

Circa-2015 UCLA global lake database as SWOT a priori lake dataset

Yongwei Sheng

UCLA Department of Geography
ysheng@geog.ucla.edu

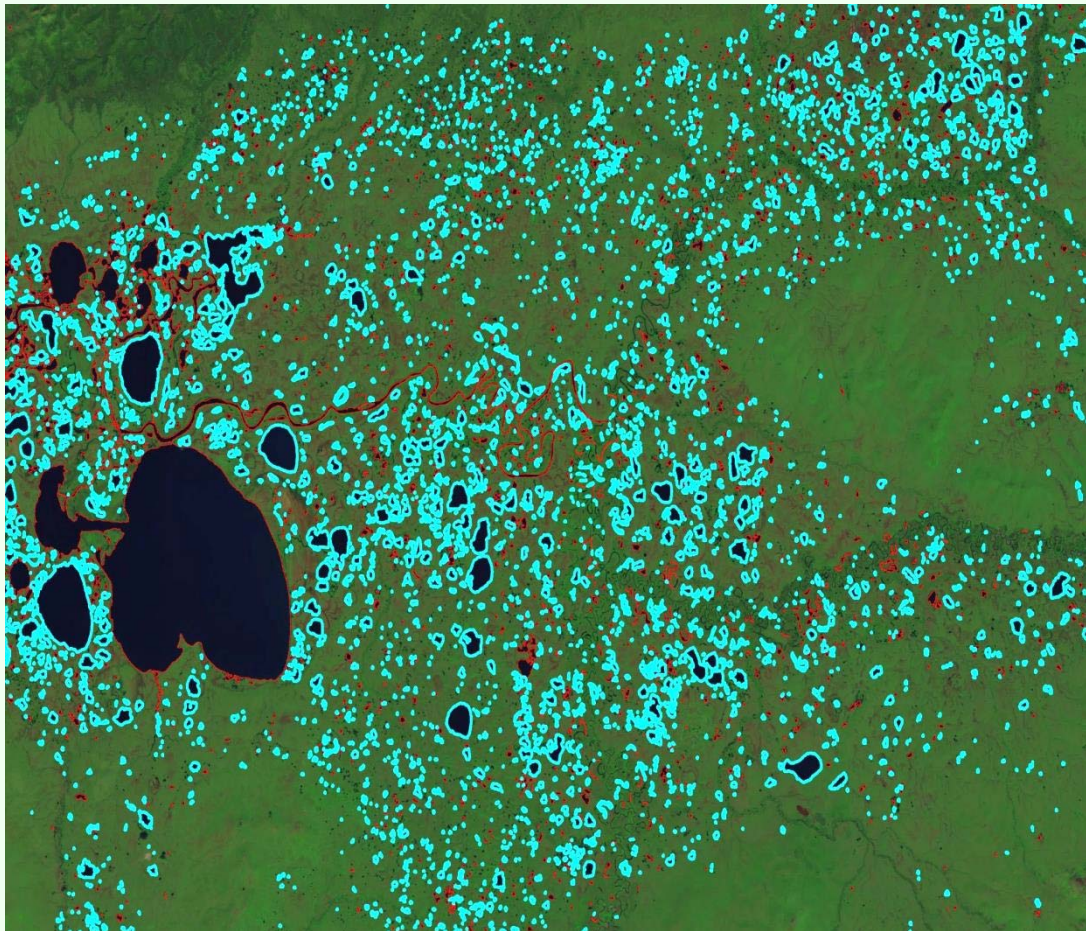
Circa-2015 Lake Mapping

- ☑ Using satellite big data:
- ☑ ~60,000 Circa-2015 Landsat scenes;
- ☑ Acquired at appropriate seasons.
- ☑ Millions of lakes (> 0.5 ha);

Two Emphasizes in Lake Database Production

- ☑ Representativeness;
- ☑ Reducing workload in QA/QC.

Earth's lakes mapped twice in Circa-2000



- Images acquired at stable seasons;
- Automated QA;
- Semi-automated QC.

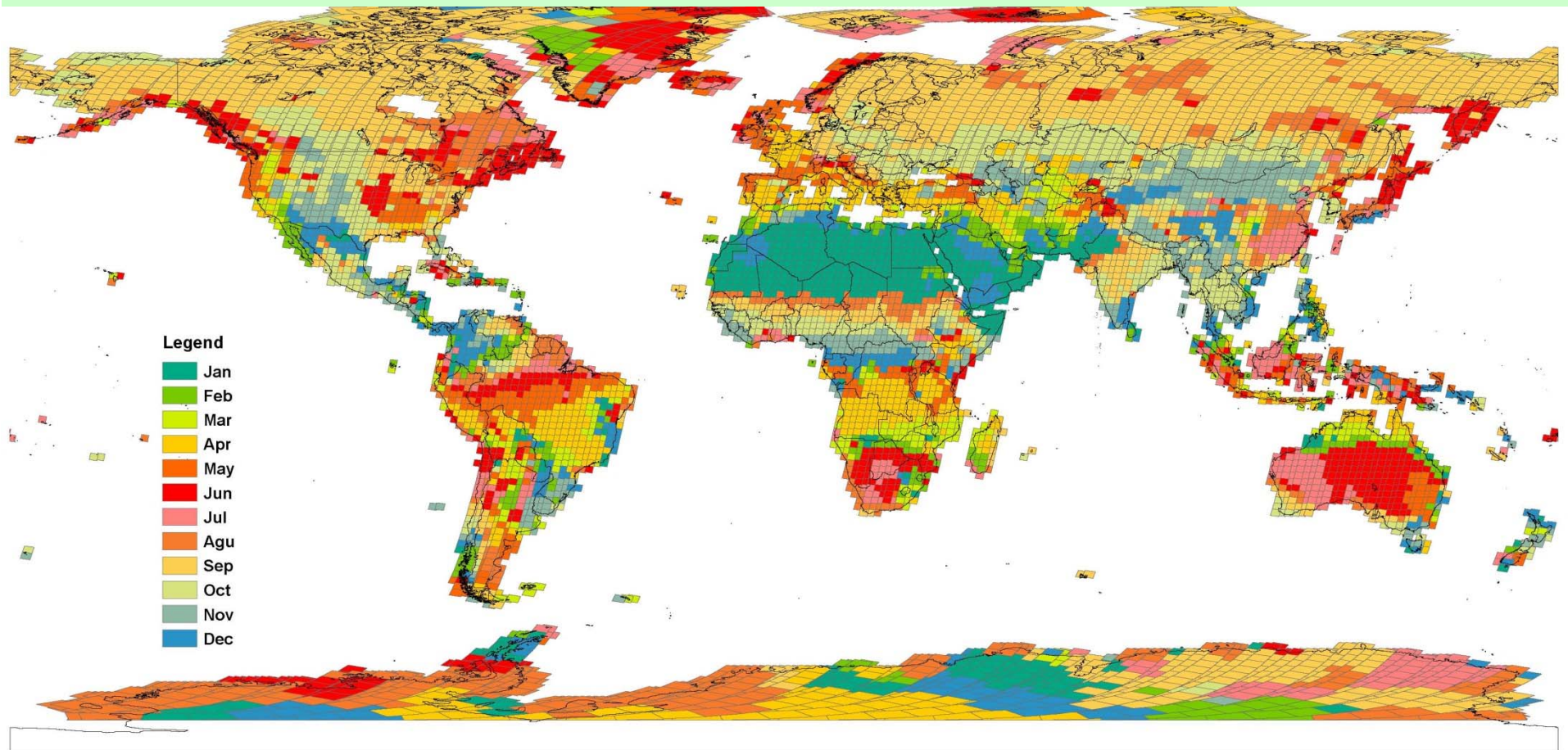
Circa-2015 Representative Lake Mapping

- ☑ Stable season!

- ☑ How to reduce seasonal variability?
- ☑ How to produce representative lake maps?

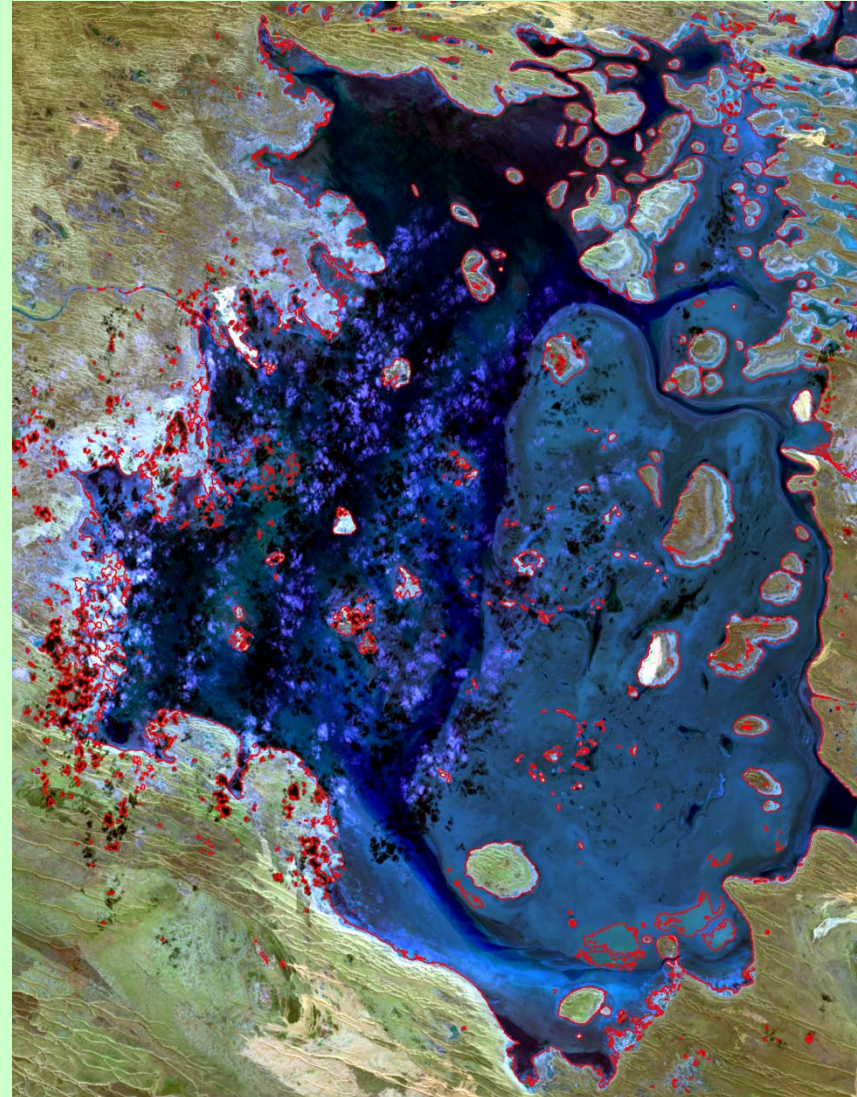
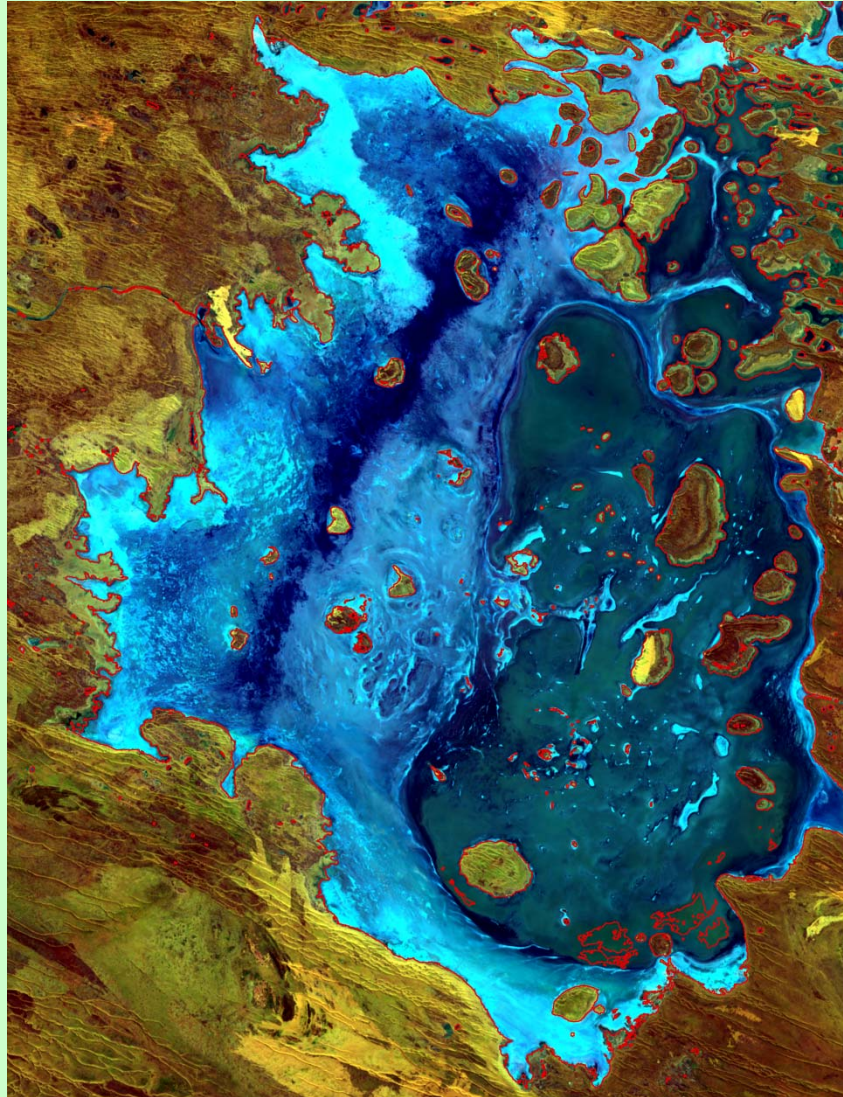
- ☑ Multi-temporal approach (*Sheng et al, 2016*):
 - To address seasonal variability;
 - To produce representative lake maps;
 - To automate QA with minimal labor work.

Image Acquisition during Stable Seasons



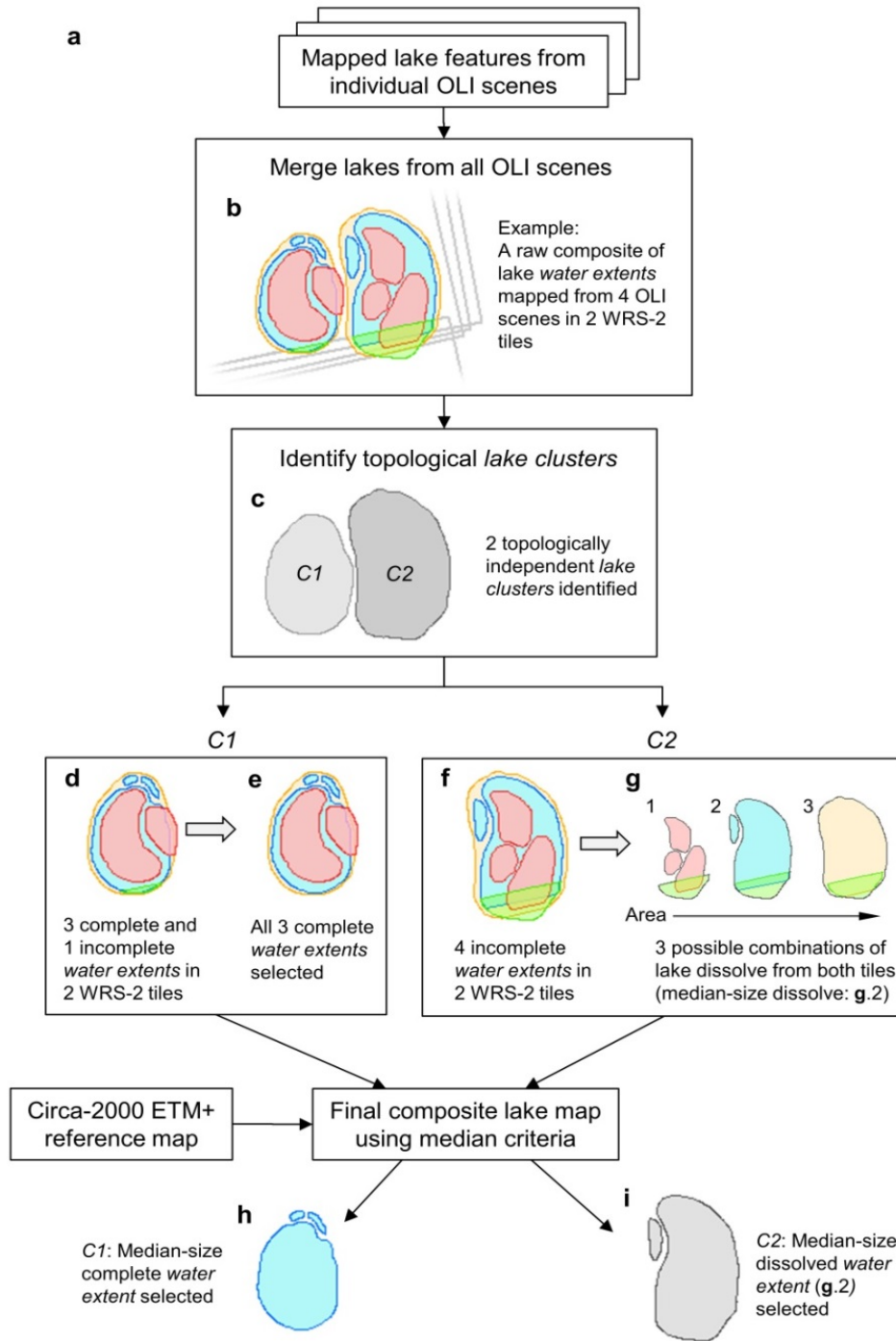
(Lyons and Sheng, 2018)

Lake Disappointment

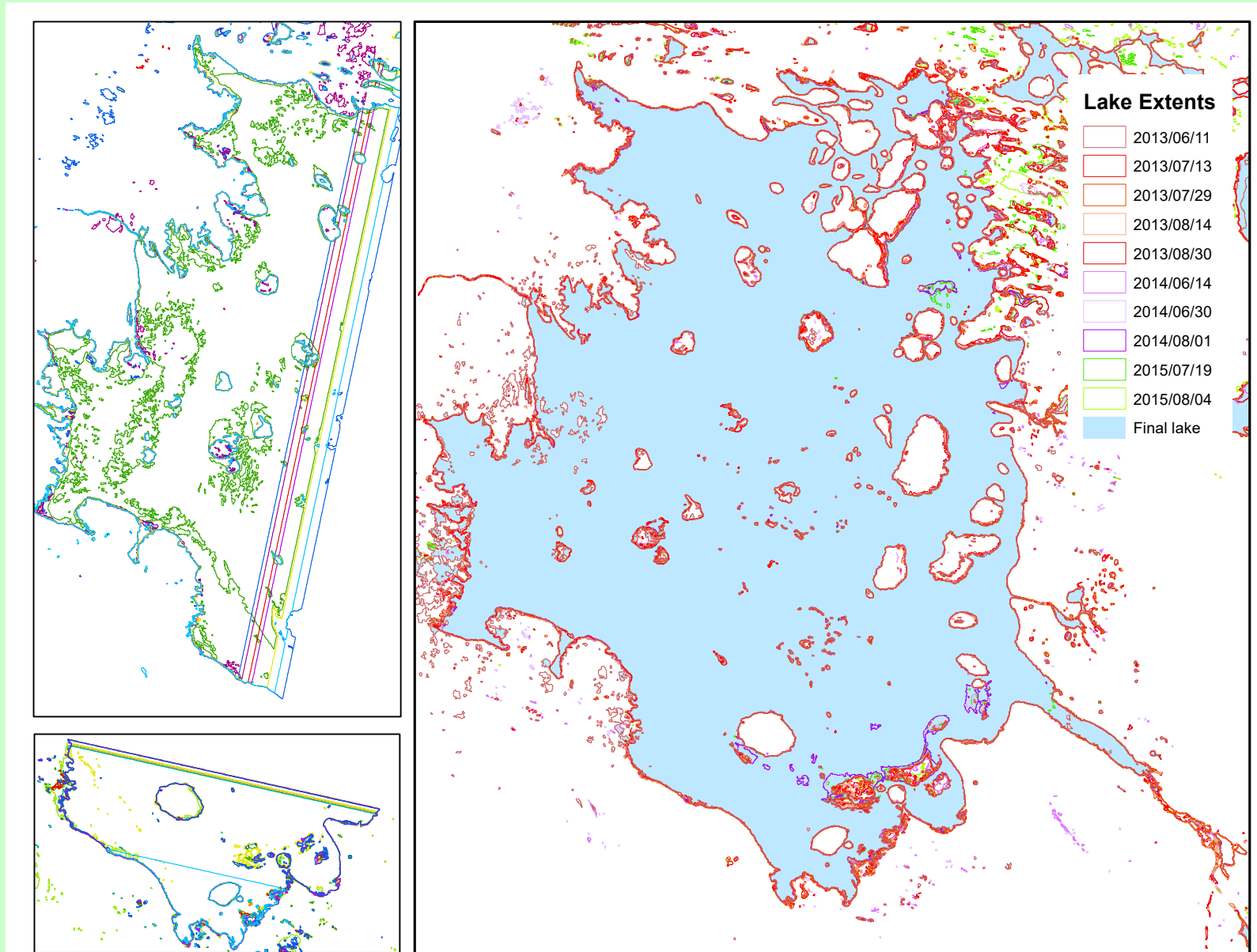


Lake composition method from multi-temporal images

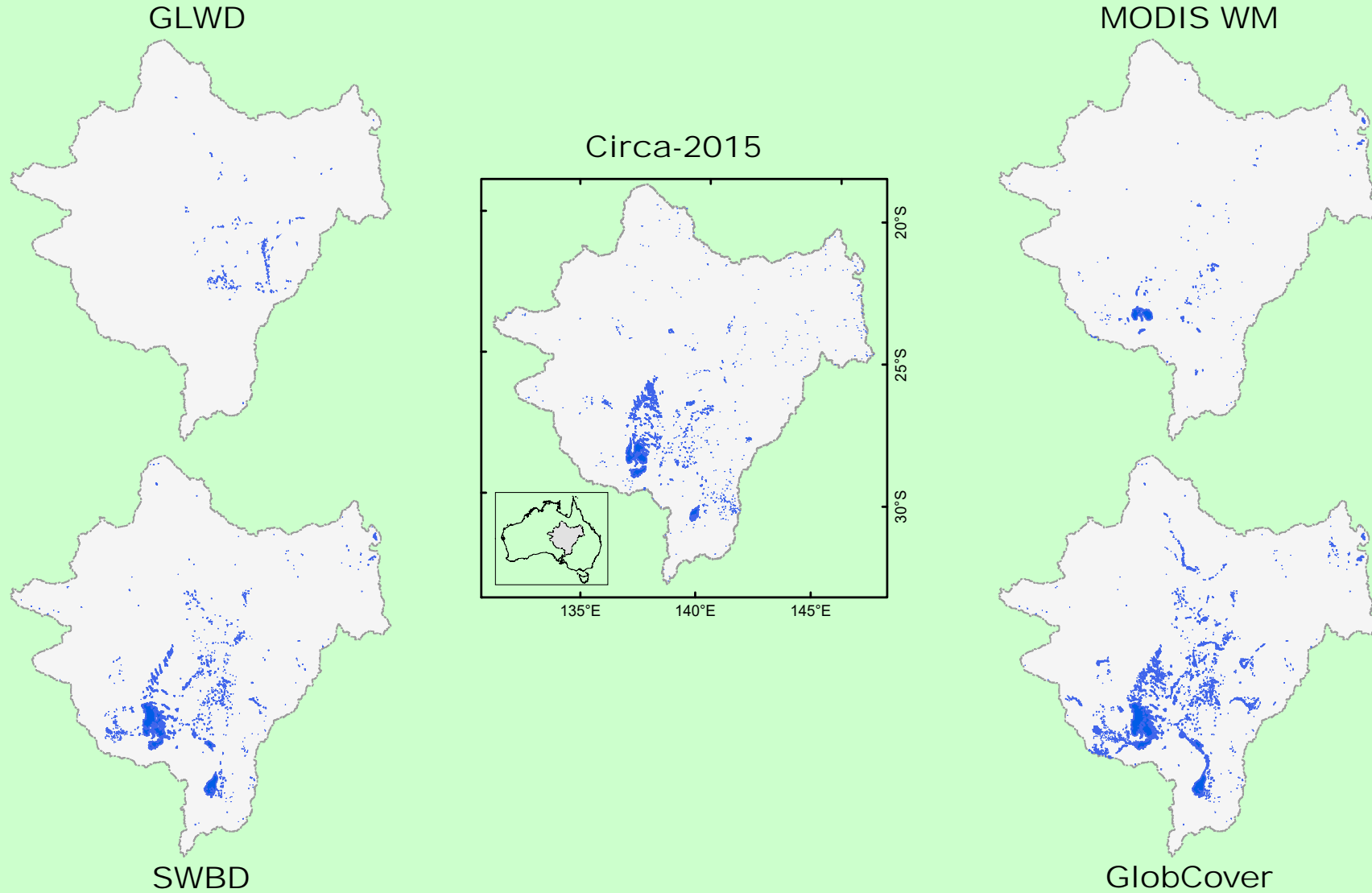
- Spatial link lake clusters;
- Half lakes;
- $m : n$.



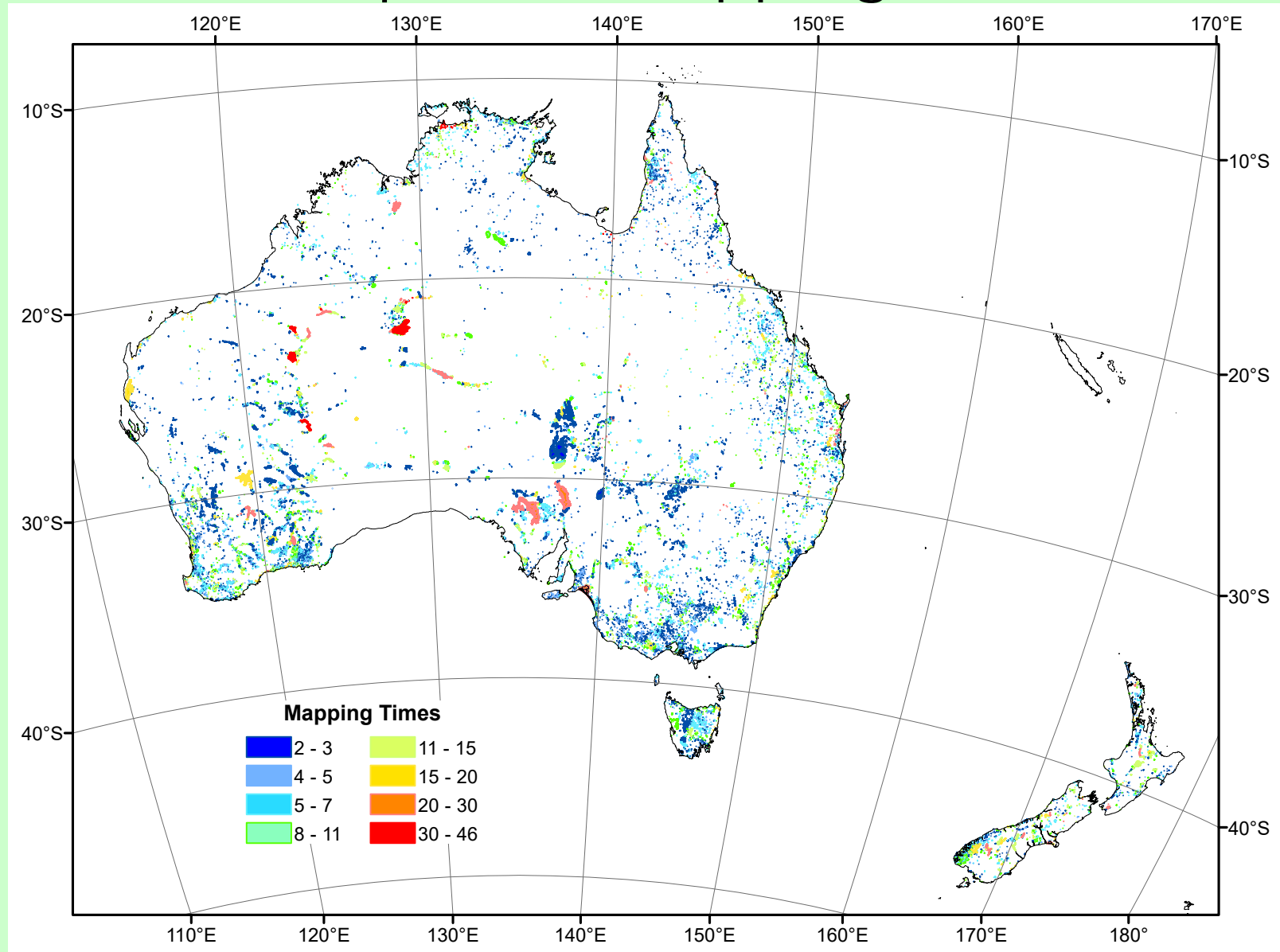
Lake composition example



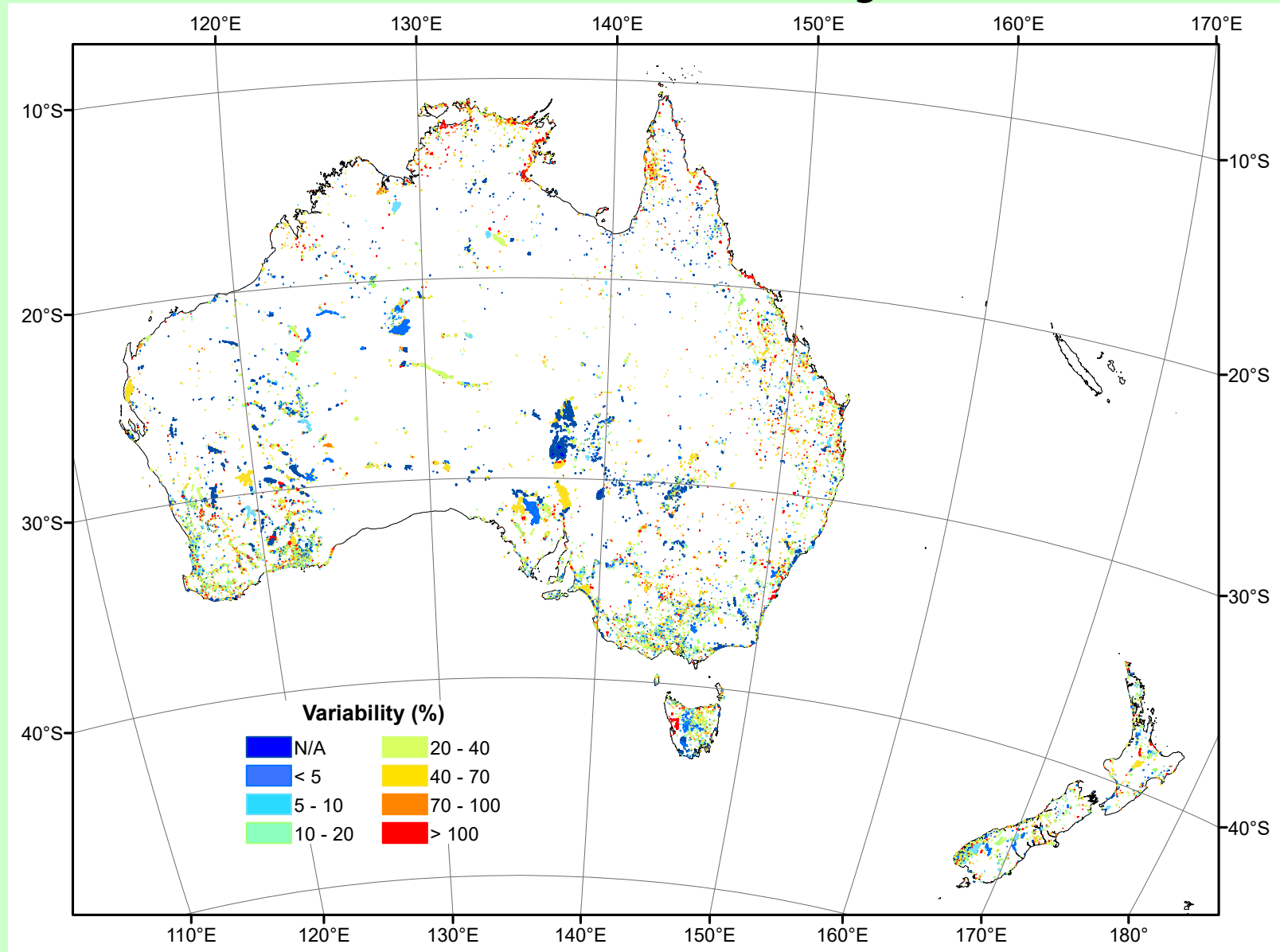
Comparisons for Lake Eyre Basin



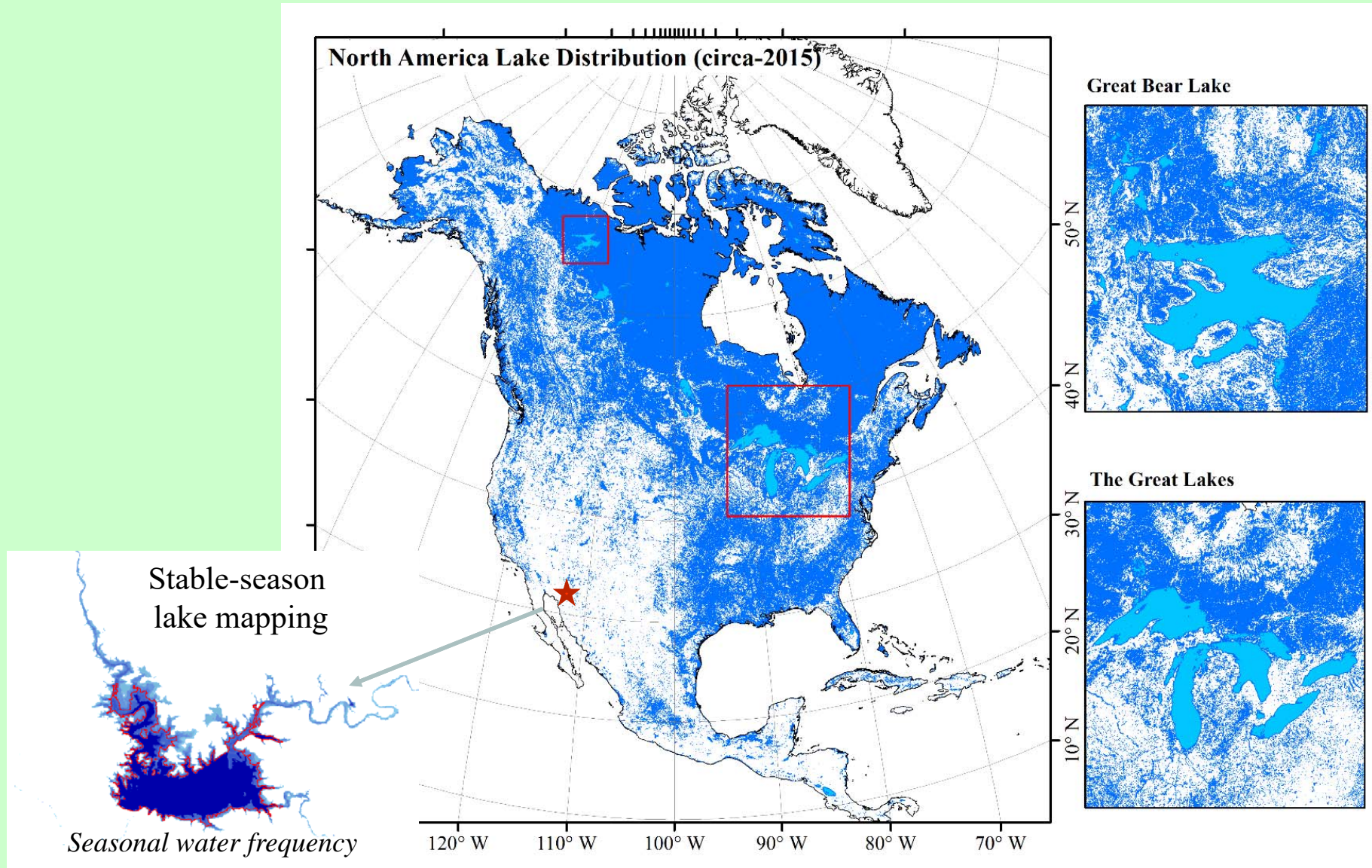
Lake-specific Mapping Times



Lake Variability



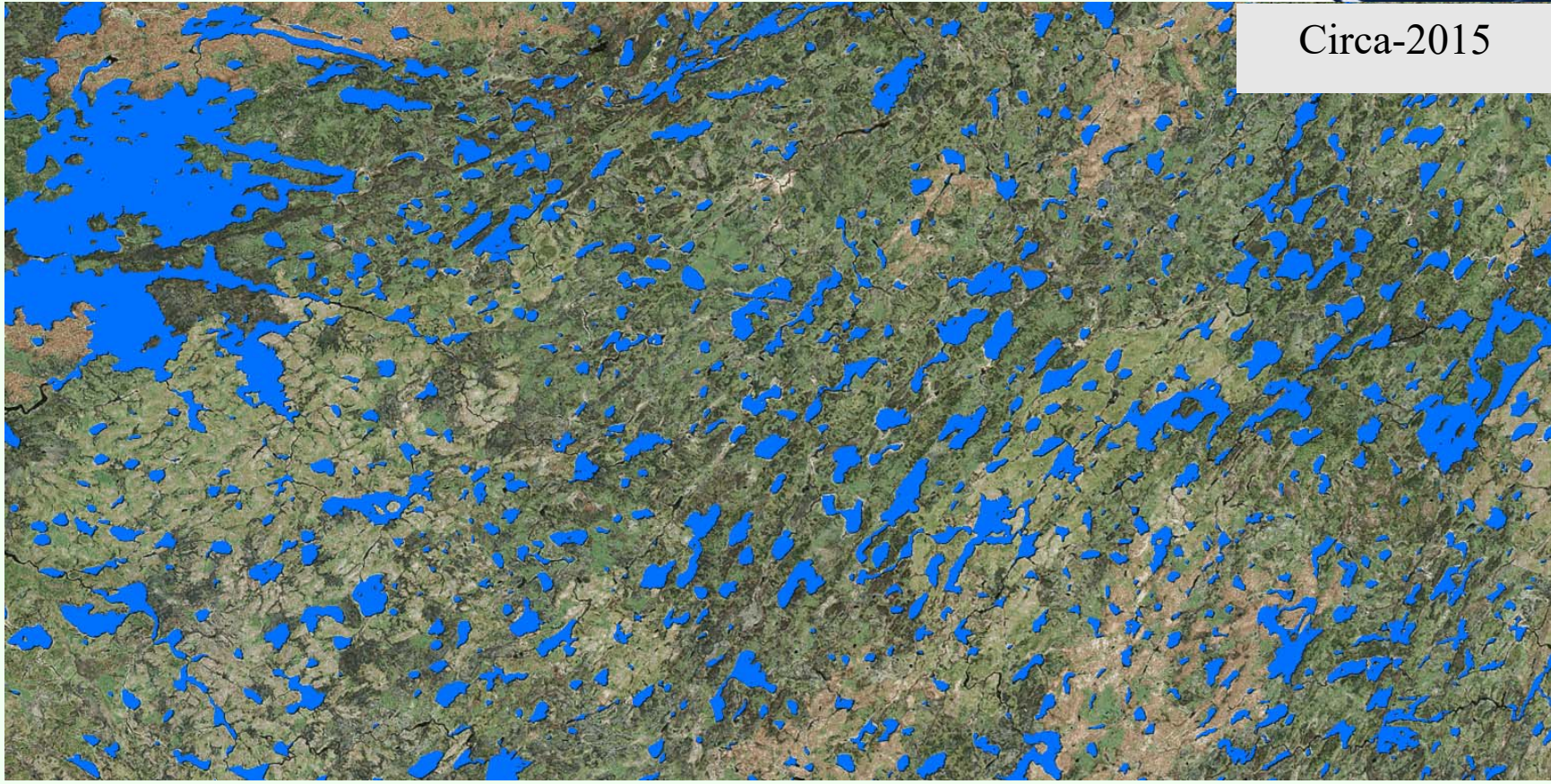
Circa-2015 Global Lake Database (North America)



Comparison of Circa-2000, Circa-2015 with GLWD and SWBD Data Sets



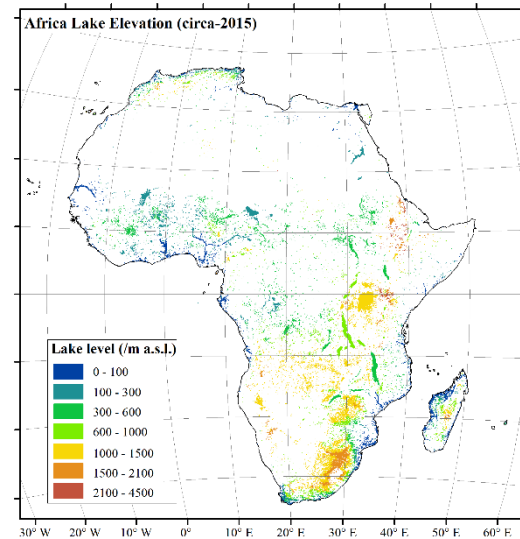
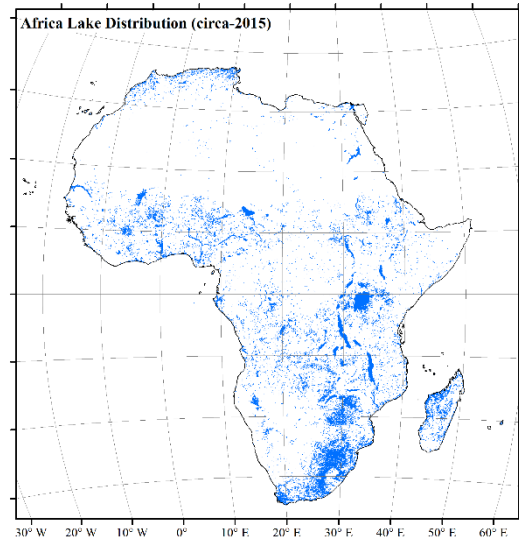
Circa-2015



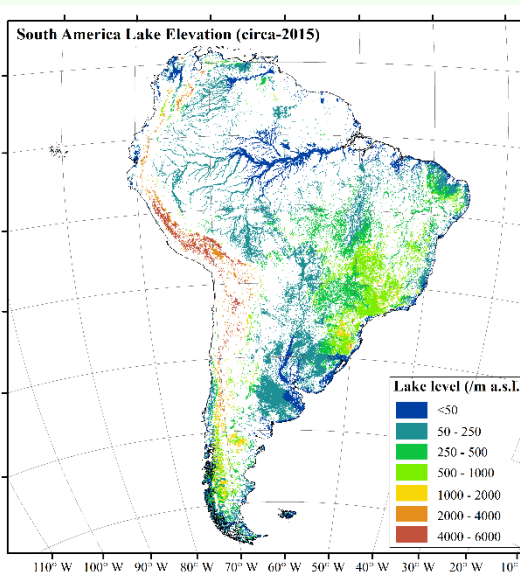
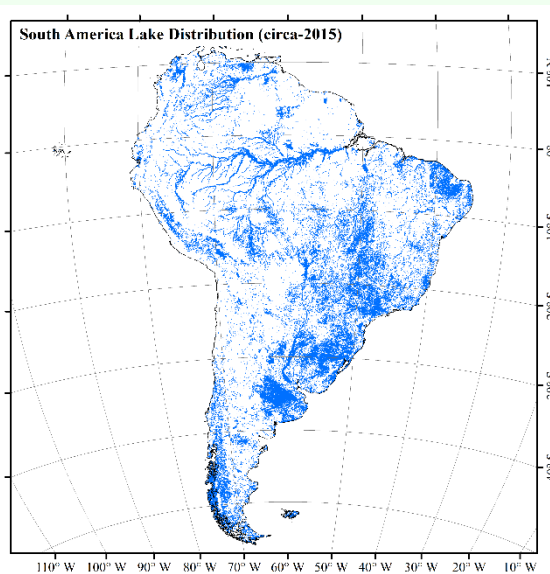
Lake size distribution for each continent

Size class (km ²)	Africa	Oceania	Europe	Asia	N America	S America	Global
< 10 ⁻²	47,935	25,948	232,747	971,910	1,660,702	189,449	3,128,691
10 ⁻² - 10 ⁻¹	60,710	35,848	368,523	1,267,110	2,682,153	192,267	4,606,611
10 ⁻¹ - 10 ⁰	14,238	10,965	102,461	329,141	731,764	52,336	1,240,905
10 ⁰ - 10 ¹	2,559	2,200	14,336	38,288	88,858	7,900	154,141
10 ¹ - 10 ²	451	451	1,520	3,132	7125	905	13,584
10 ² - 10 ³	96	73	147	368	628	144	1,456
10 ³ - 10 ⁴	21	11	16	45	57	24	174
> 10 ⁴	3	0	1	4	8	0	16
Total	126,013	75,496	719,751	2,609,998	5,171,295	443,025	9,145,578

Circa-2015 global lake database

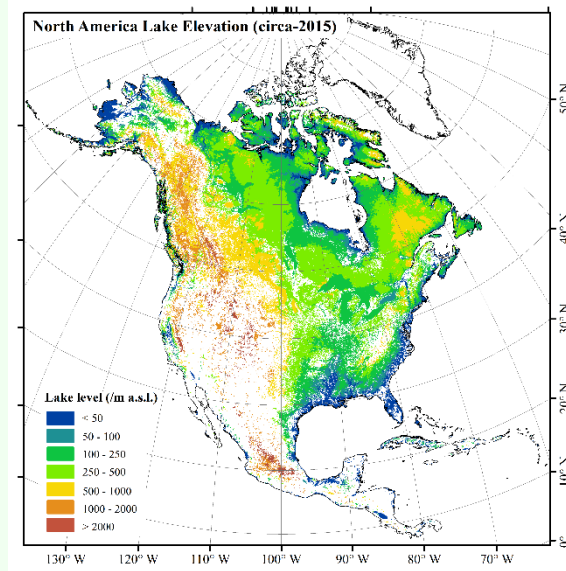
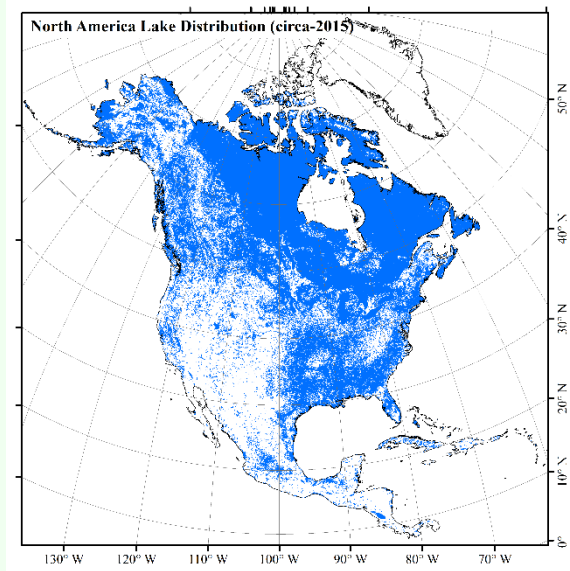


Africa

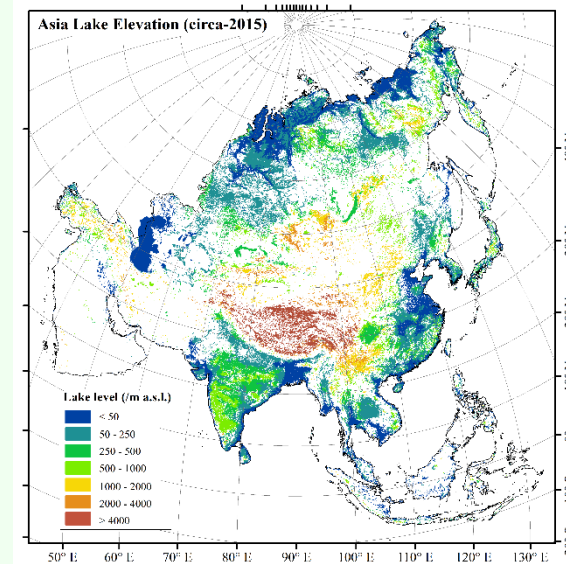
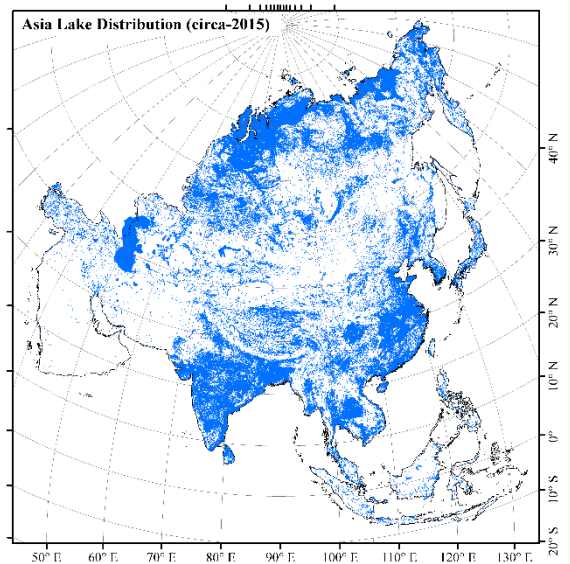


South America

Circa-2015 global lake database (Asia)



North America



Asia

Continental Statistics of Lake-River Overlaps

Continents	Rivers			Lakes			Overlapped Lake/River
	Total #	Overlap #	%	Total #	Overlap #	%	
Africa	3,127	765	24%	126,013	904	0.72%	1.18
Asia	20,574	5,015	24%	2,566,446	9,341	0.36%	1.86
Europe	3,588	1,458	40%	719,751	3,477	0.48%	2.38
N. America	6,511	3,720	57%	5,171,245	5,817	0.11%	1.56
S. America	7,044	2,397	34%	433,209	3,575	0.8%	1.49
Oceania	697	130	19%	75,496	188	0.24%	1.44
Global	41,541	31,485	32%	9,092,160	23,302	0.26%	1.73

Overlap mainly with reservoirs

