INFLUENCE OF THE CONTINENTAL RUNOFF ON THE BIOGEOCHEMICAL STRUCTURE OF THE KARA SEA SURFACE LAYER in 2021

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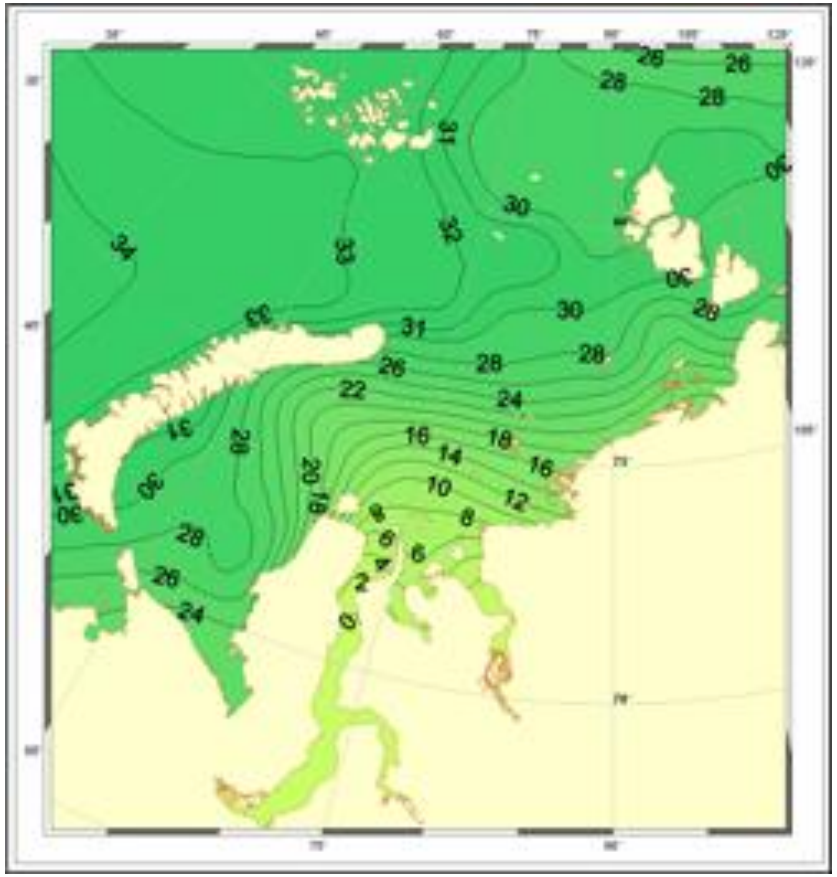
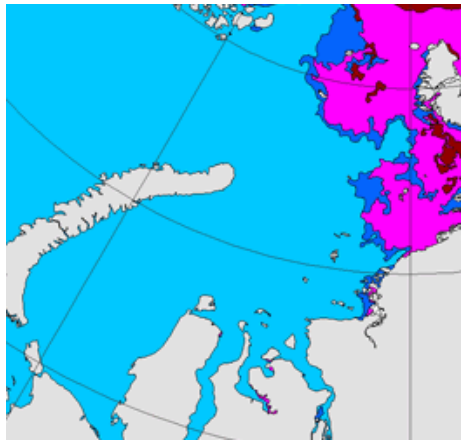
Surface desalinated layer (SDL)



August

October



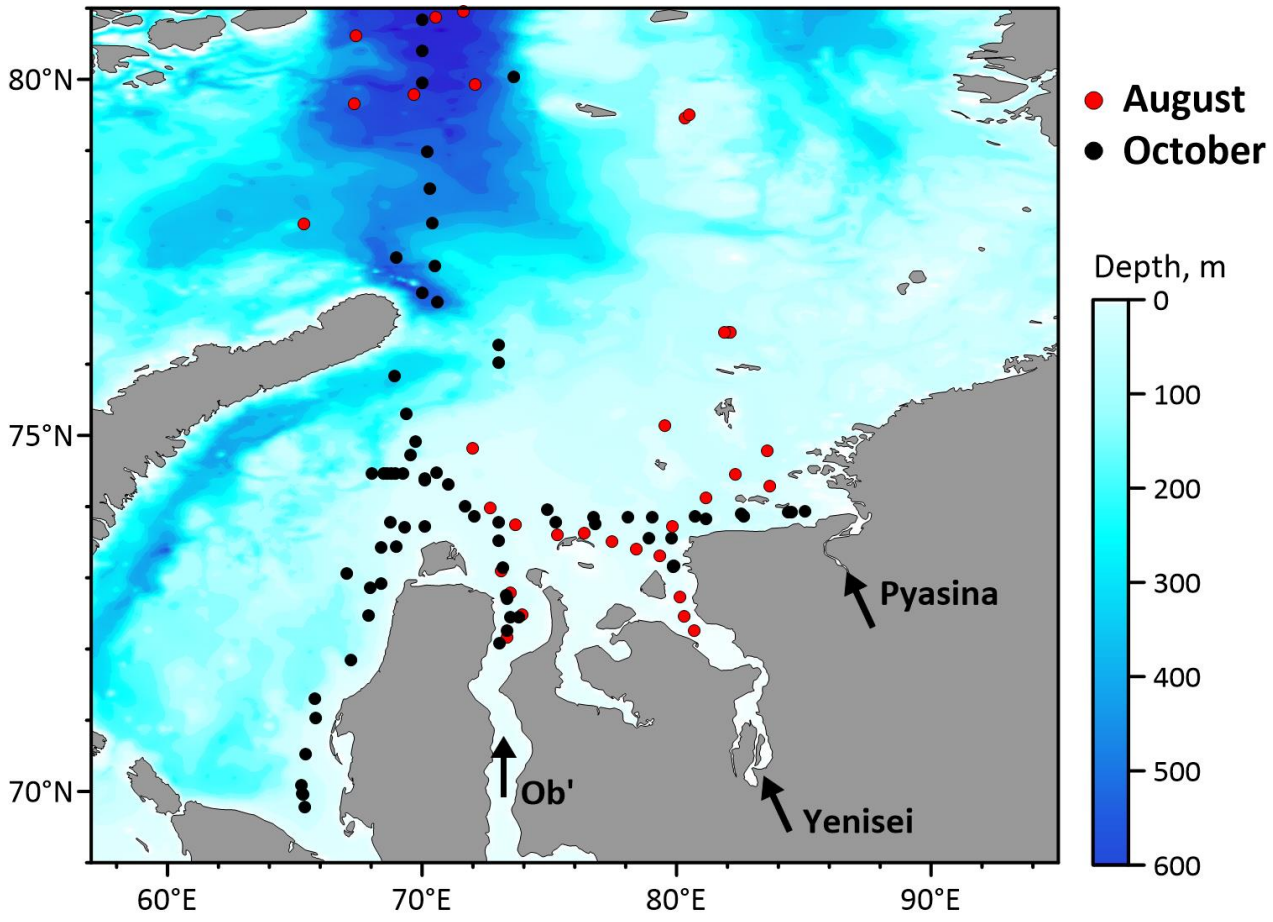
Salinity of the surface layer of the Kara Sea in summer (left) and the ice conditions in 2021 (right)
http://www.aari.nw.ru

The inflow of a large volume of river runoff causes the presence of a surface desalinated layer (SDL).

In August-October 2021 the presence of ice cover was observed in the northern and northeastern parts of the Kara Sea.

Goal: to analyze the temporal and spatial variability of biogeochemical and carbonate parameters during the ice-free period of 2021

Data



The sampling stations

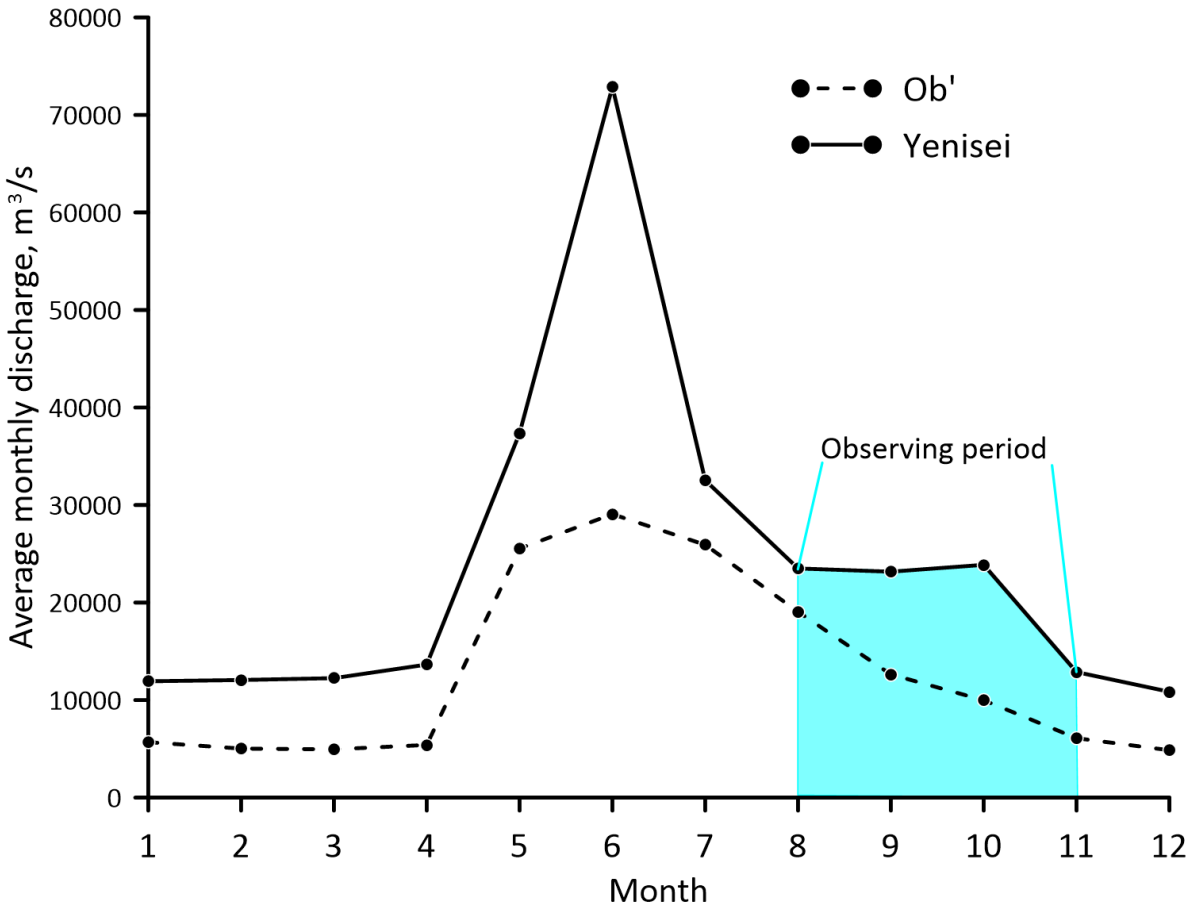
Cruises held by SIO RAS to the Kara Sea

- 58th cruise of the RV "Academik Ioffe" in August 2021
- 86th cruise of the RV "Academik Mstislav Keldysh" in October-November 2021

Expedition data

- CTD data
- hydrochemical parameters: nutrients, pH, O_2, alkalinity Ta and compounds of the carbonate system (DIC, pCO_2, HCO_3, CO_3, CO_2, Ω_{Ca}, Ω_{Ar} and Revelle factor)

River runoff in the Kara Sea



Average monthly discharge of the Ob and Yenisei in 2021
https://www.arcticrivers.org/

Parameters of the river runoff of the Ob, Yenisei and Pyasina, measured in the estuaries of rivers.

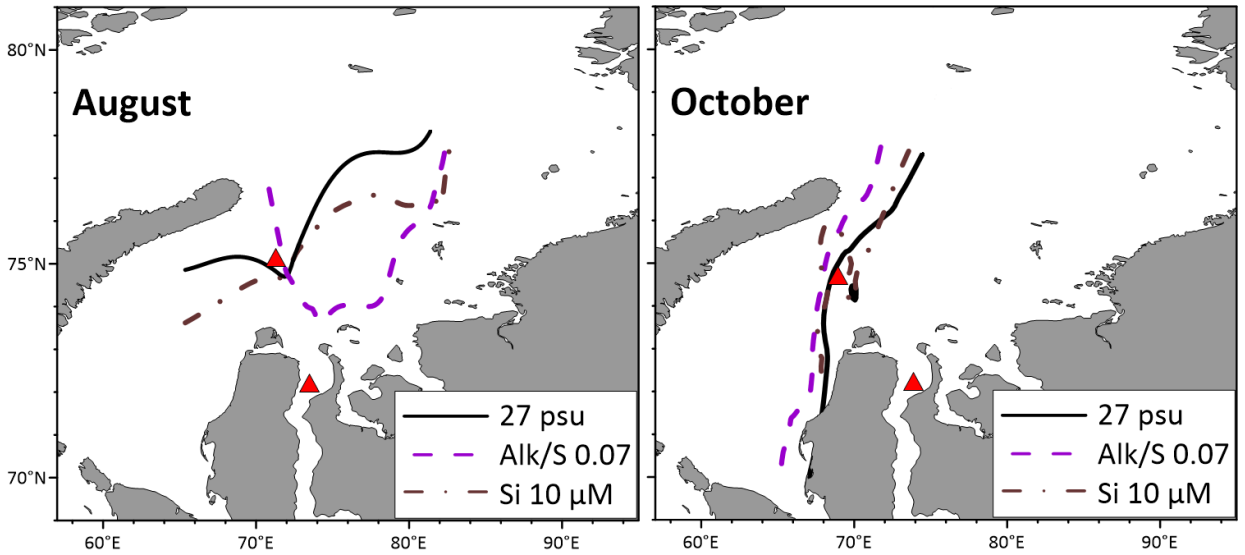
The volume of annual runoff from the source https://www.arcticrivers.org/

Parameter		Ob’	Yenisei	Pyasina
Annual runoff volume, km³/year		427	673	~86
Salinity	August	0.4417	1.2818	7.3024
	October	5	14.05	15
Ta, μM	August	861.5	699.4	1067
	October	1068.1	1550.32	1488.7
Si, μM	August	32.73	61	49
	October	47.6	41.02	31.15
pH, NBS	August	7.75	7.7	7.77
	October	8	7,97	8,04

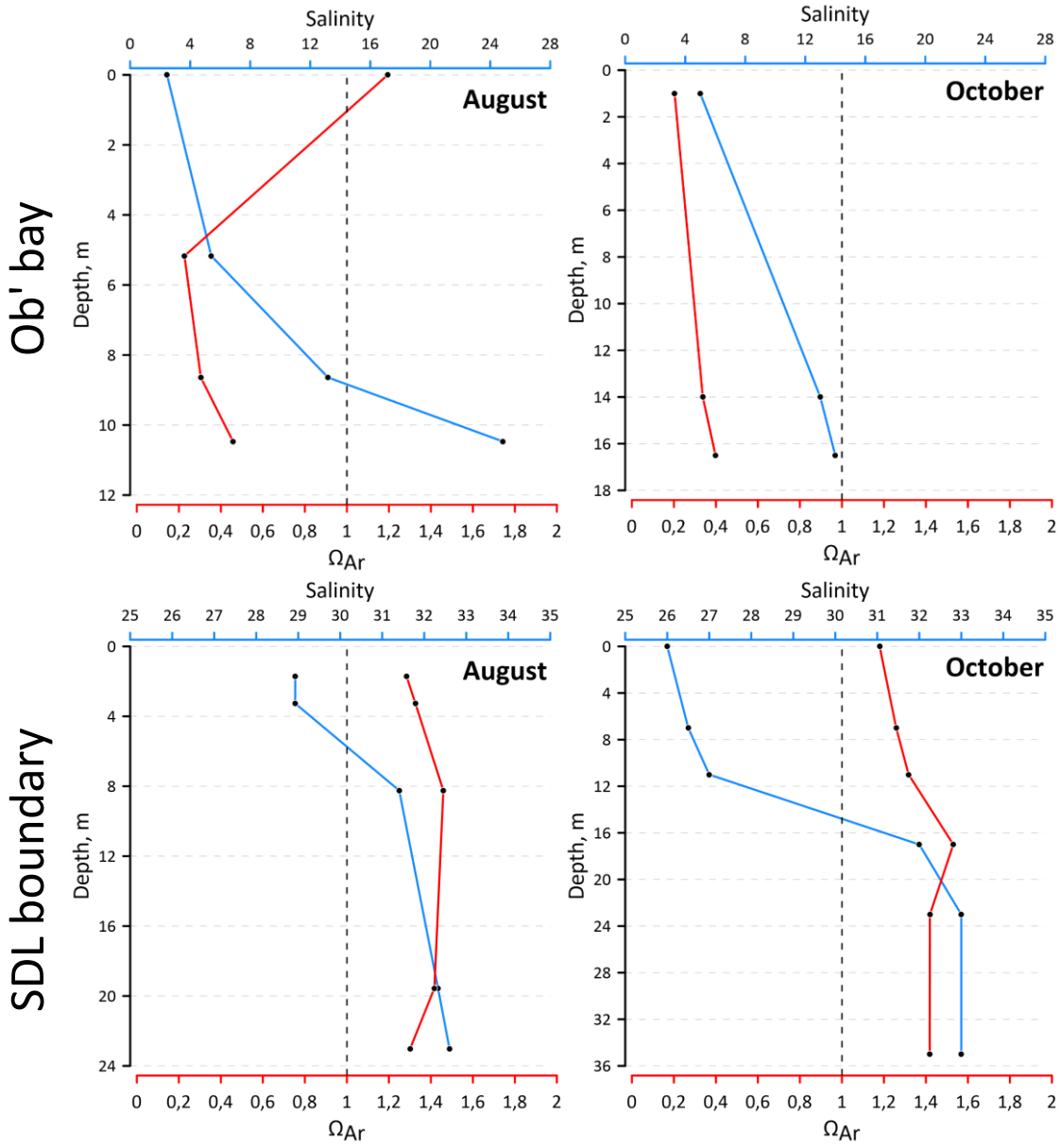
SDL structure

The Ω_{Ar} less than 1 in the waters of the Gulf of Ob is a fact of the acidifying effect of the Ob river runoff.

At the boundary of the SDL distribution under the pycnocline, Ω_{Ar} does not exceed 1.5, which also indicates the strong effect of acidification by river runoff.



The distribution boundary of SDL determined by various parameters (salinity, the ratio of alkalinity and salinity, dissolved silicates). The red triangles are stations for which the vertical distribution are represented



Vertical distribution of Salinity and Ω_{Ar} in the mixing zone of the Gulf of Ob fresh water and marine water of the Kara Sea

Seasonal variability

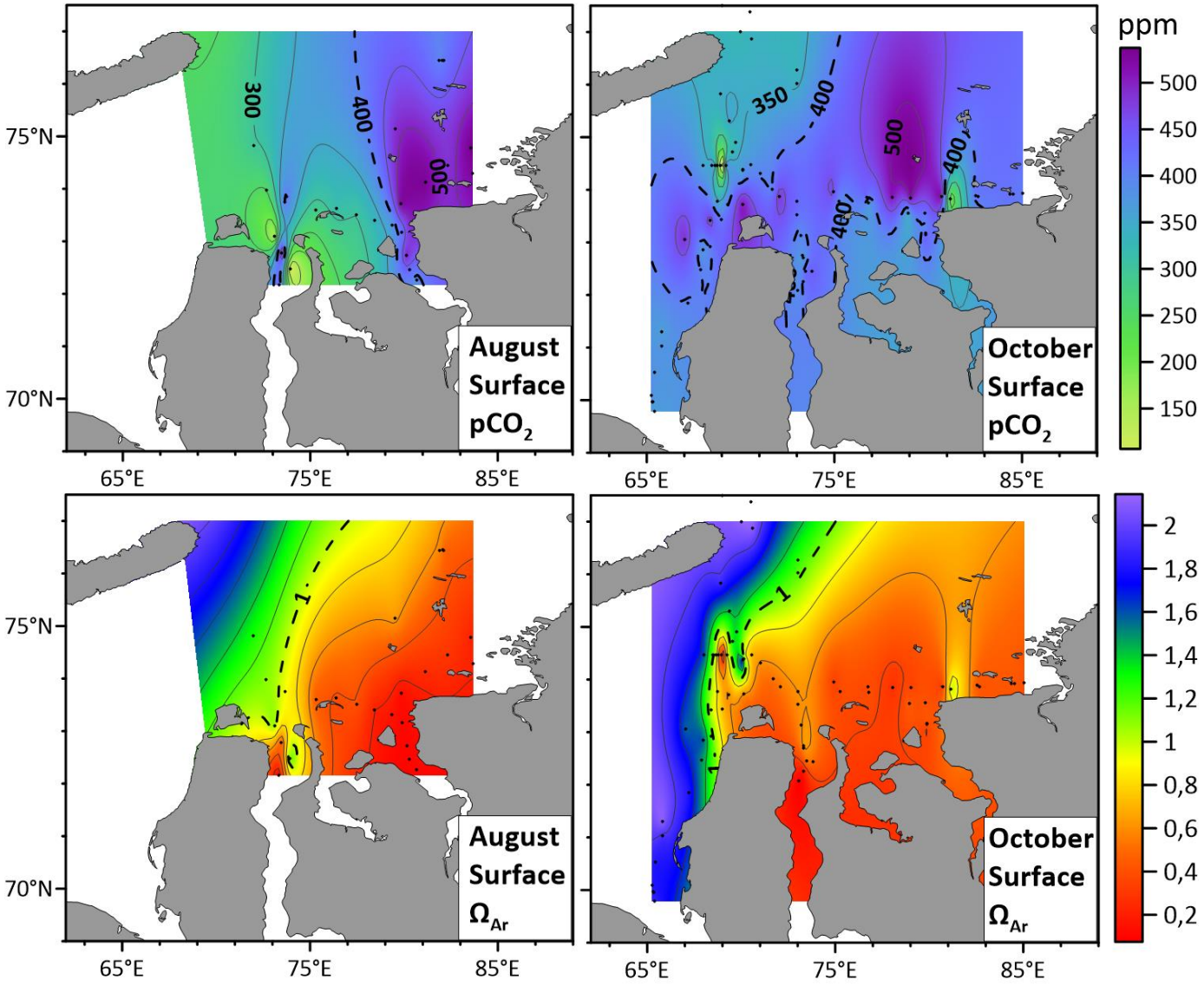
The effect of river runoff on a larger area of the study.

The figures show isolines of critical values: pCO_2 = 400 ppm and Ω_{Ar} = 1.

Despite the smaller volume of incoming river runoff, in October the influence of river runoff is observed over a larger area.

pCO2 values in August more than 400 ppm indicate biological activity of phytoplankton, in October – oxidation of organic matter.

Freshwater propagation owing to wind forcing and the inflow of organic matter with continental runoff as well local phytoplankton growth could be an additional source of water acidification.



Distribution of pCO2 (ppm) and ΩAr in the surface layer of the Kara Sea in August and October 2021

Contacts

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