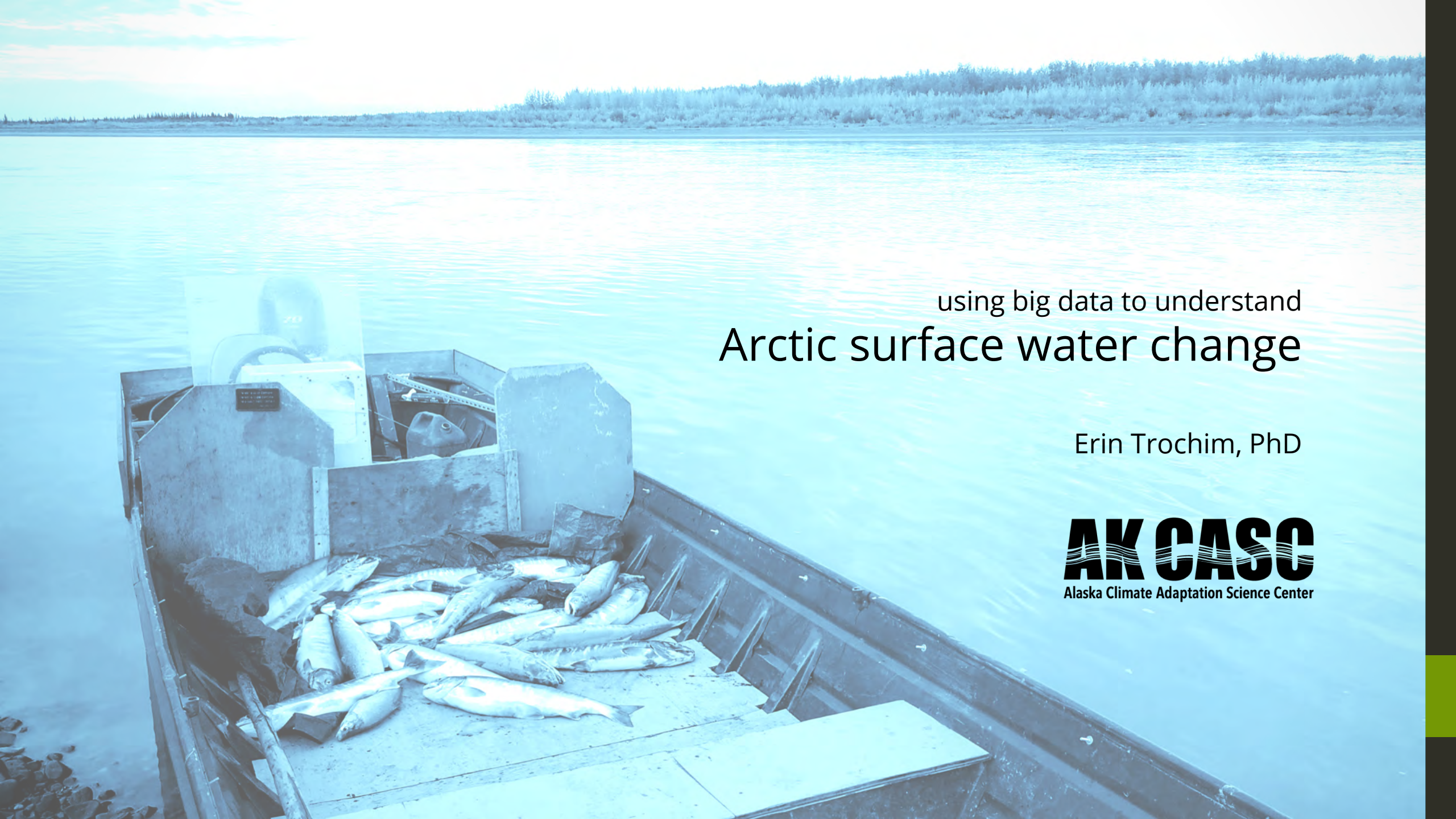

using big data to understand

Arctic surface water change

Erin Trochim, PhD

AK CASC
Alaska Climate Adaptation Science Center

surface water is abundant and highly variable in the Arctic
Understanding distribution and change is critical for local, regional and global processes

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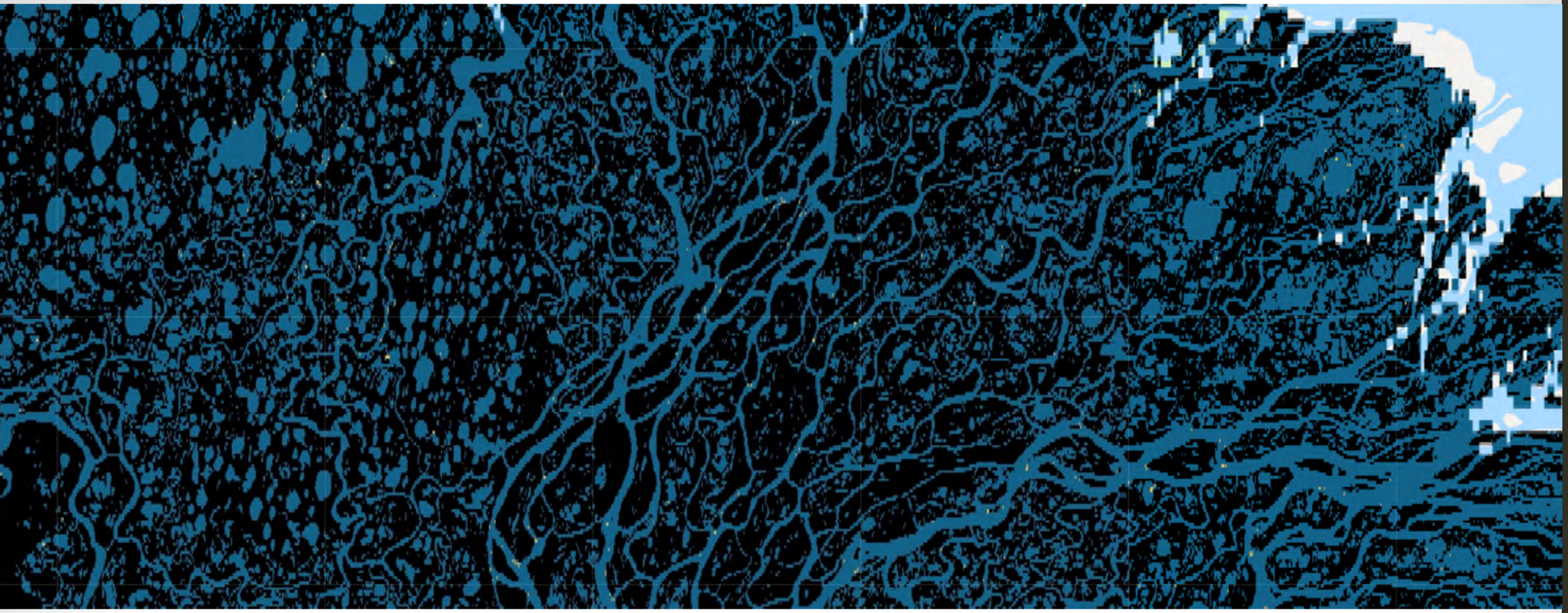

big data makes it possible to examine differences in time and space –
and allows us to understand processes over broad areas

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Policy Implications

Theoretical Improvements

Better representation of water over time in Arctic environments

Computational Efficiencies

Improvements in processing speed and data representation

Communication & Education

Core components of applying and adopting practices in variety of fields

Integrating Big Data is the new norm for Arctic surface water studies

Scientific questions, research approaches and training must evolve with data availability, improvements in processing and delivery, and application needs

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from

Policy to Synthesis

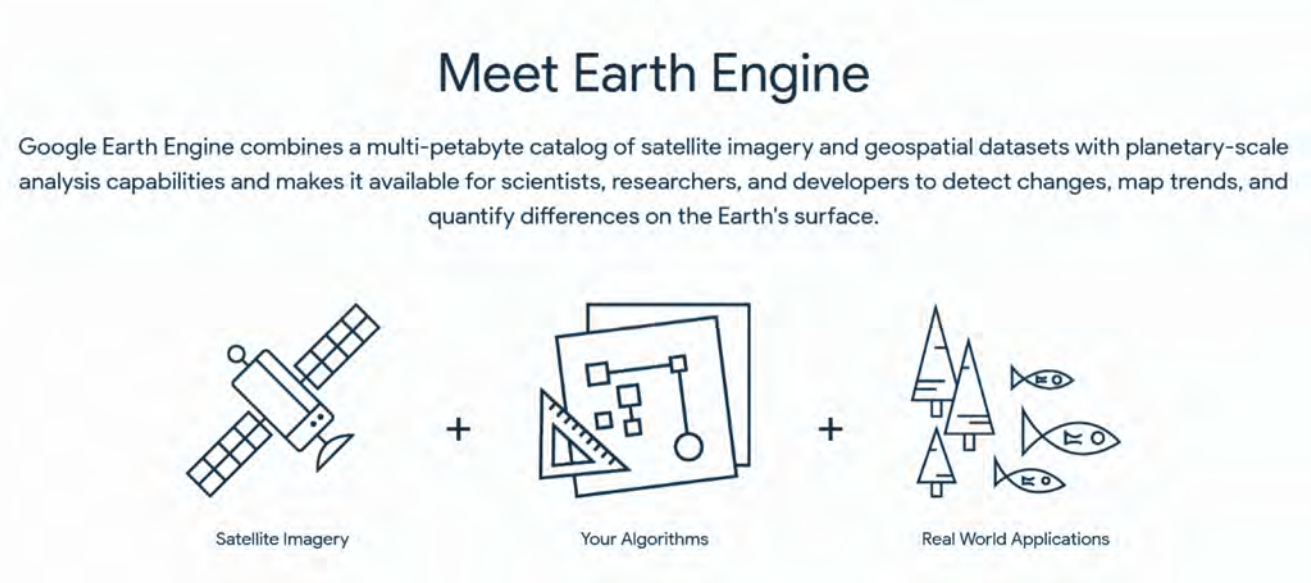
with

a detour to

Hard-core Science

and

Big Data



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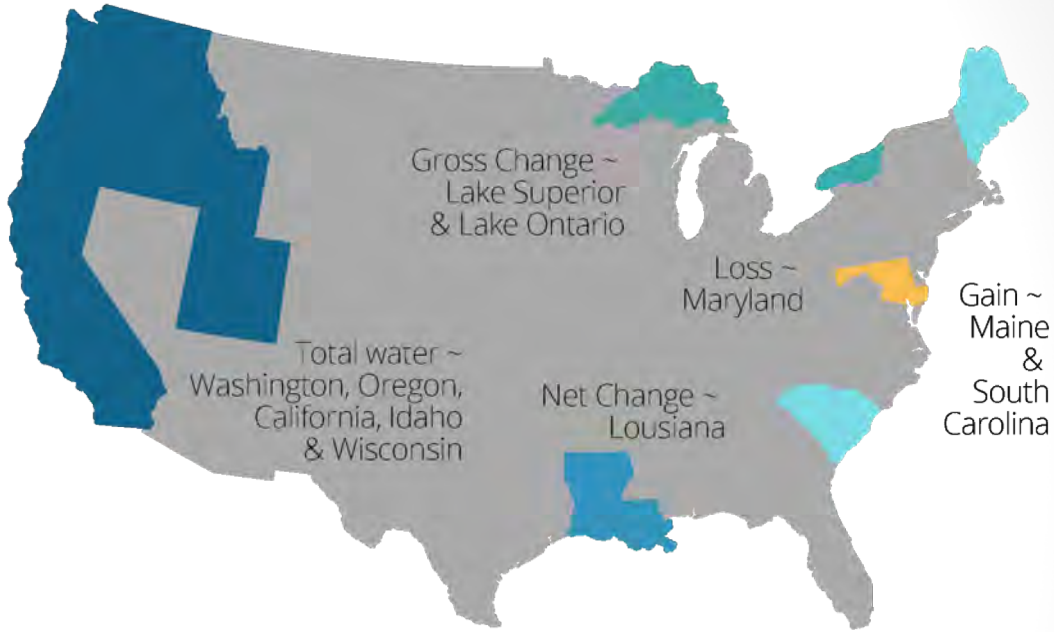
a. Surface water covered a total area of

1,203,655 km²

IN NORTHERN HEMISPHERE PERMAFROST AREAS FROM 1984-2018

b. Permafrost water areas extrapolated to the United States



bottom-line up-front findings:
in northern hemisphere permafrost

Stable water areas comprised 30% of all global permanent and seasonal water while gains and losses each made up 12% respectively

Trochim et al. (in review) Surface water distribution and change in northern hemisphere permafrost

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methods:

7 separate
data sets used
for
Analysis

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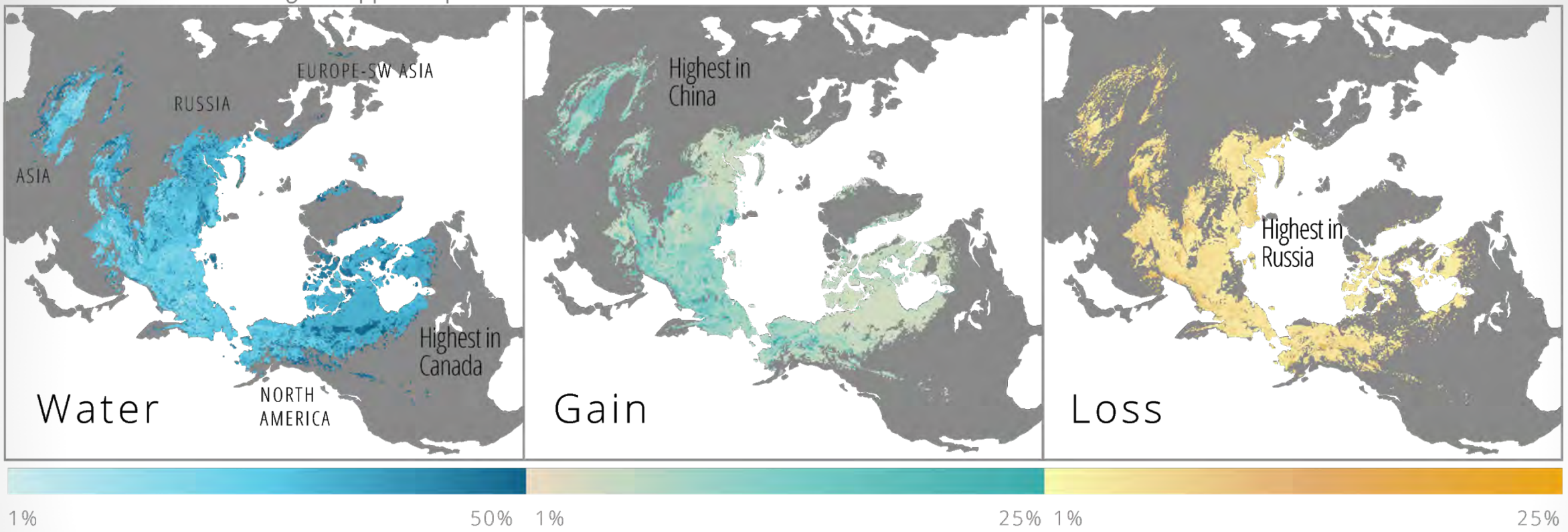
c. Surface water and changes mapped to permafrost areas



bottom-line up-front findings:

% water not simply correlated to % changes

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results

warmer temperatures or higher ice contents

were not consistently associated with higher amounts change

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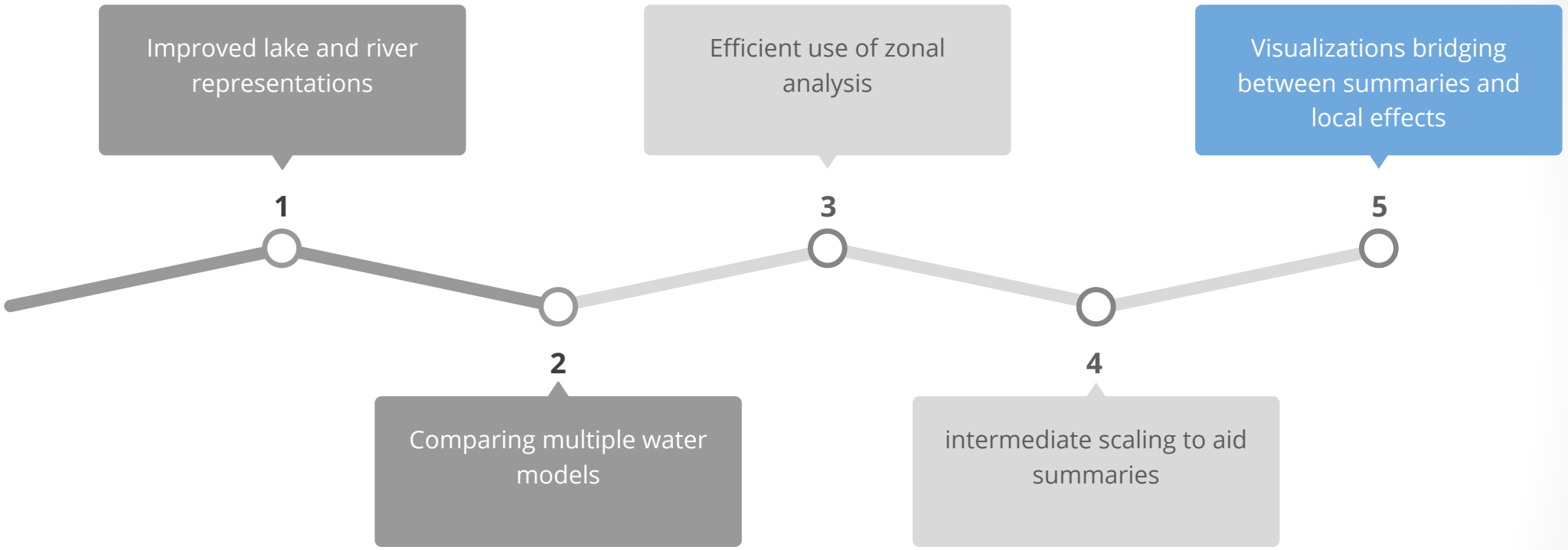
theoretical

computational

communication



5 keys:

to improve analysis

for differentiating how variability affects surface water over time

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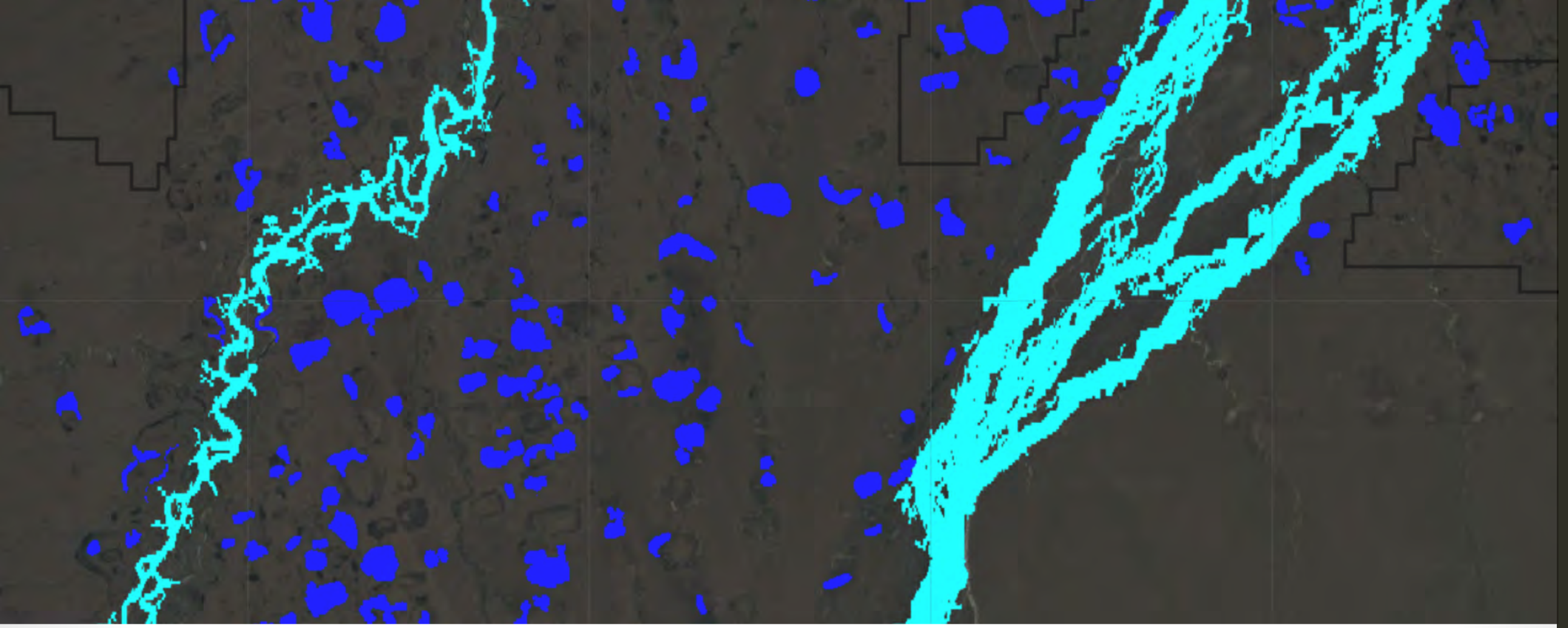

improved lake and river representations

Captured variations by extending average river and lakes based on cumulative cost

from maximum water over 35 years

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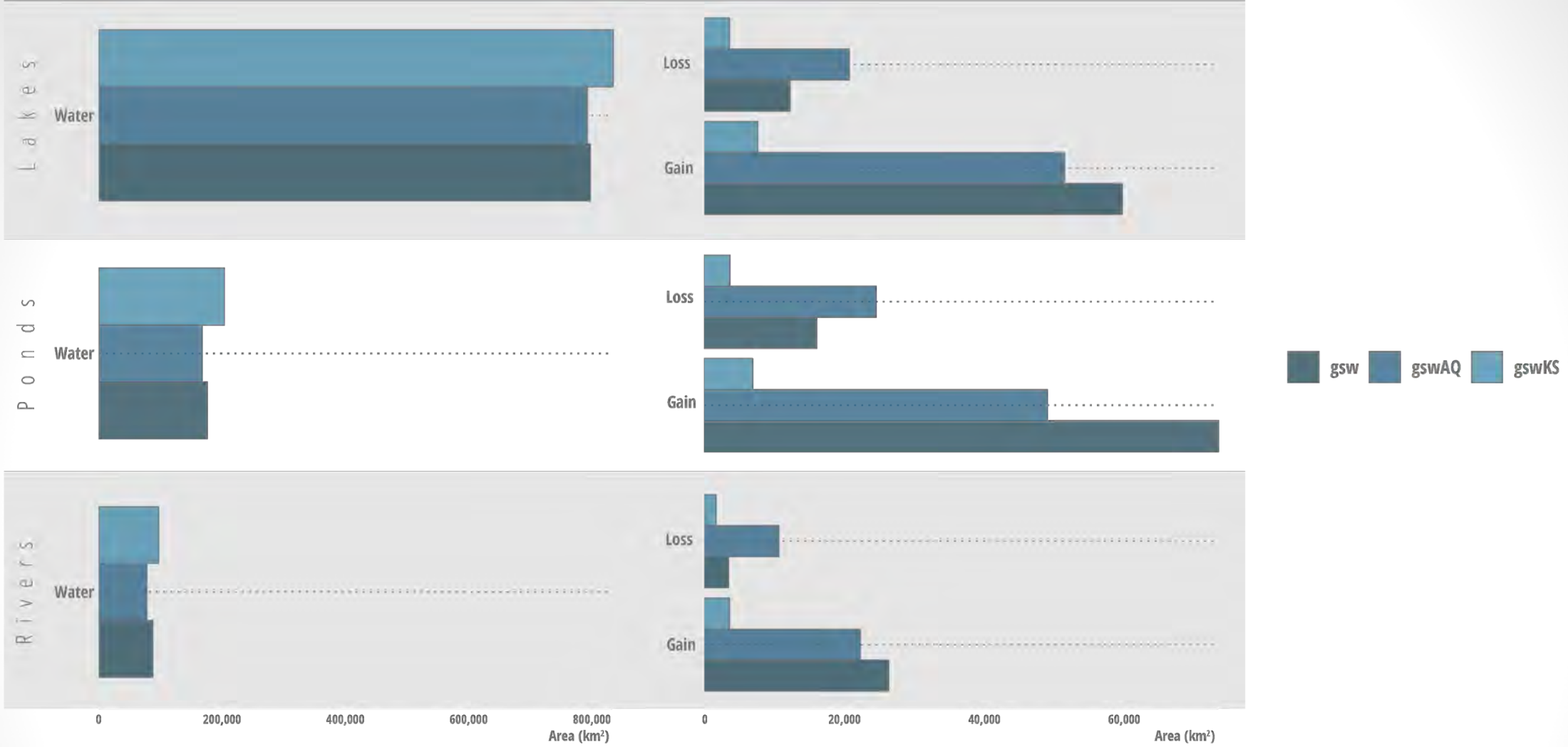

differences in models

need to be explored, understood and discussed

in order to understand variability

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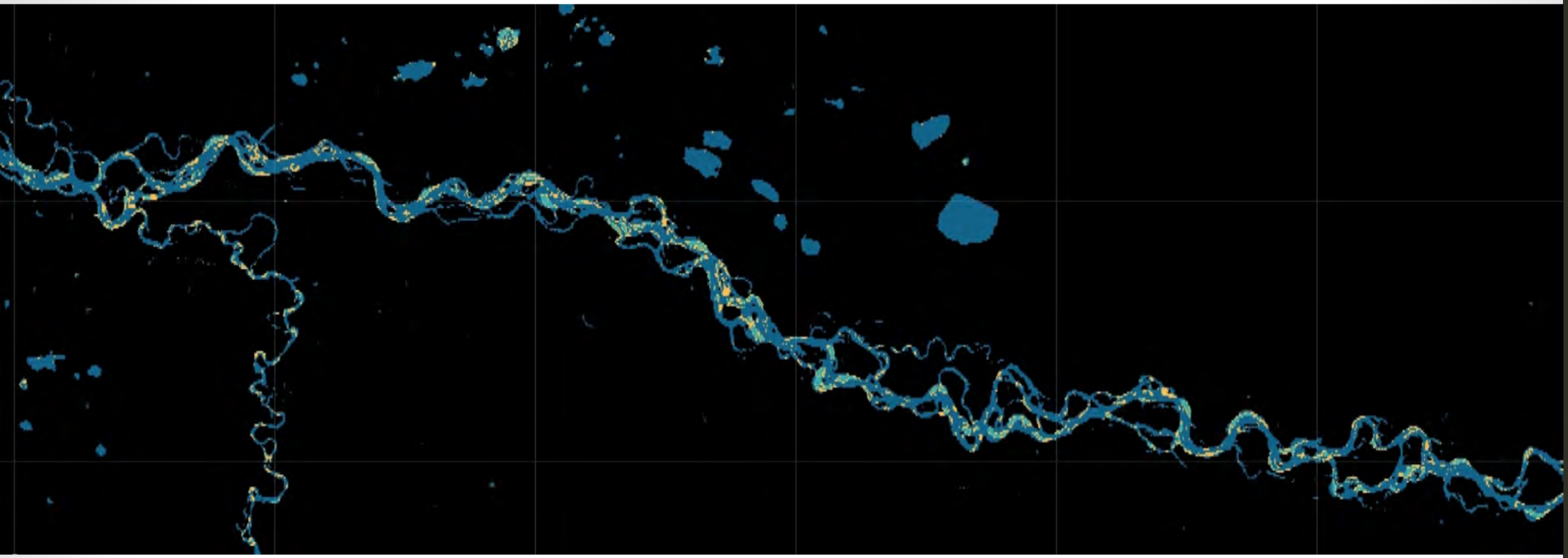

efficient zonal analysis made it possible to be the

1st to examine all rivers at fine (30 m) scale

in northern hemisphere permafrost areas

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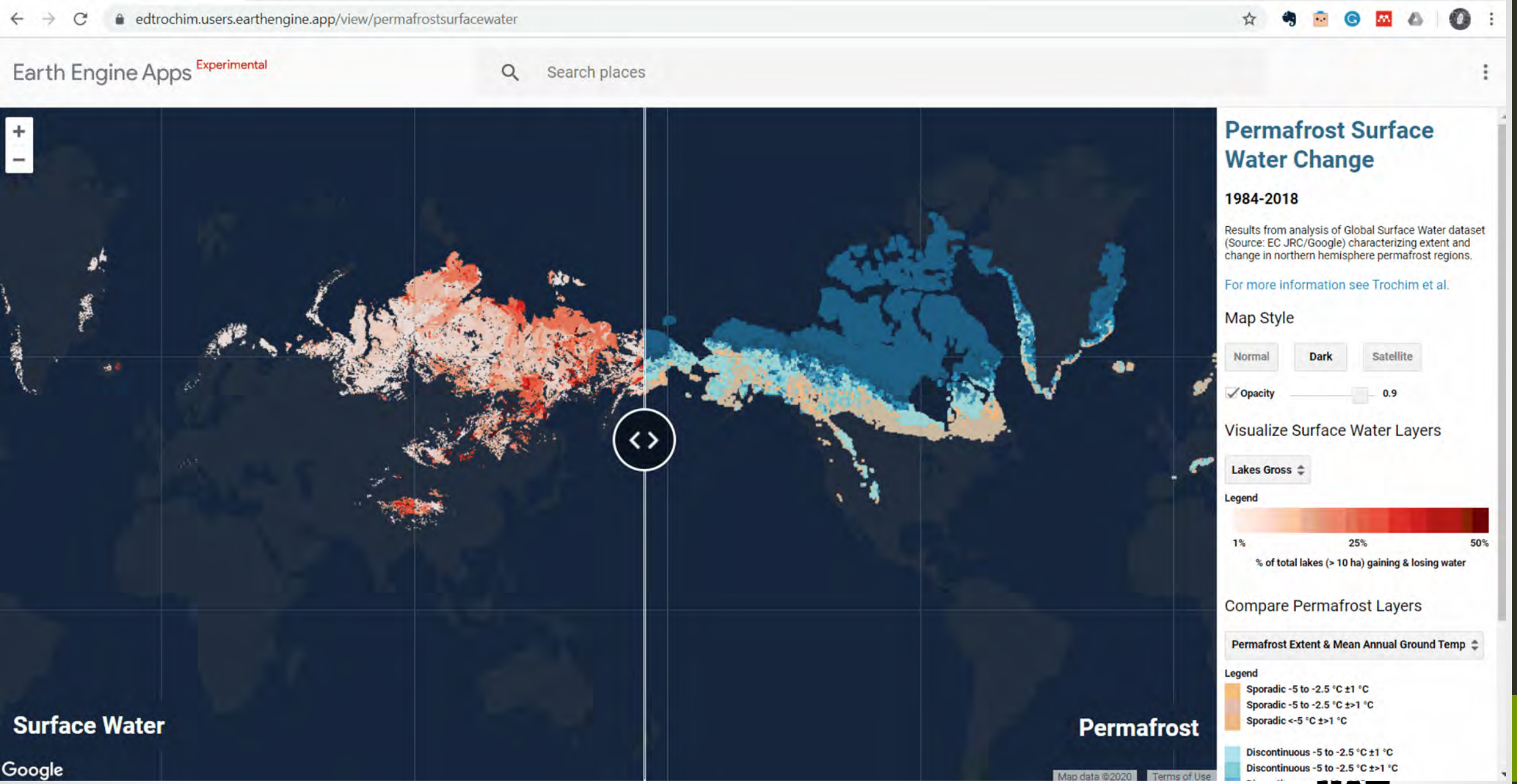

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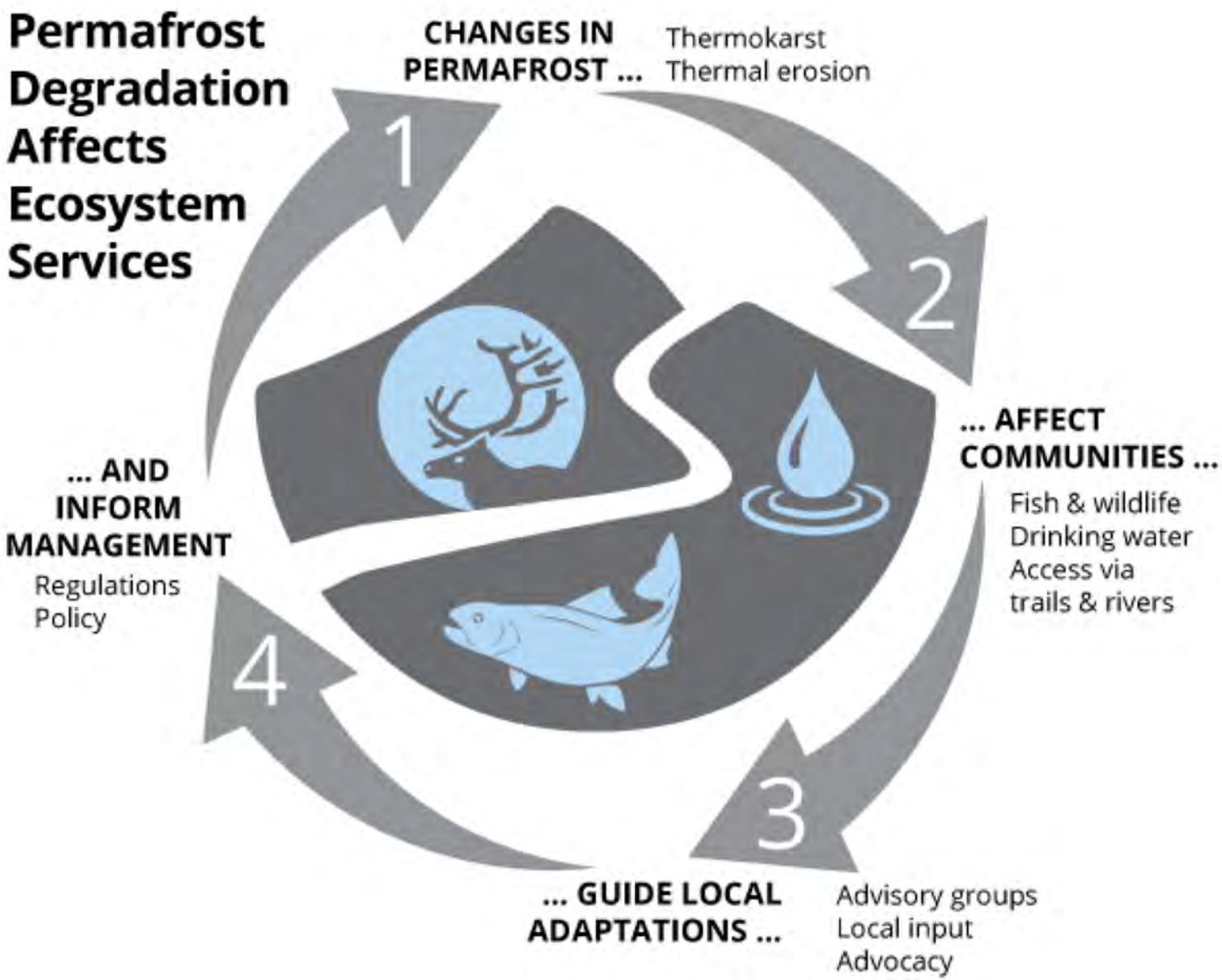

https://www.searcharcticscience.org/arctic-answers/permafrost-ecosystem-services

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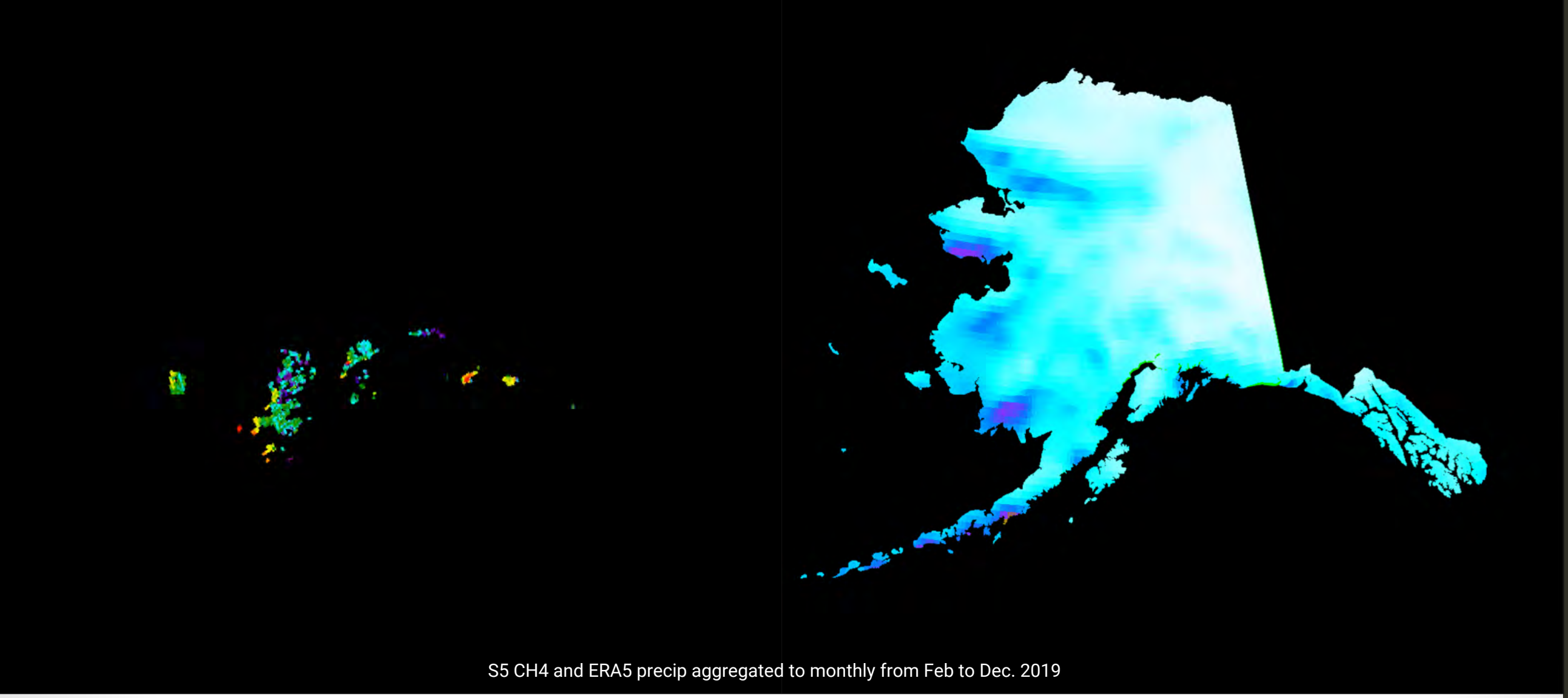

S5 CH4 and ERA5 precip aggregated to monthly from Feb to Dec. 2019

obvious opportunities to use S5 CH4 and ERA5 precip

to link drivers and predict relationships

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surface water impacts

communities and infrastructure

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