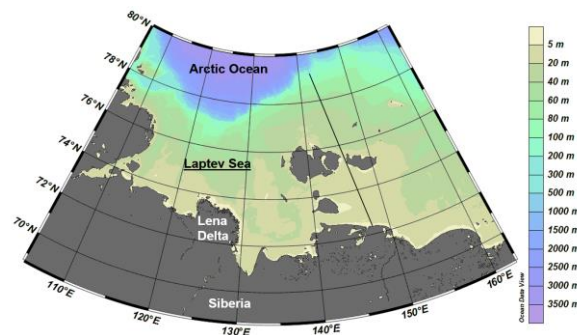


Bachelor project (15 ECTS):

## Spatial variability of organic carbon in surface sediments of the Laptev Sea shelf

The East Siberian Arctic Shelf (ESAS) is the main receptor of sediments and organic carbon (OC) that are mobilized from Siberian permafrost systems. Arctic permafrost hosts an OC pool (~1300 Pg PF-C; Hugelius et al., 2014) twice as large as the current atmospheric inventory, and ESAS surface sediments in fact contain more terrestrial OC released from permafrost than OC produced by marine phytoplankton (Vonk et al., 2012). Climate change is expected to cause faster erosion of Siberia's coastlines and thaw of inland permafrost, an effect that could amplify today's export of terrestrial PF-C to the ESAS in the near future.

Stock, distribution and source of OC in ESAS sediments are not well constrained but important for understanding the seaward transport of PF-C in arctic carbon cycling. Current research at ACES moves forward to establish a Circum-Arctic Shelf Sediment Carbon DatabasE (CASSCADE). This database will be first of its kind and is a joint effort by an international team of leading researchers in a large EU-funded project (Nunataryuk) that investigates environmental change in the Arctic. We propose a 10-week bachelor project (15 ECTS) that contributes to the CASSCADE by collecting/mining published sediment data of OC characteristics in the Laptev Sea. The Laptev Sea covers an area of 498.000 km<sup>2</sup> and has a mean water depth of only 48 m. Its location in the continuous permafrost zone, the strong influence of the Lena River and fast coastal erosion make the Laptev Sea a hot spot region of interest for collaborative earth system research. Within the bachelor thesis, the student will analyze and discuss carbon characteristics in a spatial context focusing on the Laptev Sea.



The main tasks will be:

- Literature investigation of the Laptev Sea area, screening for OC, nitrogen,  $\delta^{13}\text{C}$ ,  $\Delta^{14}\text{C}$  (optional also biomarkers); select, categorize and enter data from 30 – 60 publications into the database
- Analyze and discuss differences of OC concentration and composition along bathymetric transects or other apparent gradients using plots, statistical analysis (e.g. regression analysis) and optionally a geographical information system (ArcGIS) to visualize spatial patterns and create maps
- Discuss different OC sources to Laptev Sea sediments using the isotopic data from the literature ( $\delta^{13}\text{C}$ ,  $\Delta^{14}\text{C}$ ) and estimate PF-C stock and distribution based on a simple isotope mass balance mixing model
- Summarize and report in bachelor thesis according to regulations of the study program

We provide an interesting and stimulating work environment in an international and multidisciplinary team of experts in biogeochemistry, oceanography and paleoclimatology. We will assist, support and supervise all tasks (literature selection, data interpretation, potential GIS application) and demand no advanced background in software or statistics. As this degree project contributes to international research and will be supervised by international researchers the project will be carried out in English language.

**Advisors: Jannik Martens, Birgit Wild and Örjan Gustafsson**

Contact: [jannik.martens@aces.su.se](mailto:jannik.martens@aces.su.se)

Department of Environmental Science and Analytical Chemistry (ACES),  
Stockholm University

### References and recommended preparative literature reading (\*)

Hugelius, G., Strauss, J., Zubrzycki, S., Harden, J.W., Schuur, E.A.G., Ping, C.-L., Schirrmeister, L., Grosse, G., Michaelson, G.J., Koven, C.D., O'Donnell, J.A., Elberling, B., Mishra, U., Camill, P., Yu, Z., Palmtag, J., Kuhry, P., 2014. Estimated stocks of circumpolar permafrost carbon with quantified uncertainty ranges and identified data gaps. *Biogeosciences* 11, 6573–6593.

\*Vonk, J.E., Sánchez-García, L., van Dongen, B.E., Alling, V., Kosmach, D., Charkin, A., Semiletov, I.P., Dudarev, O. V, Shakhova, N., Roos, P., Eglinton, T.I., Andersson, A., Gustafsson, Ö., Gustafsson, O., 2012. Activation of old carbon by erosion of coastal and subsea permafrost in Arctic Siberia. *Nature* 489, 137–140. doi:10.1038/nature11392