

FROM PRE-FRESHET TO PRE-FREEZE

A FIELD SURVEY OF THE FATE OF ORGANIC MATTER REMOBILIZED FROM THE THAWING PERMAFROST

IN THE MACKENZIE DELTA COASTAL REGION

EGU Sharing Geoscience Online
May 2020

Session BG4.3

Mobilization of permafrost material to aquatic systems and its biogeochemical fate

WHO?

THIS SCIENTIFIC PROJECT IS PART OF NUNATARYUK

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WHY?

CONTEXT

Thawing of permafrost in the Mackenzie Delta Region of Northern Canada, coupled with an increase in river discharge, prompts the release of particulate and dissolved organic matter from the largest Arctic drainage basin in North America into the Arctic Ocean. The fate of the newly-mobilized organic matter as it transits from the watershed through the delta and into the marine system remains poorly understood.

([Nunataryuk - WP4](#))

OVERARCHING OBJECTIVE

Determine the seasonality and the fate of organic matter (OM) released in coastal waters of the Mackenzie Delta Region following permafrost thaw.

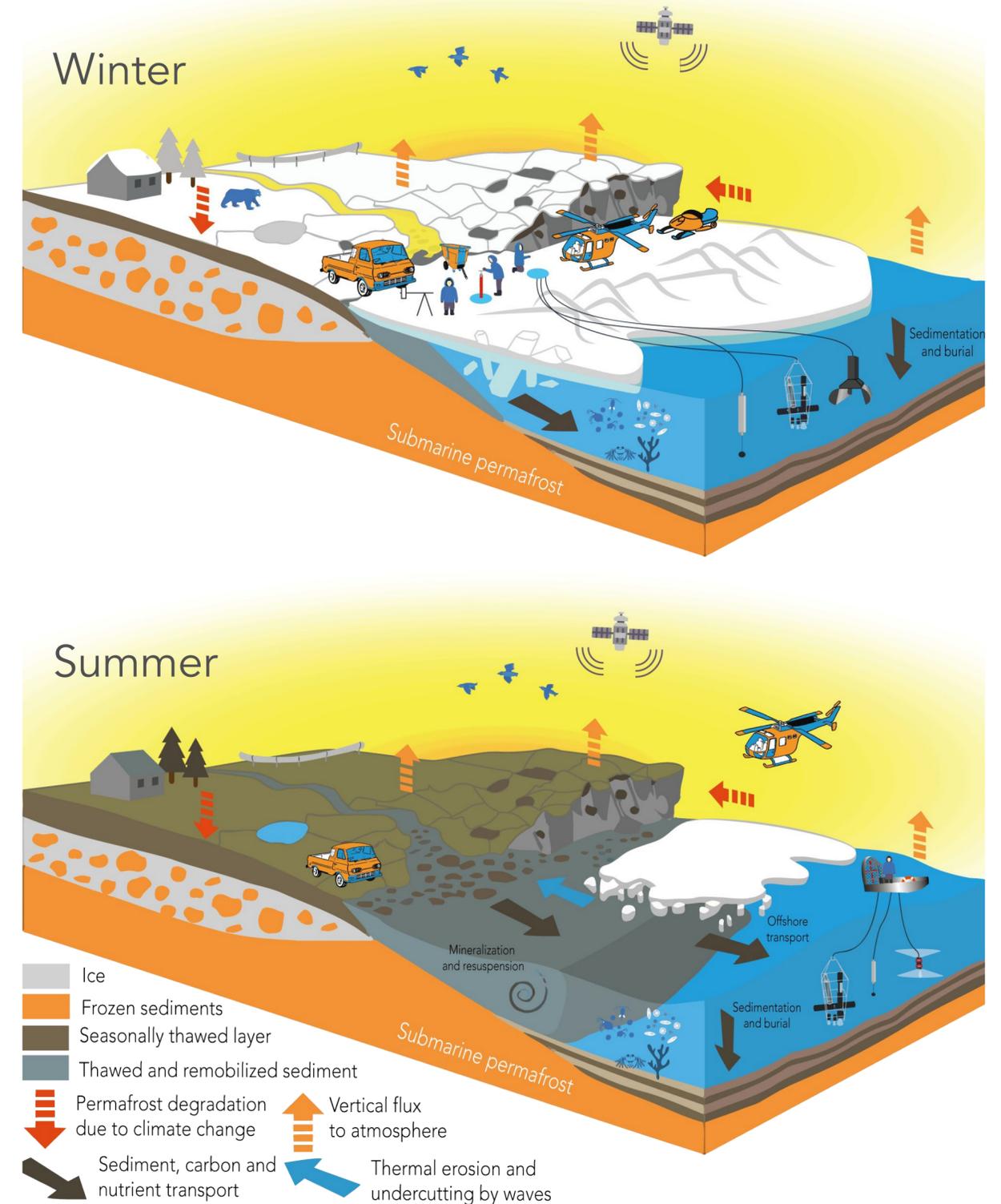
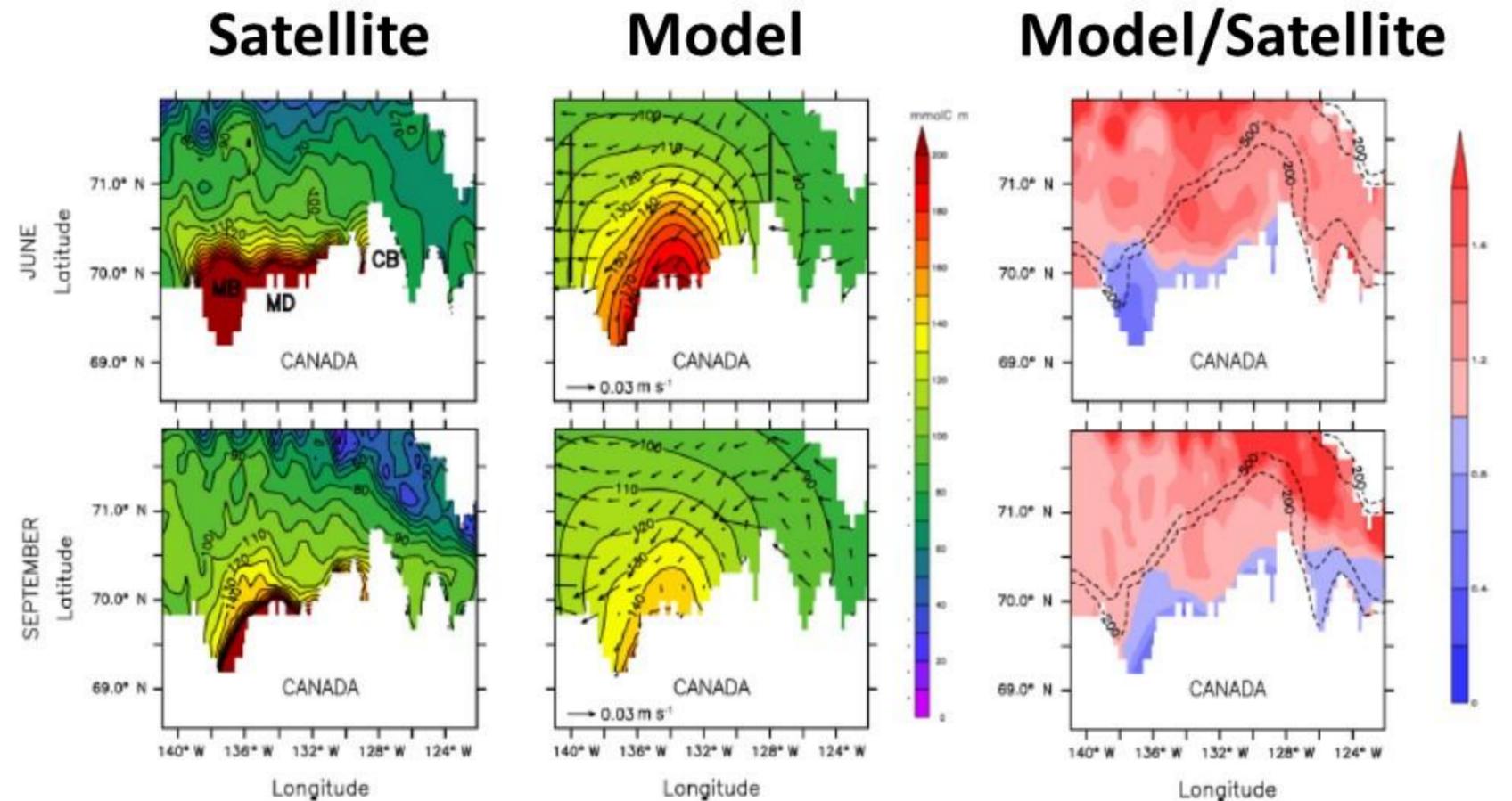


Figure from Fritz et al., 2017; adapted by J. Sansoulet et al.

GROUND TRUTHING AS A FIRST STEP

TOWARDS REMOTE SENSING ASSESSMENTS AND BIOGEOCHEMICAL MODELLING

While past model results show general agreement with satellite estimates for dissolved organic carbon (DOC), a significant discrepancy appears particularly in the delta. Field campaigns are needed to address this knowledge gap.

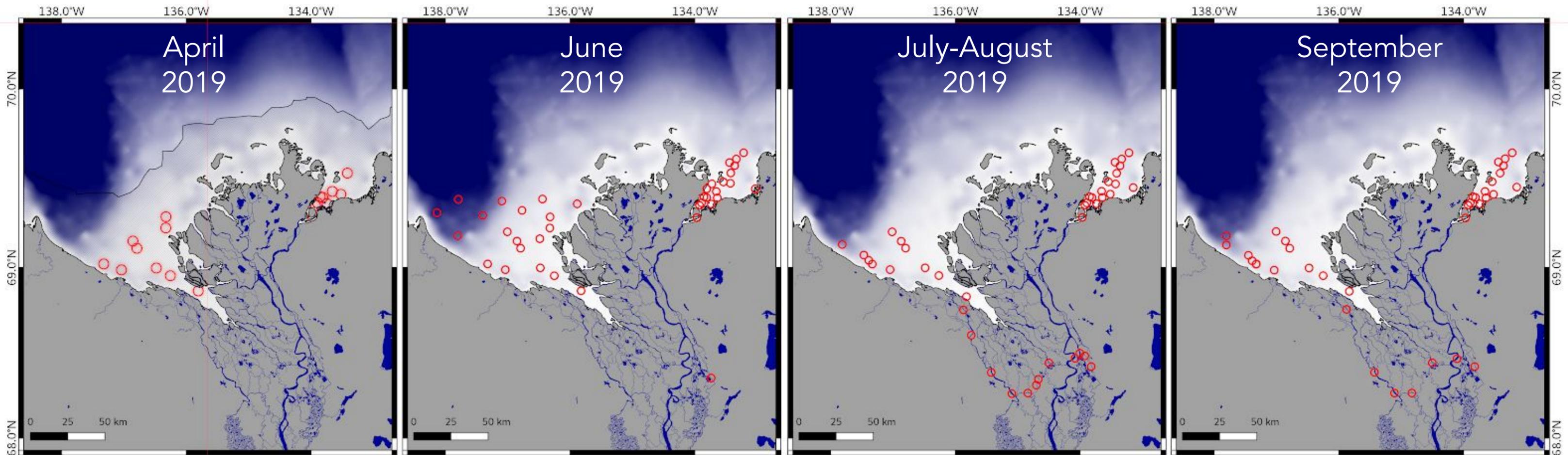
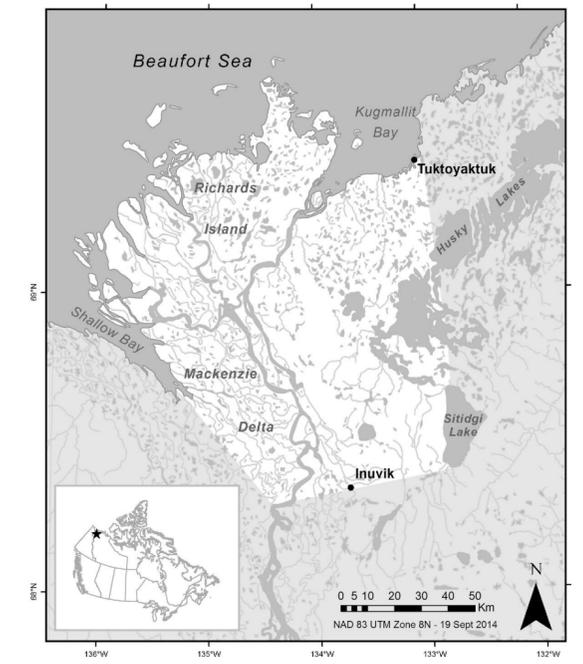


[Le Fouest, Matsuoka et al., 2018, BG]

WHERE AND WHEN?

MACKENZIE DELTA, INUVIALUIT SETTLEMENT REGION (ISR), CANADA

WINTER / SPRING / SUMMER / FALL (SEASONAL SURVEY - 2019)



Juhls et al., in prep.

HOW?

VARIOUS SAMPLING PLATFORMS AND LOCAL PARTNERSHIPS



Photo credits. S. Antonova, G. Bécu, J. Ferland, C. Gould, B. Juhls, E. Leymarie, M. Lizotte, A. Matsuoka, L. Oziel.

WHAT?

VARIABLES MEASURED

Vertical profiles of *in situ* hydrological parameters (temperature, conductivity (salinity), inherent optical properties (particle size distribution, particle backscattering coefficients, fluorescence of Chl *a* and of CDOM, vertical profiles of radiometric quantities (upwelling radiance, downwelling irradiance, surface irradiance). Absorption by colored dissolved organic matter (aCDOM), particulate absorption (a_p), chlorophyll *a* (Chl *a*), nutrients, HPLC-pigments, DOC, DIC, FDOM, major cations and anions, ^{14}C -POC, ^{13}C -POC, ^{15}N -PON, DNA-RNA, ^{14}C -DOC, ^{14}C -DIC, BA, $\delta^{18}\text{O}/\delta\text{D}$, SPM-TPC, biomarkers, lignins.

REMOTE SENSING

Measured *in situ* optical data will be used to calibrate algorithms for the retrieval of biogeochemical parameters from space with application to turbid coastal waters.

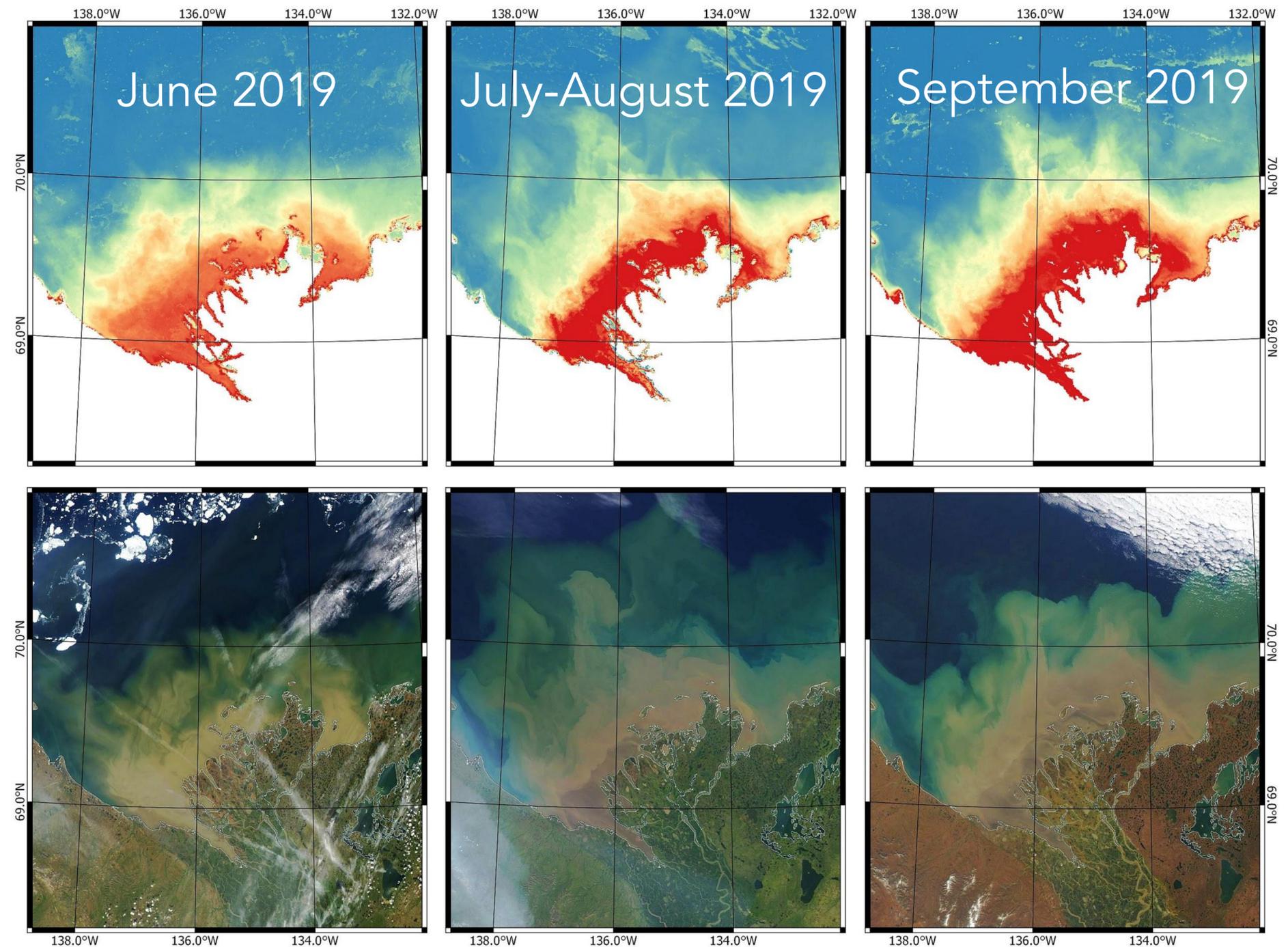
Remote Sensing provides synoptical context to *in situ* observations that are limited to short periods.

IN THE WORKS

- 1-Survey on trends in DOC and POC fluxes over the period 1998-present (available/confidential to EC).
- 2-Report on quantification of recent modifications in OM processes in the Arctic Ocean (ongoing).
- 3-Assessment of the impact of modifications in organic carbon processes on the global CO₂ flux (coming up).

PRELIMINARY

Satellite composites of coloured dissolved organic matter and non-algal particulates (a_{dg})



MODIS True Color image
(single day within sampling period)

Juhls et al., in prep.

