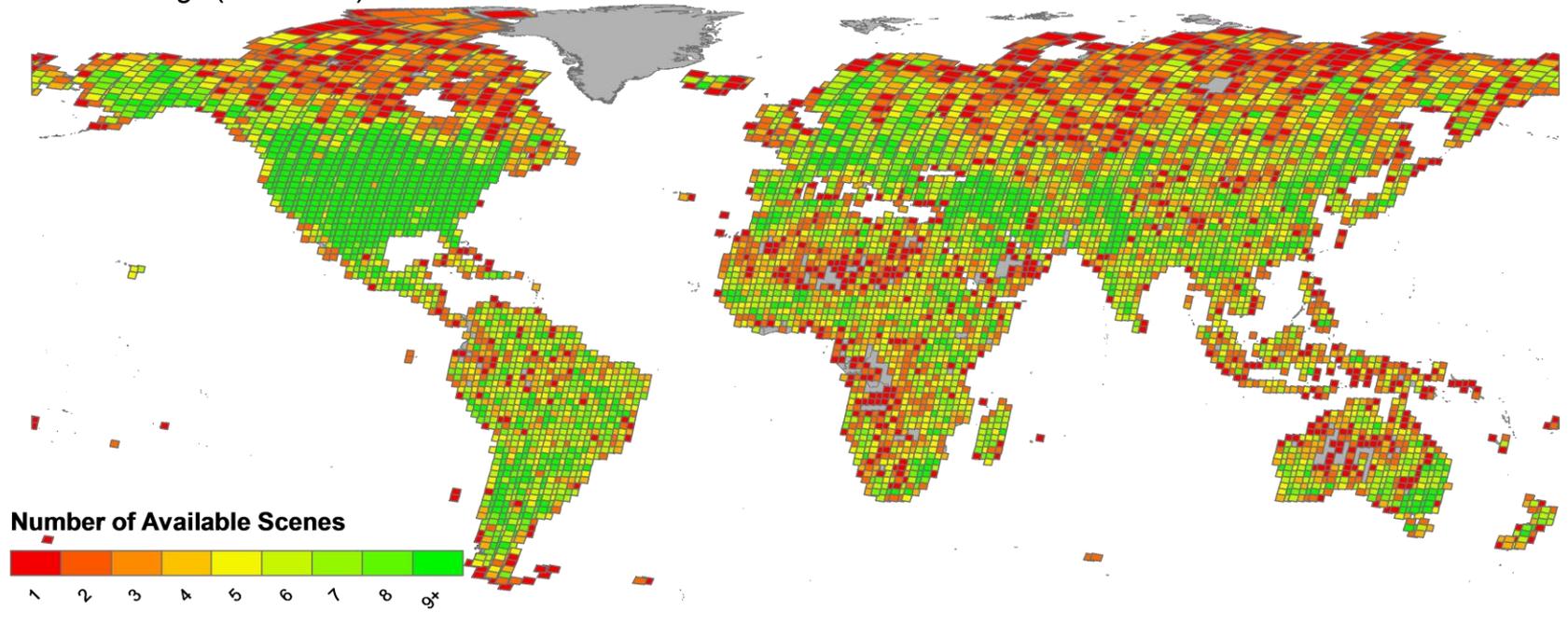
- Abundant in small-size classes;
- Various types of lakes;
- Variant from season to season;
- Stable season variant from region to region.

## ☑ Critical issues:

- Large quantity of high-resolution images!
  - ❖ >8,000 scenes of cloud-free Landsat images.
- Images to be acquired in “appropriate” detection season;
- Robust lake dynamics mapping techniques:
  - ❖ Replicability and Automation!
- QA/QC.

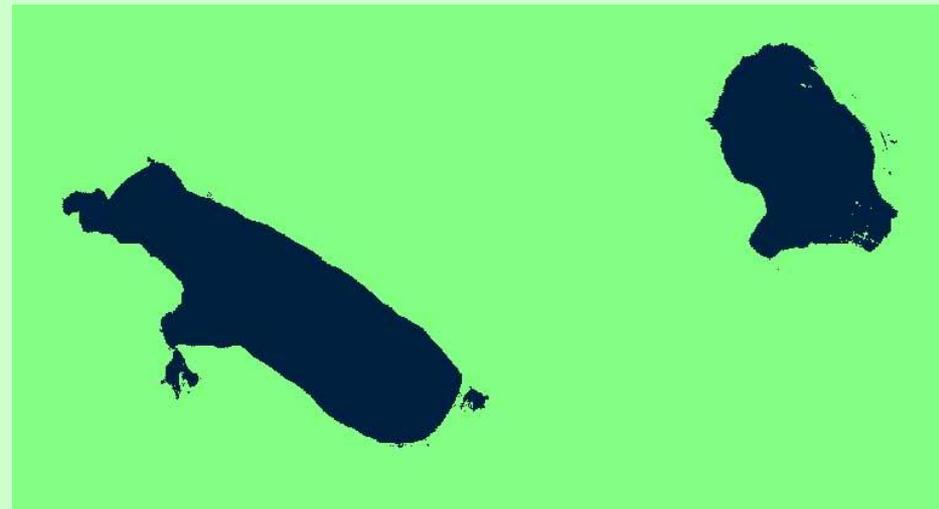
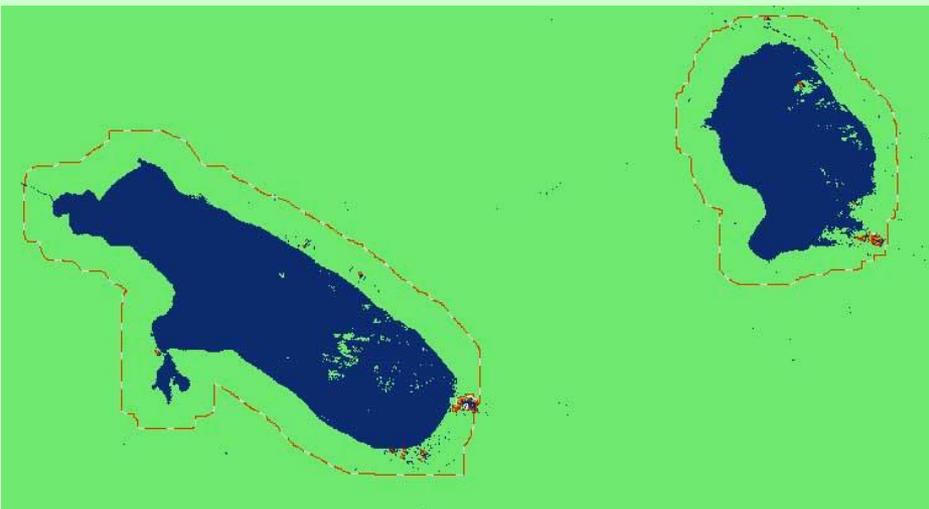
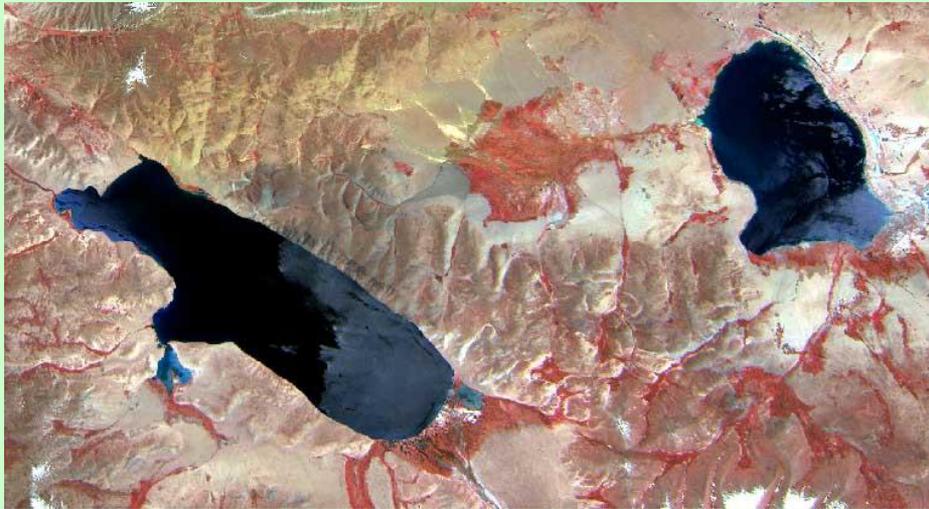


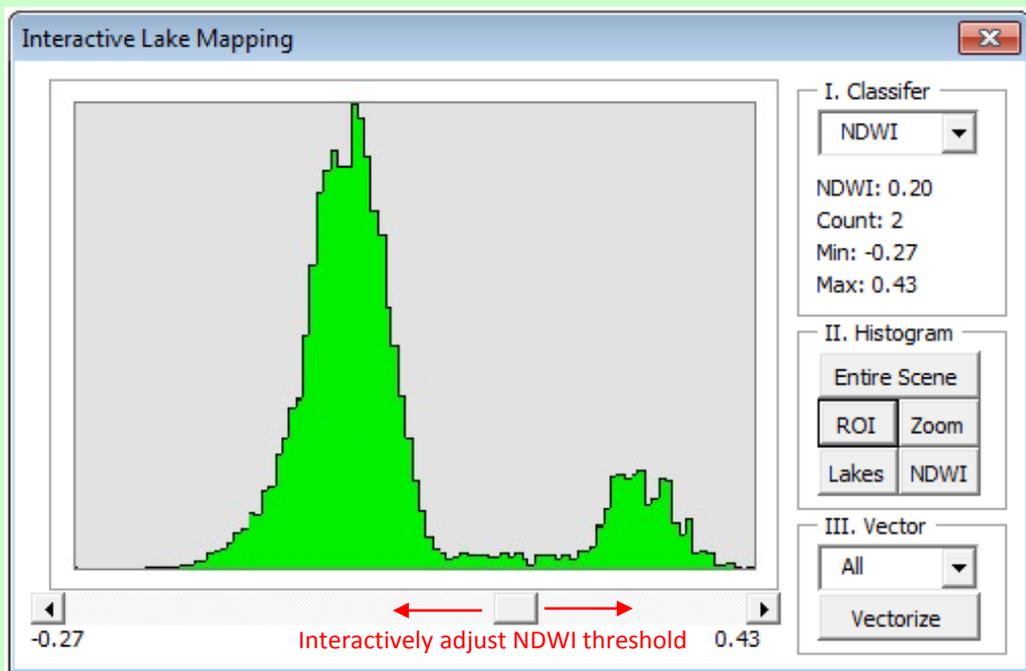
ETM+ Coverage (1999-2002)



# Hierarchical Lake Mapping

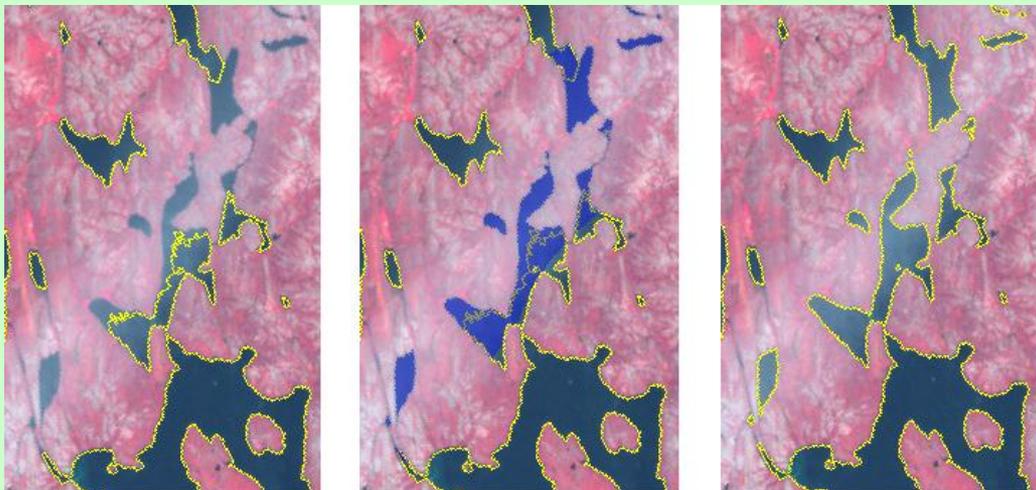
## Tibetan salt lakes





# QA/QC

- Semi-automated tools to reduce labor work.



# Outputs

Global lakes 2000;

Global lakes 2015;

Possible by-products:

- Global rivers 2000 and 2015;

- 2015 ocean shorelines.

# Future Plans

- ☑ RT/Near-RT operational water mask products for next decade's Landsat missions.
  - Robust techniques;
  - 2015 product as the baseline.