Proposed travel plan and timing

Figure 1: Proposed GLACE cruise track. The circumnavigation of Greenland will be subdivided into 2 Legs: Leg 1 (Southern Greenland, SG) from Reykjavik to Ilulissat, and Leg 2 (Northern Greenland, NG) from Ilulissat to Reykjavik. The 50 Let Pobedy atomic icebreaker will support the operations during Leg 2 (red cruise track). Locations of potential supersites are highlighted.
The mobilisation of R/V Akademik Tryoshnikov (AT) will take place in Kiel, Germany (tbc) from July 25th to July 30th 2019.

Leg 0 will lead from Kiel to Reykjavik. No science program is planned for this leg, but the possibility exists to have a limited number of scientists join this leg in order to e.g. test instruments used for continuous data acquisition.

The circumnavigation will begin after a stopover in Reykjavik around 4th August 2019 and end in Reykjavik around 25th September 2019. The circumnavigation will be subdivided into two legs, with a short stopover in Ilulissat, where scientific parties can be replaced but no additional equipment will be loaded after mobilisation in Kiel. The 50 Let Pobedy atomic icebreaker, mobilized in Murmansk, Russia, will support the AT during the Northern Greenland leg.

Similar to Leg 0, no science program is planned for Leg 4, the transit from Reykjavik back to Kiel. Limited scientific personnel will be able to stay on board the ship to acquire data, which do not require stopping of the vessel. Demobilization will take place in Kiel from 30th September to 2nd October.

Given the unprecedented nature of the expedition and the impossibility to foresee weather and ice conditions, a successful completion of the circumnavigation cannot be guaranteed at this stage. Please also note that all the dates above are still tentative.

Due to time constraints, it is anticipated that scientific sampling during transit time will be focused on oceanographic sampling from the underway water supply, and continuous atmospheric sampling approaches. Four hours of station-time per full day of steaming is included in the expedition timing. How and when this station time will be used will be decided with input from all involved projects, and can change due to weather and ice conditions.

Several super-sites have been identified along the proposed cruise track. Super-sites will last several days (2 days during Leg 1 and up to 5 days during Leg 2) to allow for extensive land-based sampling as well as detailed surveys of coastal hydrography and ice-edge processes. Super-sites of particular interest and time allocation will be located in the northern section, however, access to these sites is strongly dependent on weather and ice conditions and cannot be guaranteed.
Super sites during Leg 1

**SG1: Kangerlussuaq Fjord & Gunnbjorn Feld**
68°55 N, 29°47 W

**SG2: Helheim Fjord & Schweizerland**
56°56 N, 36°47 W

The Kangerlussuaq and Helheim fjords host the terminations of two major accelerating glaciers from south Greenland and previous studies have shown a direct influence of Atlantic waters on the melting of the ice sheet. These sites represent the "southern" end members in our holistic approach to studying the melting of Greenland ice cap and ice/ocean interactions.

The Gunnbjørn feld and Schweizerland range in the vicinity of these two fjords are amongst the highest mountains in Greenland and also represent major opportunities to obtain good ice cores that may provide important information about past regional climatic fluctuations. Visiting these two sites will also provide the opportunity to carry out biodiversity/chemistry surveys along both altitude and coast to land gradients.

**SG3: Prince Christian Sund**
60°9 N, 43°53 W

Prince Christian Sund is the southernmost area of Greenland. The area hosts small marine terminating glaciers and numerous lakes. Spending two days in the area will provide the opportunity to carry out a detailed hydrographic survey, documenting past climatic variations using lake sediments, and biodiversity/chemistry surveys along coast to land gradients. Being the southernmost part of Greenland, contrasting samples collected here to samples collected at the northernmost part of Greenland (Cape Morris Jessup, NG2) will likely be of particular interest.

*Figure 2: Potential super-sites during leg 1 and leg 2.*
Super sites during Leg 2

Four potential super-sites have been identified during Leg 2. Please note that super-site NG4 is considered a ‘back-up’ super-site, in case ice conditions prevent from sampling at super-sites NG1, NG2, or NG3. While five days have been allocated to each super-site, time spent at each super-site can be adjusted depending on the scientific interests of selected projects and weather and ice conditions.

The 50 Let Pobedy atomic icebreaker will escort the AT during super-sites NG1 and NG2, and the possibility of using berth space and helicopter use for additional scientific personal can be discussed.

NG1: Ryder & Ostenfeld Glacier
83°38 N, 32°39 W
82°15 N, 47°5 W

The Ryder and Ostenfeld Glaciers are two major glacial outflow areas, with substantial melting documented over the past decades. Detailed oceanographic surveying in this area will be able to address the effect of glacial outflow on marine physics, chemistry and biology. Collection of sea-ice samples and short sea-ice cores in this region will be considered. Possibilities for terrestrial sampling include ice cores, lake sediment cores, lake / snow / ice microbiology, drone surveys, and collection of rare vegetation and microbiological ‘baseline data’ in this rapidly changing environment. The possibility of setting up over-night camps exists at this super-site, but cannot be guaranteed.

NG2: Cape Morris Jessup & Morris Jessup Rise
83°38 N, 32°39 W
38°45 N, 20° W

Cape Morris Jessup is the northernmost area of Greenland, and North America. Contrasting samples collected from this super-site with samples collected at the southernmost part of Greenland (Prince Christian Sund, SG3) will be of particular interest. Collection of sea-ice samples and short sea-ice cores in this region will be considered. Terrestrial sampling at this vastly understudied area include ice cores, lake sediment cores, lake / snow / ice microbiology, drone surveys, and collection of rare vegetation and microbiological ‘baseline data’. The possibility of setting up over-night camps exists at this super-site, but cannot be guaranteed.

NG3: Independence Fjord
82°08 N, 28°00 W

Independence Fjord is a large fjord in the eastern part of northern Greenland. It is about 200 km long and up to 30 km wide. The Marie Sophie Glacier and the Academy Glacier have their terminus at the head of the fjord. Ice and weather conditions permitting, a detailed hydrological survey of the fjord system will be conducted. Terrestrial sampling could include (but is not limited to) ice cores, lake sediment cores, lake / snow / ice microbiology, drone surveys, and collection of rare vegetation and microbiological ‘baseline data’. No over-night camps are anticipated for this super-site, and the 50 Let Pobedy will likely not be accompanying the AT during this part of the expedition.
NG4: Zachariae Glacier  
78°00 N, 30°00 W

NG4 is a potential super-site, which acts as back-up if ice conditions during NG1, NG2, or NG3 prohibit extensive sampling. The site is located at the outlet of Zachariae Isstrom Glacier, which has recently undergone large scale melting. Detailed oceanographic surveys in this area will be able to address the effect of glacial outflow on marine physics, chemistry and biology. Possibilities for terrestrial sampling include ice cores, lake sediment cores, lake / snow / ice microbiology, drone surveys, and collection of rare vegetation ‘baseline data’. No over-night camps are anticipated for this super-site, and the 50 Let Pobedy will not be accompanying the AT during this part of the expedition.