

An Evaluation of Independent Science Supported by Arctic Great Rivers Observatory (Arctic-GRO) Data



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“contribute to the needs of the
broader scientific community”



Yukon River

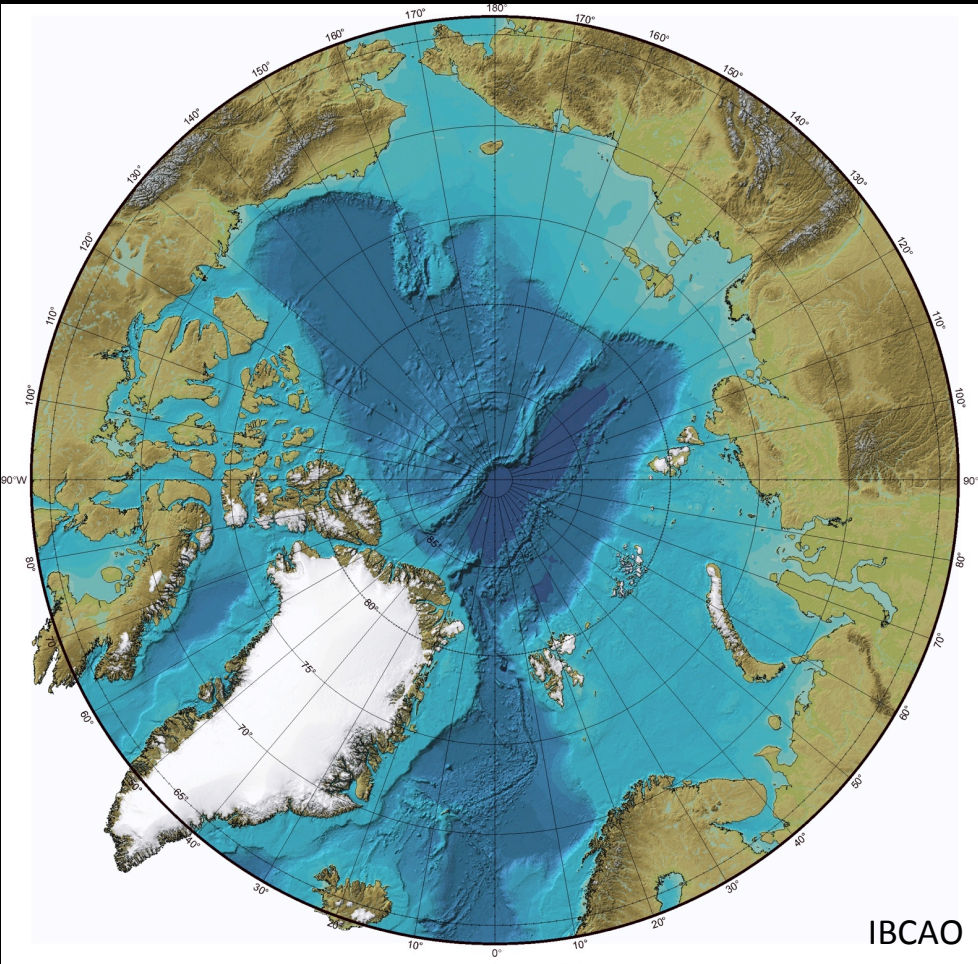
Outline

- Arctic-GRO Overview
- Survey of “Independent Science” Supported by Arctic-GRO
- Lessons Learned



Lena River

Why Arctic Rivers?



- Big Rivers, Small Ocean
- Vast Shelf
- Rivers Integrate
- Changes Underway...
 - River Discharge Increasing
 - Permafrost Thawing
 - Vegetation Shifting...

Building an Arctic River Observatory

>100 rivers to reach 67% of total global river discharge

Just 6 river to reach 67% of total Arctic river discharge



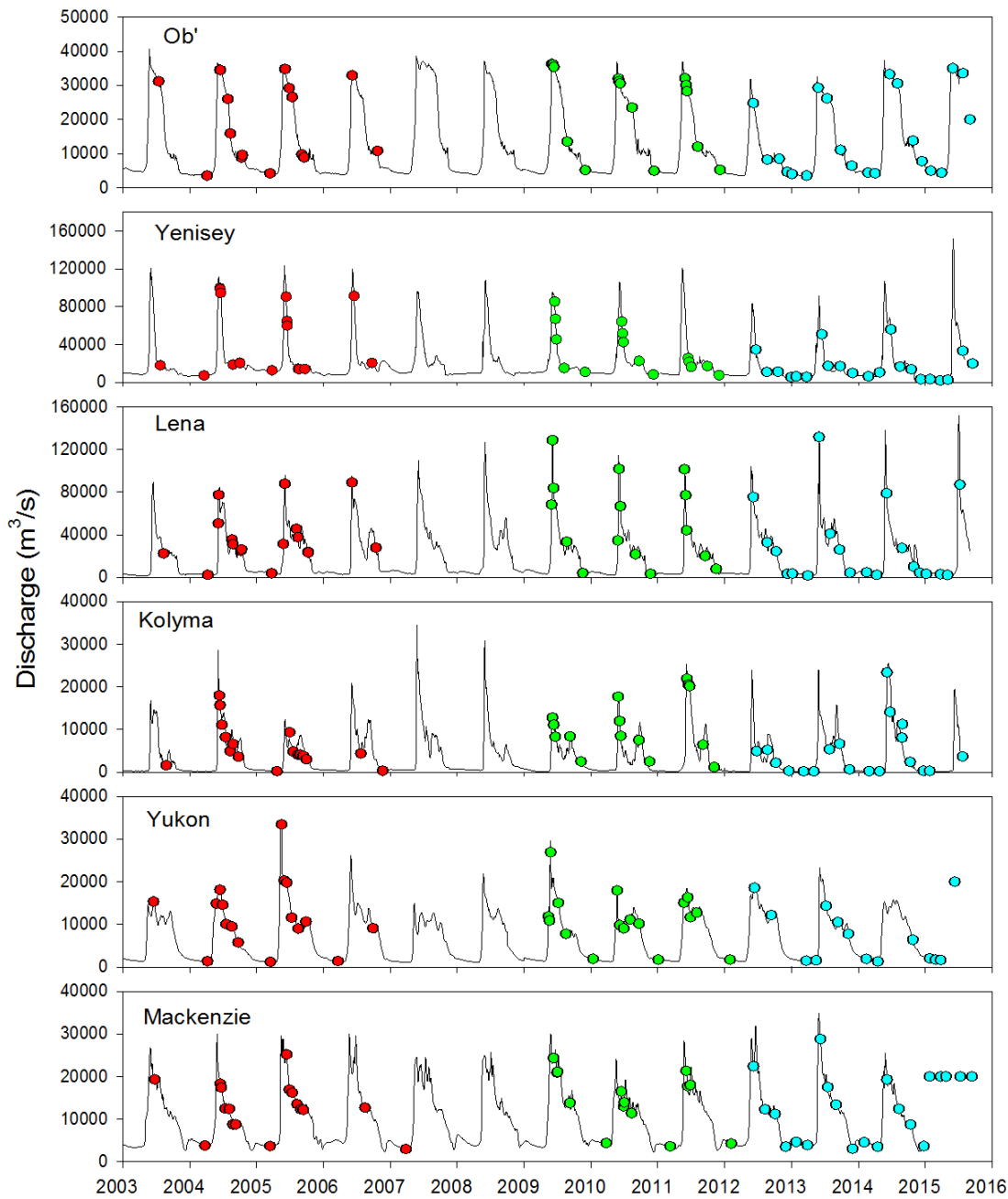
Lena River

Arctic-GRO

The Arctic Great Rivers Observatory



- Sample 6 largest rivers, multiple times per year
- Began in 2002 as PARTNERS
- Broad suite of biogeochemical measurements
- Sample archive
- Now includes discharge data



Cost has decreased
over time

Home

Massive northern rivers transport huge quantities of water and constituents from the continents to the Arctic Ocean. Changes in arctic river discharge and chemistry provide insights into changes occurring on land and also impact the chemistry, biology, and circulation of the receiving coastal and ocean waters. Our earlier efforts, beginning in the mid-1990's, to synthesize historical information about river discharge and chemical fluxes from northern rivers to the Arctic Ocean were a mixed success. Great progress was made in compiling and analyzing long-term discharge records at the pan-arctic scale.

Results were particularly striking for large Russian rivers, where discharge records dating all the way back to the 1930s allowed detection of long-term discharge increases linked to global climate change (on [Publications page](#), see Peterson et al. 2002, McClelland et al. 2004, McClelland et al. 2006). On the other hand, our early efforts to synthesize historical biogeochemical records were hampered by sparse data availability as well as data reliability issues (on [Publications page](#), see Holmes et al. 2000, Holmes et al. 2001, Holmes et al. 2002).



Watersheds of the six largest arctic rivers, all of which were part of the original PARTNERS project (2003-2007) and are now included in the Arctic Great Rivers Observatory. Map by Greg Fiske, WHRC.

Types of “Arctic-GRO” Publications

- Primary (24)
- Secondary (33)
- Tertiary (>40)



Kolyma River

Tertiary Publications

- Use Arctic-GRO dataset, or
 - Use summary results presented in Primary Publications, or
 - Use samples collected by Arctic-GRO
- *Does not include the 100s of papers that cite Primary Publications but don't directly use Arctic-GRO data for new analyses



Yenisey River

Some Examples

- Chemical Oceanography
- Physical Oceanography
- Arctic Terrestrial Hydrology and Biogeochemistry
- Global Analyses



Mackenzie River

Chemical Oceanography

Nonconservative behavior of dissolved organic carbon across the Laptev and East Siberian seas

Vanja Alling,^{1,2} Laura Sanchez-Garcia,^{1,2} Don Porcelli,³ Sveta Pugach,⁴
Jorien E. Vonk,^{1,2} Bart van Dongen,⁵ Carl-Magnus Mörrth,^{2,6,7} Leif G. Anderson,⁸
Alexander Sokolov,⁷ Per Andersson,⁹ Christoph Humborg,^{1,2,7} Igor Semiletov,^{4,10}
and Örjan Gustafsson^{1,2}

GLOBAL BIOGEOCHEMICAL CYCLES, VOL. 24, GB4033, [doi:10.1029/2010GB003834](https://doi.org/10.1029/2010GB003834), 2010



Arctic Ocean off Kolyma River

Physical Oceanography

 **AGU** PUBLICATIONS

 JGR

Journal of Geophysical Research: Oceans

RESEARCH ARTICLE

10.1002/2014JC010023

Variability in the meteoric water, sea-ice melt, and Pacific water contributions to the central Arctic Ocean, 2000–2014

Key Points:

Matthew B. Alkire¹, James Morison¹, and Roger Andersen¹



Arctic Ocean off Kolyma River

Arctic Terrestrial Hydrology and Biogeochemistry

Geophysical Research Letters

RESEARCH LETTER

10.1002/2014GL062762

Key Points:

- Low-temperature fire biomarkers occur in major Arctic rivers at all flow regimes
- In fire-impacted watersheds PyC is an

Labile pyrogenic dissolved organic carbon in major Siberian Arctic rivers: Implications for wildfire-stream metabolic linkages

Allison N. Myers-Pigg¹, Patrick Louchouart^{1,2}, Rainer M. W. Amon^{1,2}, Anatoly Prokushkin^{3,4}, Kayce Pierce², and Alexey Rubtsov^{3,4}



Global Analyses

Global Biogeochemical Cycles

RESEARCH ARTICLE

10.1002/2013GB004723

Key Points:

- Catchment DIN attenuation is greater in summer compared to other seasons
- Both runoff and temperature influence seasonal DIN-transport efficiency
- Depending on season and latitude, 3-10% of TN inputs are exported as DIN

Factors influencing export of dissolved inorganic nitrogen by major rivers: A new, seasonal, spatially explicit, global model

Michelle L. McCrackin^{1,2}, John A. Harrison¹, and Jana E. Compton³

¹School of the Environment, Washington State University, Vancouver, Washington, USA, ²National Research Council, National Academies of Science, Washington, District of Columbia, USA, ³Western Ecology Division, U.S. Environmental Protection Agency, Corvallis, Oregon, USA



Yukon River

Lessons Learned

- Challenging to track, but just thinking about Tertiary Publications is useful
- Much interest in end-member data from Primary Publications
- Data downloads are increasing, can encourage more
- Sample archive can be a great resource
- Don't know how we compare



Ob' River