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Upscaling Water Body Size Distributions

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Water Bodies in the Arctic

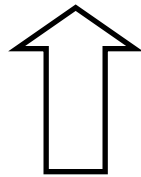
- general distinction of ponds vs. lakes: ponds are water bodies with a surface area less than 100x100m
- ponds and small lakes are not inventoried on the pan-arctic scale and not implemented in large-scale models
- eg 40% of the CO₂ emissions on Samoylov Island originates from ponds (Abnizova et al. 2012)

Samoylov Island, Lena Delta, Siberia

Upscaling From Local Snapshots To Regional Estimates

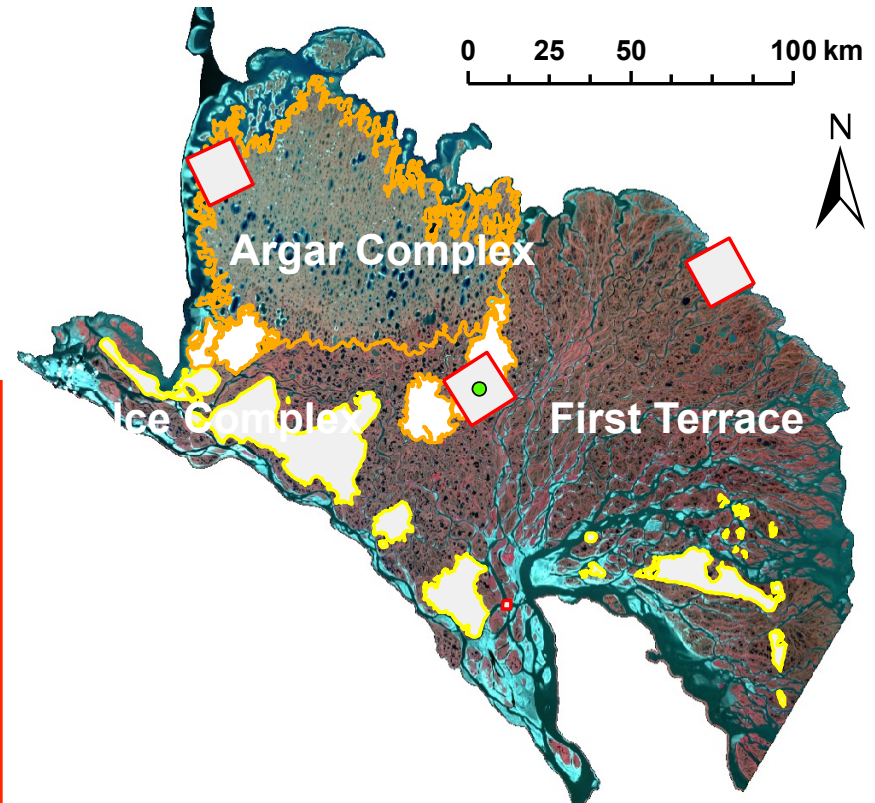
regional
fraction of
water surface

regional size
distribution



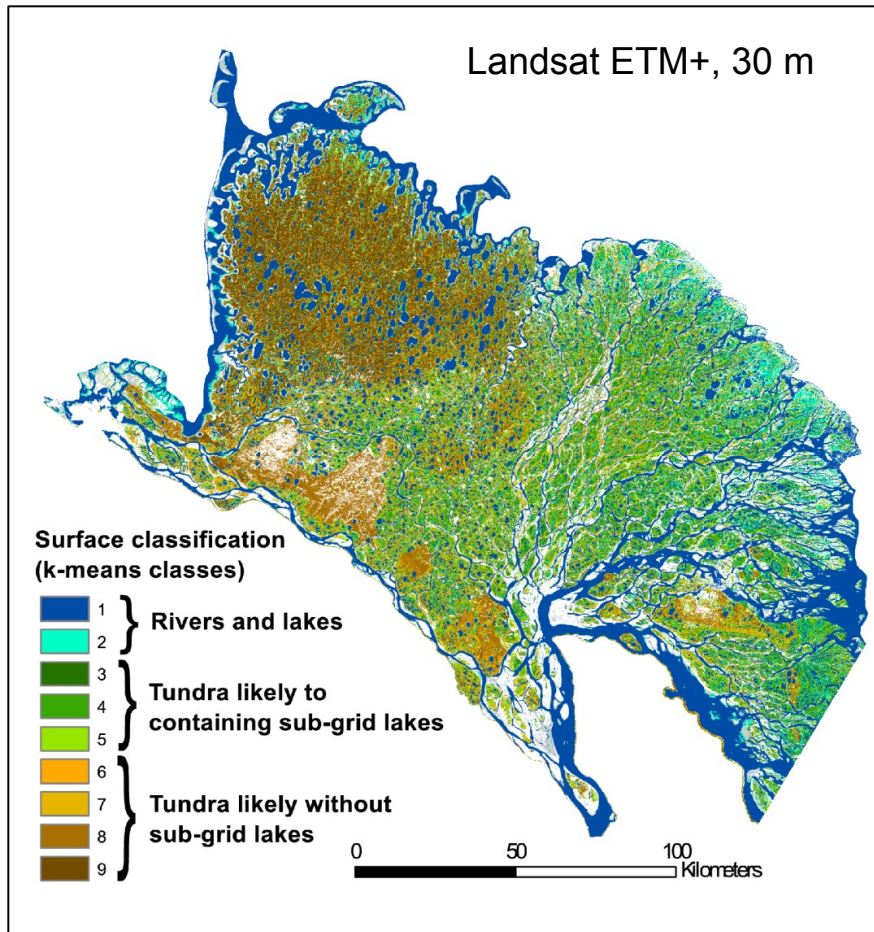
High-resolution data sets

- distinct geological & geomorphological units
- Kompsat-2 with 4 m resolution
- TerraSAR-X with 3 m resolution
- Aerial imagery with 0.3 m resolution



Lena Delta, Siberia, Russia

Subpixel Fraction Of Water Surface Area



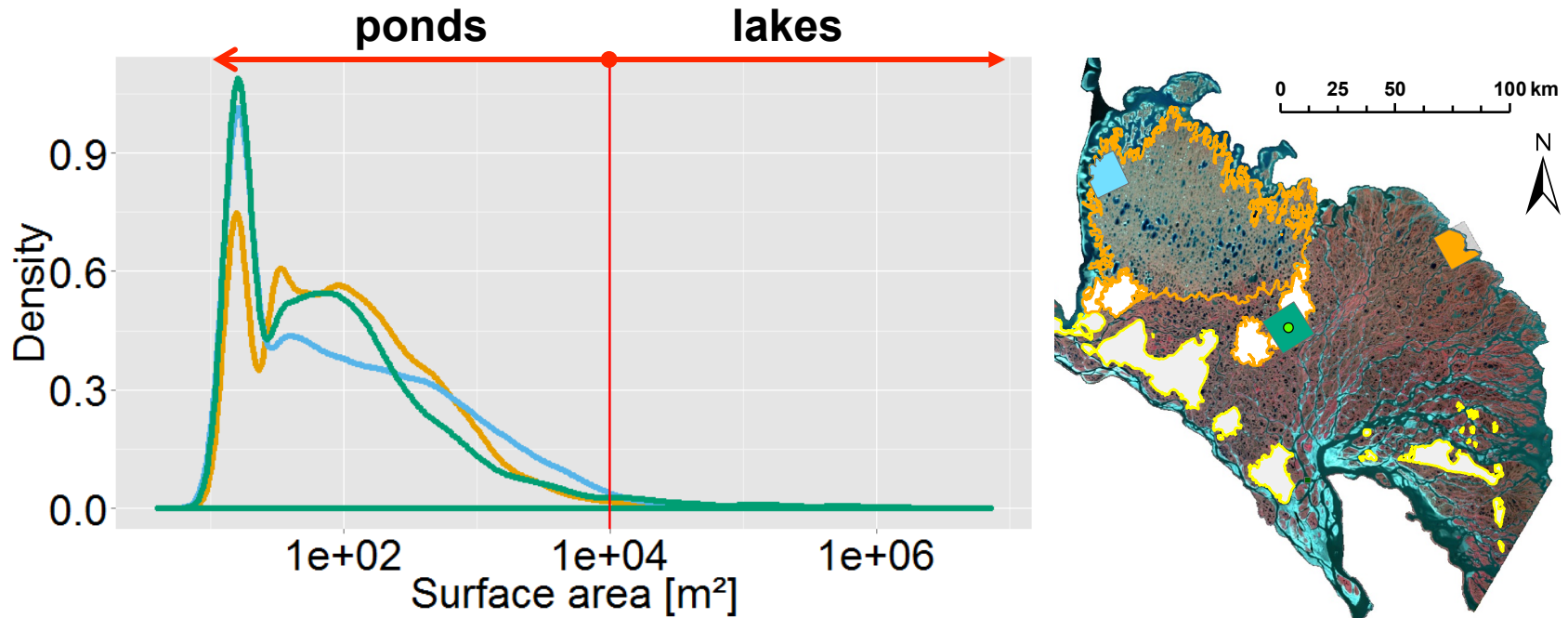
Landsat underestimates water surface area about 30%

Resolution of 4 m or better necessary to detect ponds

Subpixel land/water fraction is related to the Landsat albedo

Muster et al. 2012, Tellus B & Muster et al. 2013, Remote Sensing PANGAEA doi:10.1594/PANGAEA.786926

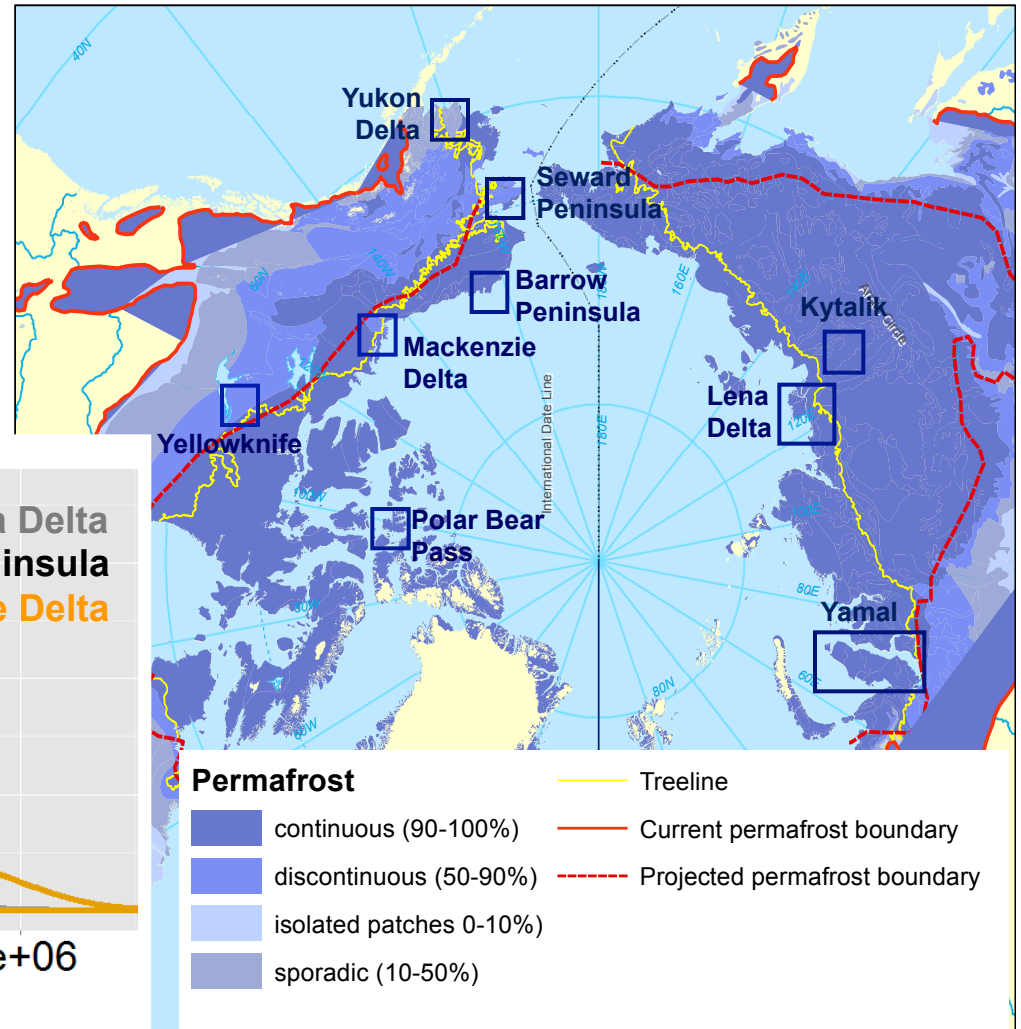
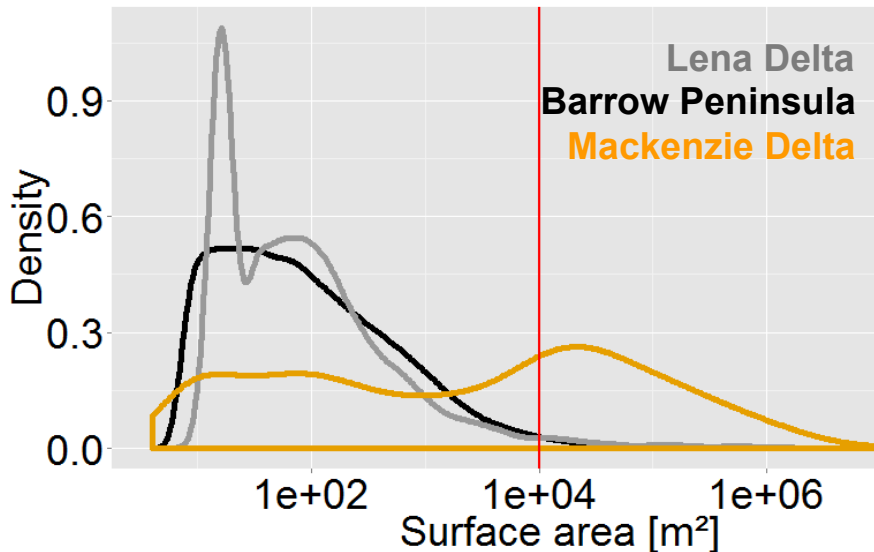
Size Distributions In Different Subregions



- Over 90% of the number of water bodies are smaller than 100x100m
 - similar probability density functions (pdf) across region
- Definition of regional pdf with mean, skew, standard variation & uncertainty

Outlook: Circum-Arctic Inventory

Probability density functions are **landscape-specific**



Future requirements

- baseline high-resolution water body map (Tandem-X)
- summer baseline (**VIS/NIR/SWIR**) product on the scale of Landsat (**30 m resolution or better**) with **pan-arctic coverage in regular intervals** (a few years) to monitor long-term changes

Thank you!



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