

*Understanding past and
future of the Thwaites Glacier,
Antarctica*
with Frank Nitsche



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Thwaites Glacier

- Thwaites Glacier covers 192,000 square kilometres (74,000 square miles)—about the size of Florida or Great Britain—is particularly susceptible to climate and ocean changes.
- Computer models show that over the next several decades, the glacier may lose ice rapidly, as ice retreats. Already, ice draining from Thwaites into the Amundsen Sea accounts for about four percent of global sea-level rise.
- A run-away collapse of the glacier would contribute around an additional 65cm (25 inches) to sea-level rise over the coming centuries.

<https://thwaitesglacier.org/news/mission-begins-antarcticas-remote-thwaites-glacier>

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- 5-year, \$50 million joint U.S.-U.K. mission
- The 65-day voyage, led by scientists from the University of East Anglia (UEA), along with researchers and engineers from Sweden and the U.S., will investigate atmospheric and oceanic conditions close to Thwaites ice shelf, the floating part of Thwaites Glacier where it meets the sea.
- *Boaty McBoatface*, the state-of-the-art Autosub Long Range (ALR) vehicle operated by the National Oceanography Centre, will travel under the ice shelf along with *Ran*, a Hugin robot, from University of Gothenburg in Sweden, while six ocean gliders patrol the entrances and exits to the ice shelf cavity. The fleet will explore largely uncharted territory, to measure geometry and melting processes, the seafloor below, the ice thickness above and water properties in between.
- <https://thwaitesglacier.org/news/mission-begins-antarcticas-remote-thwaites-glacier>



Boaty McBoatface^{[2][7]} (also known as **Boaty**)^{[1][6]} is the British lead boat in a fleet of three robotic of [lithium battery](#)–powered [autonomous underwater vehicles](#) (AUVs) of the Autosub Long Range (ALR) class.^{[1][5]} Launched in 2017 and carried on board the polar scientific research vessel [RRS Sir David Attenborough](#), she is a [focal point](#) of the Polar Explorer Programme of the [UK Government](#).

[Boaty McBoatface - Wikipedia](#)

RAN

- <https://www.kongsberg.com/maritime/products/marine-robotics/autonomous-undhttps://www.kongsberg.com/maritime/products/marine-robotics/autonomous-underwater-vehicles/AUV-hugin/erwater-vehicles/AUV-hugin/>

- **1. Thwaites is the widest glacier on Earth, at ~120 km (~80 miles) wide.**
- Its fastest flowing grounded ice is centred between 50 and 100 km (31 and 62 mi) east of Mount Murphy on the north coast of West Antarctica. (Source: *Elevation Map of Antarctica (REMA)*, Howat et al., 2019, *The Cryosphere*)
- **2. Thwaites Glacier Basin measures 74,000 mi² or 192,000 km² (Source: Rignot 2019, PNAS)**
- It is larger than England, Wales and Northern Ireland put together (England, Wales and Northern Ireland have a combined area of 164,000 km²),
- And roughly the size of the island of Britain (Great Britain is 209,000 km²).
- It is larger than US state of Florida (Florida covers an area of 170,000 km²).
- **3. Thwaites glacier is between 800 and 1200 metres deep at its grounding line**



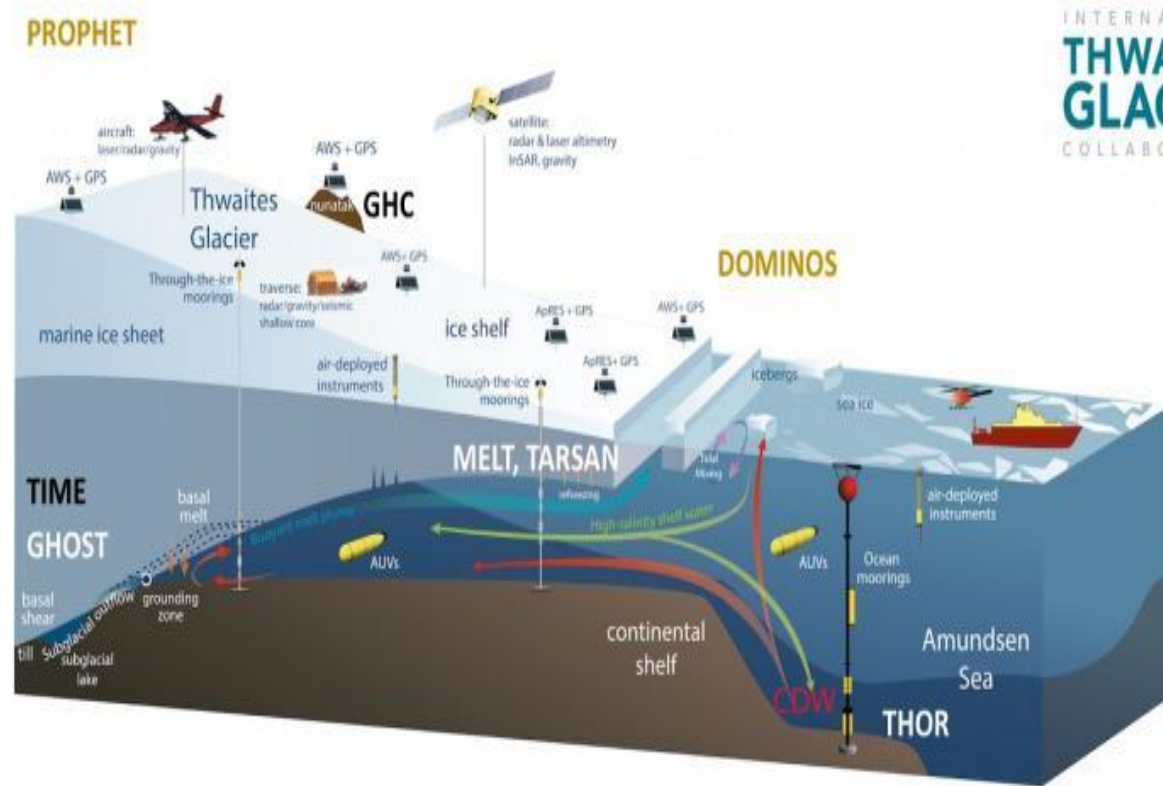
<https://thwaitesglacier.org/about/facts>

- **4. Thwaites Glacier is part of the West Antarctic Ice Sheet (WAIS).** The area of WAIS is approximately 3,435,000 km².
- **5. Thwaites Glacier is roughly equidistant between the UK's Rothera Research Station and the US McMurdo Research Station.** The Thwaites region of West Antarctica is due south of the western US, 7000 miles away.
- **6. If Thwaites Glacier was to collapse entirely, global sea levels would increase by 65 cm (25 in)**

- **7. Thwaites Glacier ice loss currently contributes around 4% of all global sea-level rise**
- **8. If Thwaites Glacier continues to accelerate, retreat, and widen at rates consistent with recent changes**, it could contribute several cm to sea-level rise by the end of the century. Collapse of the glacier would require a few centuries.
- **9. Annually Thwaites is losing about 50 billion tons of ice more than it is receiving in snowfall.**
- **10. Since 2000, the glacier has had a net loss of more than 1000 billion tons of ice.**
- **11. The amount of ice loss has doubled over the last 30 years by Thwaites and its neighbouring glaciers.**

- Hence the concern and need to understand what has and might happen.

The Thwaites Project: 8 targeted multi-disciplinary research proposals

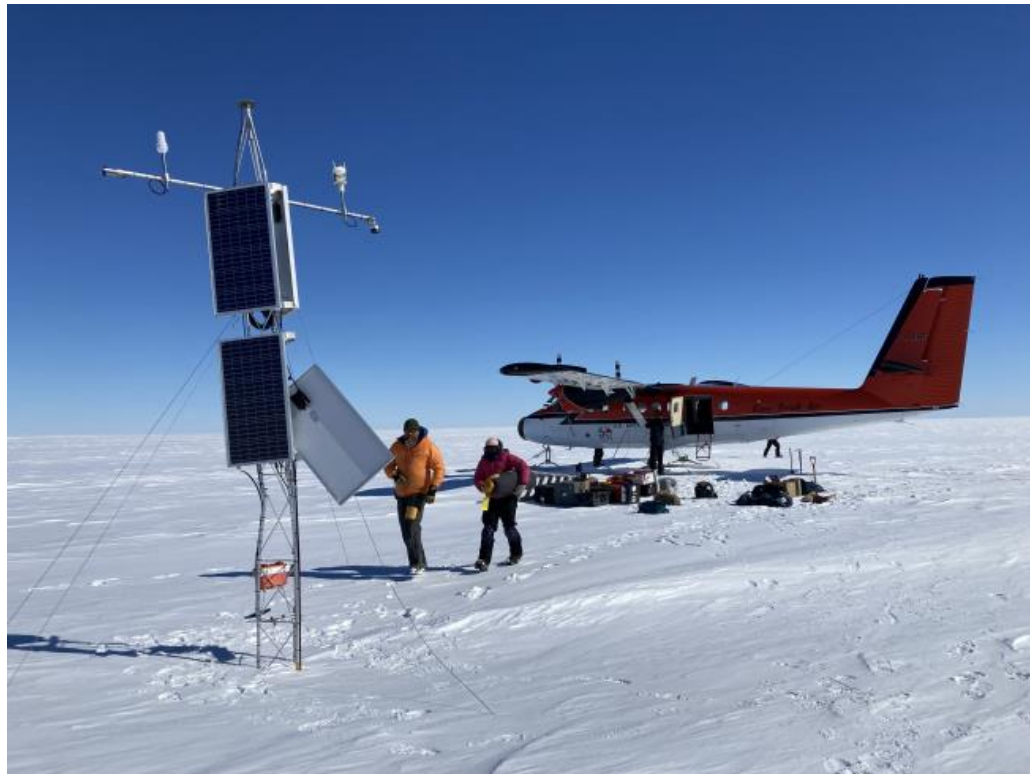


Scambos, Bell, et al., 2017 Global Planet. Change

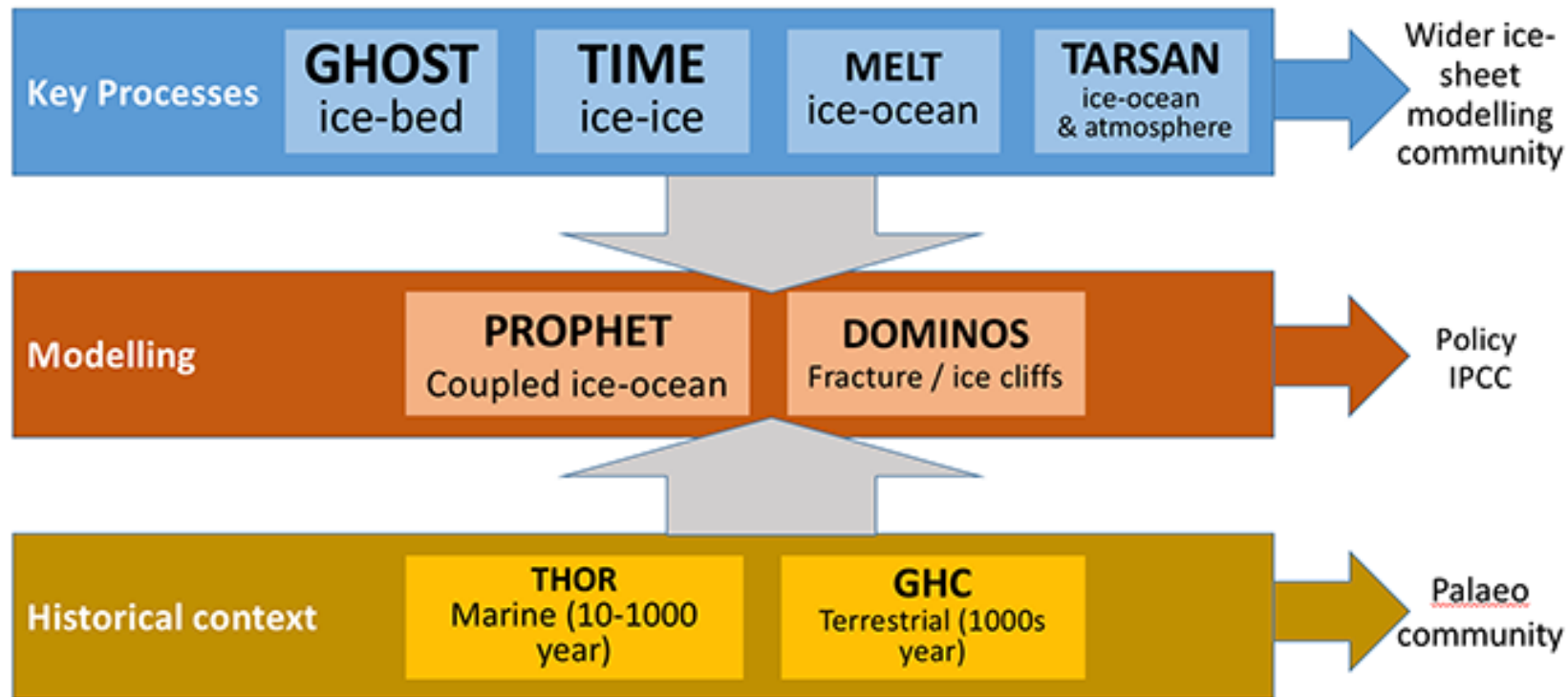
- [Disintegration of Marine Ice-sheets Using Novel Optimised Simulations \(DOMINOS\)](#)
- [Geological History Constraints on the Magnitude of Grounding-Line Retreat in the Thwaites Glacier System \(GHC\)](#)
- [Geophysical Habitat of Subglacial Thwaites \(GHOST\)](#)
- [Melting at Thwaites grounding zone and its control on sea level \(MELT\)](#)
- [Processes, drivers, Prediction: modeling the History and Evolution of Thwaites \(PROPHET\)](#)
- [Thwaites-Amundsen Regional Survey and Network Integrating Atmosphere-Ice-Ocean Processes \(TARSAN\)](#)
- [Other Projects](#)

<https://thwaitesglacier.org/projects/thor>

By land, sea, and air



International Thwaites Glacier Collaboration



<https://thwaitesglacier.org/about/itgc>