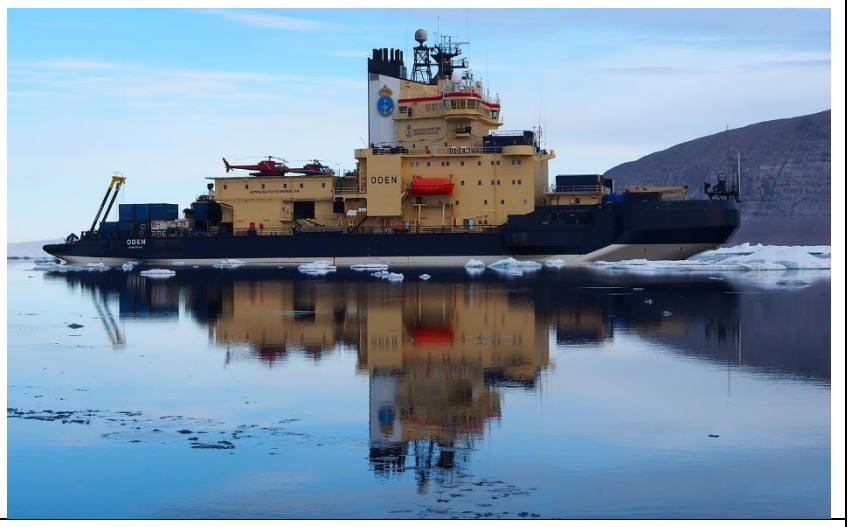
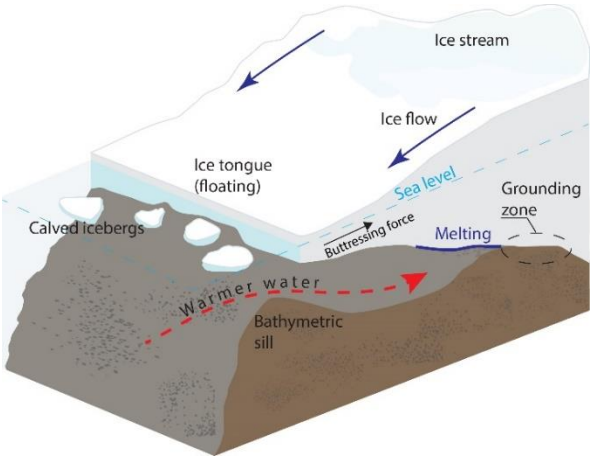
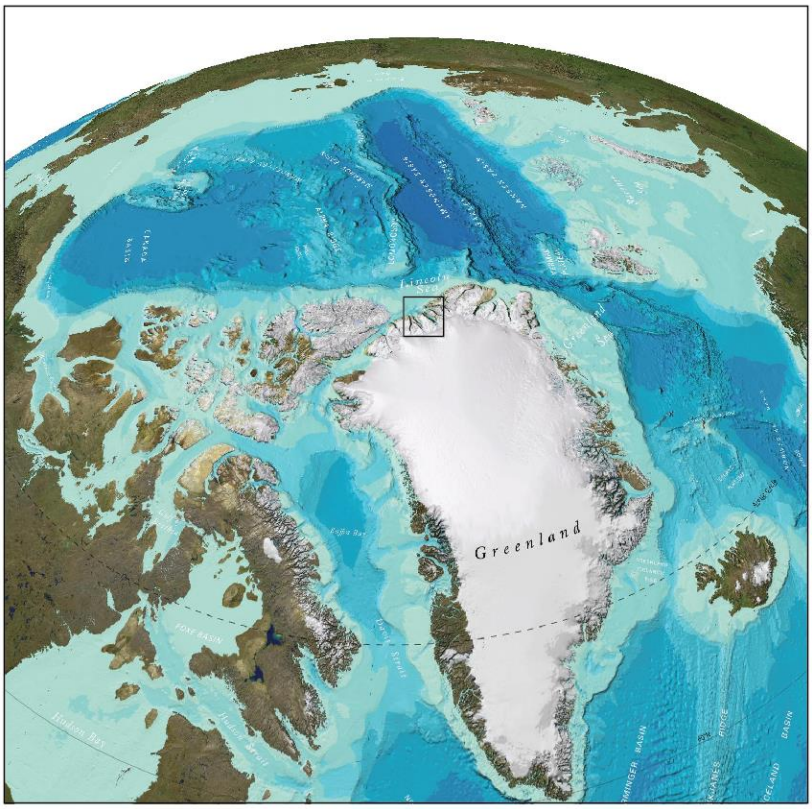
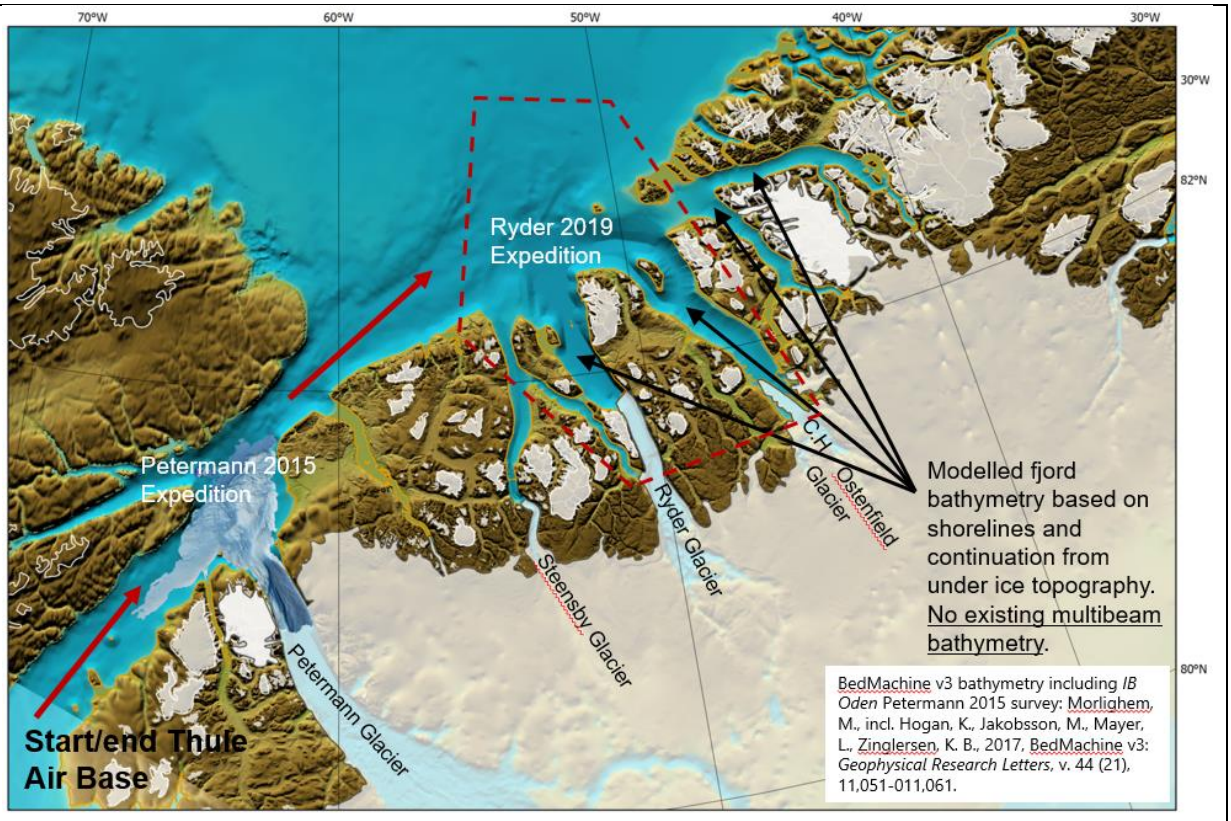
Request for support to the Ryder 2019 Expedition with Swedish Icebreaker Oden: Mapping for Seabed 2030

Expedition requesting support:	*Ryder 2019 Expedition* Chief Scientists: Martin Jakobsson and Larry Mayer
Vessel and mapping equipment:	Swedish Research Icebreaker Oden Length: 109 m; Beam: 31 m; Tonnage: 9438 GT; Ice class: DNV POLAR-20 (First non-nuclear icebreaker to reach the North Pole 1991) Mapping equipment: Kongsberg EM122, 1°×1°, 12 kHz deep water multibeam; Kongsberg SBP120, 3°×°3, 2-7 kHz sub-bottom profiler; Simrad EK80, 18 kHz, midwater split beam sonar on icebreaker Oden. Kongsberg EM2040 on RV Skidbladner; Pico Multibeam Sonar on Echoboat Autonomous Vehicle 
Scientific expedition focus (max 200 words):	The *Ryder 2019 Expedition* targets the yet unmapped marine region where the Ryder Glacier drains the northwestern sector of the Greenland Ice Sheet into the ocean. The *Ryder 2019 Expedition* is multidisciplinary with the main overarching goal of investigating patterns and causes of sudden dynamic changes of the Ryder Glacier and their implications for the mass balance of the northwestern Greenland Ice Sheet. The potential contribution to global sea-level rise from mass loss of the Greenland Ice Sheet in this marine sector is a key question considering the current trend of global warming. The behavior of the marine components of glaciers and ice sheets represents the single largest uncertainty in assessing the future of global sea-level rise. The *Ryder 2019 Expedition* has the potential to bring new critical

	base information from a yet uninvestigated marine region. For example, it is unknown if a bathymetric sill exist at the entrance of the Sherard Osborn Fjord where the Ryder Glacier drains, which is capable of protecting the glacier from inflowing warmer water that can exert melting of the glacier's margin consisting of a floating ice tongue.  *Schematic illustration of a floating ice tongue exerting a buttressing force to the feeding ice stream. The importance of knowing the seafloor bathymetry is obvious since a shallow sill can prevent warmer subsurface water from reaching the glacier, while the absence of a sill makes the glacier more vulnerable. The seafloor in front of Ryder Glacier is completely unknown.*

	 *The Ryder Glacier is located on northernmost Greenland where it drains the northwestern sector the Greenland Ice Sheet.*
Target area and logistics (include map of cruise plan below):	The *Ryder 2019 Expedition* will start/end from the Thule Air Base on Northwestern Greenland August 6/September 11, 2019. Mapping will be carried out continuously along the transit to and from the main target area. The expedition setup is based on the successful *Petermann 2015 Expedition* with Icebreaker Oden. In addition to geophysical mapping with Oden, the small (6.4 m long) multibeam equipped boat RV Skidbladner will be brought onboard for near shore mapping as well as an Autonomous Surface Vessel, the Echoboat, which can be transported to map inner fjords out of reach for the icebreaker Oden as well as map ahead of the icebreaker to ensure safe entrance into the fjords. The scientific program also includes geological coring, oceanographic stations, and water sampling. The expedition will involve about 40 scientists. Mapping is also planned to be carried out along the two 14 day each long transits between Southern Sweden and Northwestern Greenland. This transit will be planned to fill gaps in existing multibeam coverage across the Atlantic Ocean and along the western Greenland Continental Shelf.



Financing and requested funds:	**Primary support:** The expedition has base funding from the Swedish Polar Research Secretariat (SPRS). The total logistical cost of the expedition involving 36 days Thule-Thule and transit Sweden-Thule-Sweden is estimated to $4.5 M, which is $1.0 M more than the SPRS expedition budget. **Addition support**: The University of New Hampshire has contributed with $250 k. Stockholm University has provided $250 k to M. Jakobsson that can be used for the logistical cost of the expedition (mobilization, multibeam operators and ship time), however, under the condition that M. Jakobsson tries to recover these from external sources. **Incremental support requested for mapping:** We seek $200 k funding from Nippon Foundation to cover a part of the funding Stockholm University made available for the Ryder 2019 Expedition to M. Jakobsson. **How will the funding be used?** • $80 k will be used to cover logistical cost for the participation of the Stockholm University geophysical mapping crew, including sending multibeam operators on the two 14 day long transits between Sweden and Greenland. • $100 k will be paid to the Swedish Polar Secretariat to be used for ship cost. • $20 k will be allocated to create outreach material, including film, from the Ryder 2019 Expedition to promote the program to be initiated within Seabed 2030 aimed to facilitate mapping on planned expeditions.