

# “Direct” observations of ice shelf basal melt rates

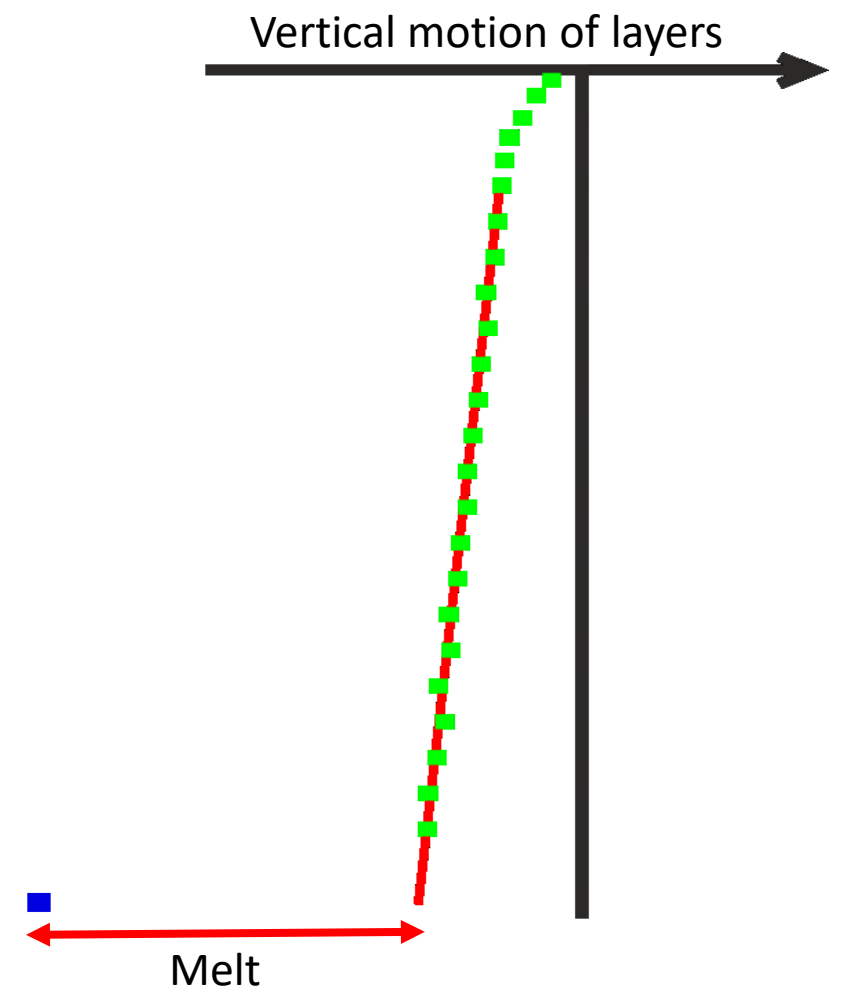
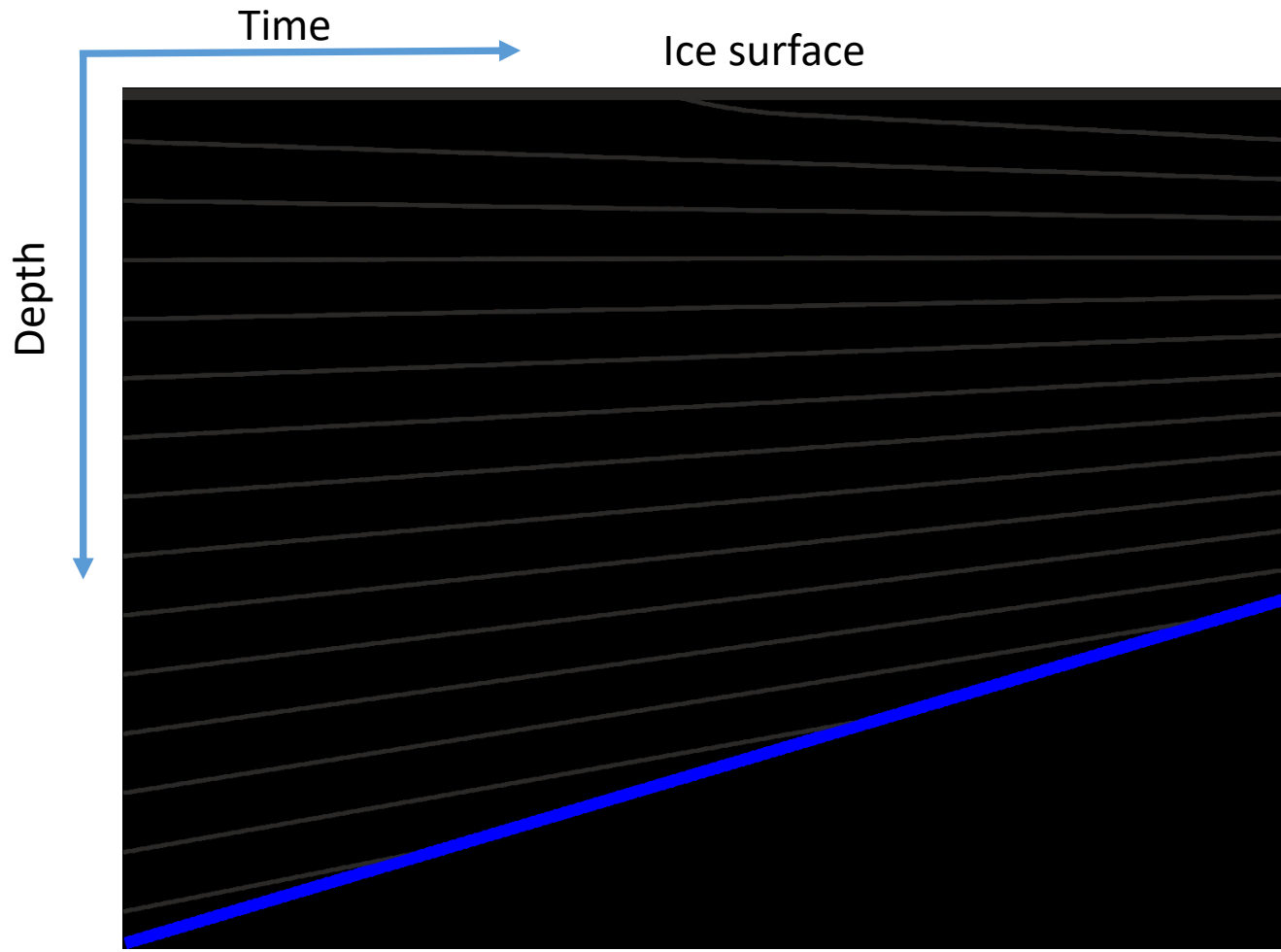
- How do we collect direct obs of melt rates?
- Why do we want direct obs?
- Where are we now?
- The NECKLACE website

Keith Nicholls, British Antarctic Survey,  
and the NECKLACE project team

## How do we observe basal melt rates?

Majority by ApRES (Autonomous phase-sensitive Radio EchoSounder)

- The radar is deployed on the ice surface
- Every hour or two it measures the range between antennas and ice base
- .....also ranges to internal layers within the ice column

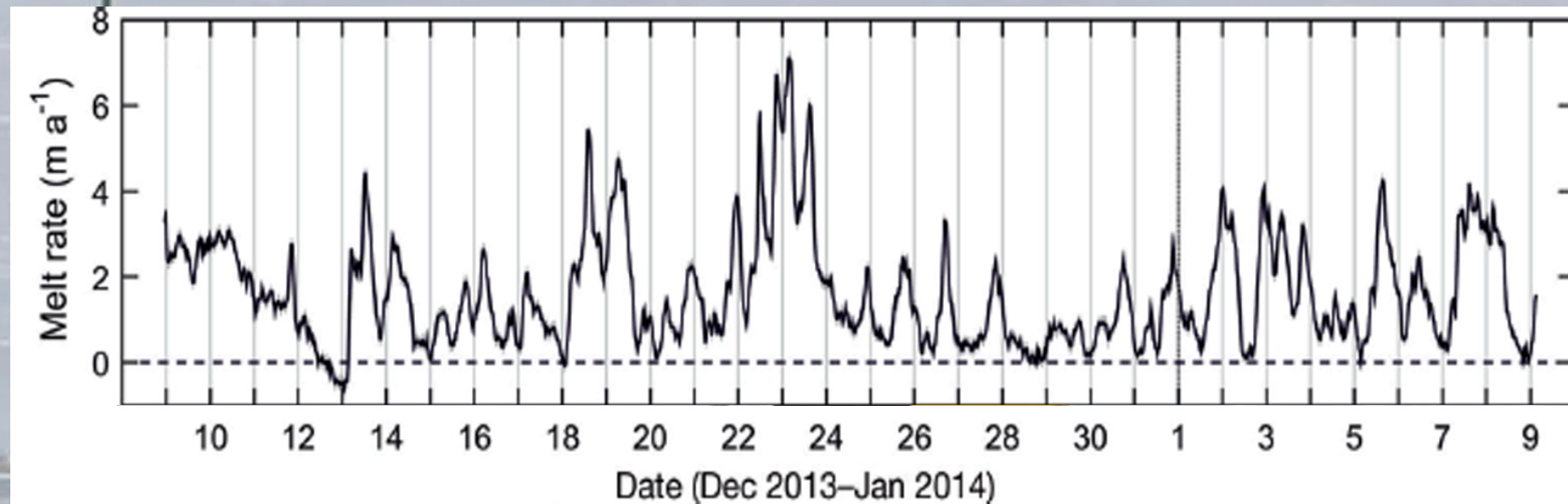


Time series typically of a year or more

Temporal resolution of a few days, or longer depending on the ice

First time series was collected by Craig Stewart from

Coulman High, Ross Ice Shelf, in 2013-14



## Why use field-based methods if satellite-derived melt rates (SDM) available?

### Advantages of direct obs over SDM

- Fewer assumptions – nr grounded ice
- High temporal resolution
- Point measurement (eg cf sub-ice obs)

### Disadvantages

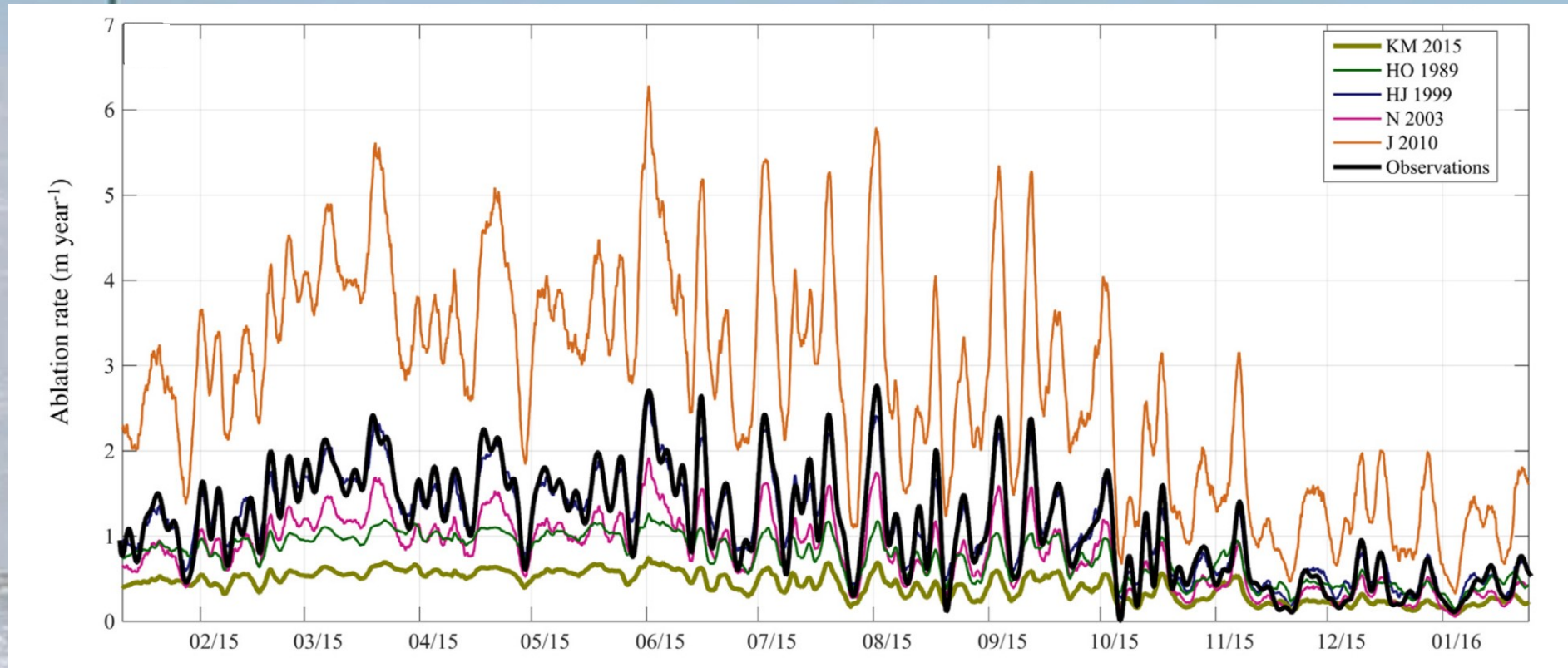
- Logistics & costs
- Can't do accretion areas
- Point measurement

### Point is that direct measurements can:

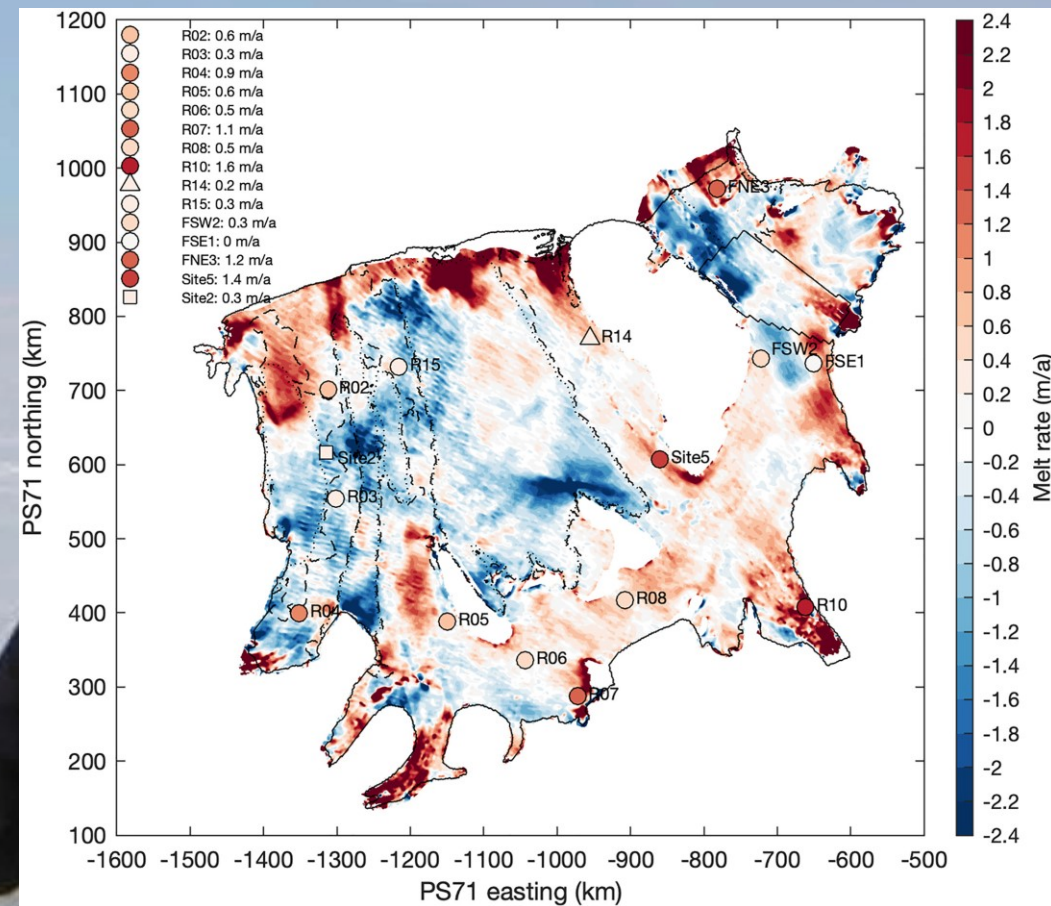
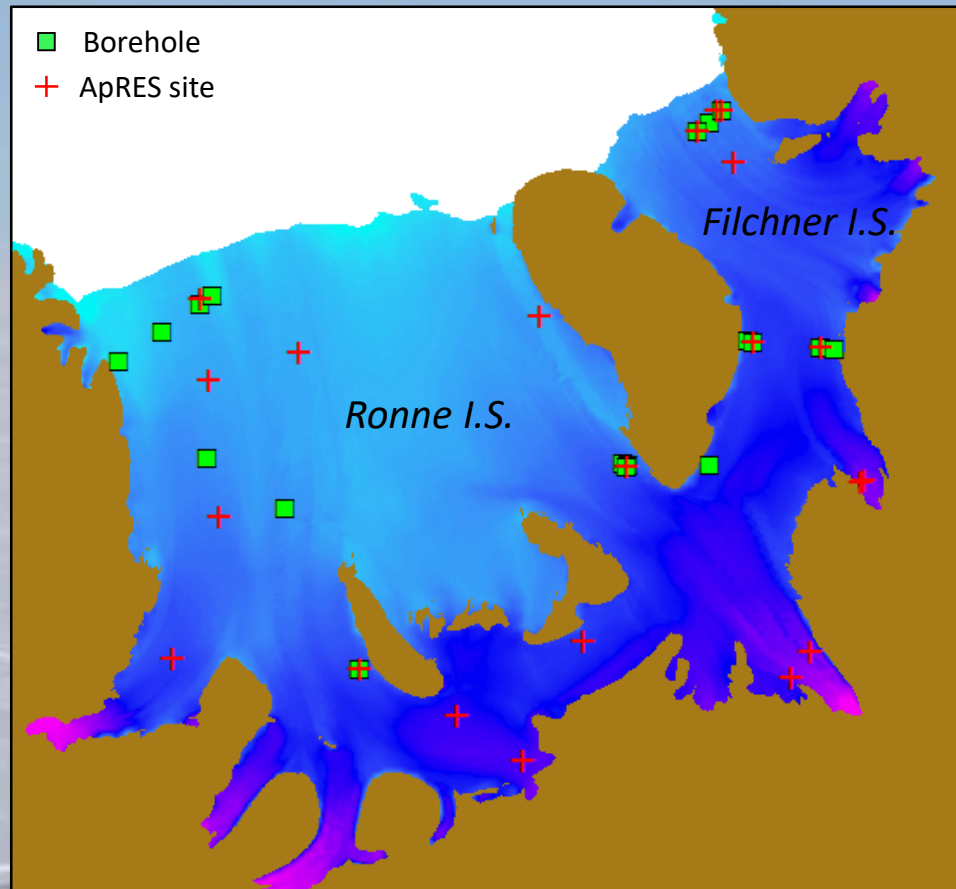
- Aid satellite-derived MR (Cal/Val)
- Provide validation/optimisation for models

## 12 months of data from Ronne Ice Shelf (Site 5)

- Ocean data from moored instruments
- Melt rate data from ApRES

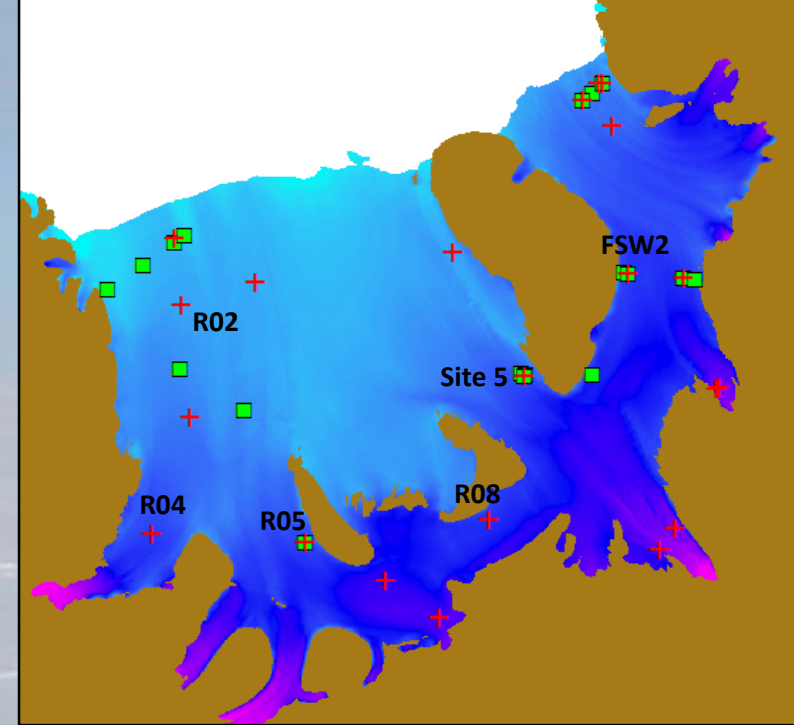
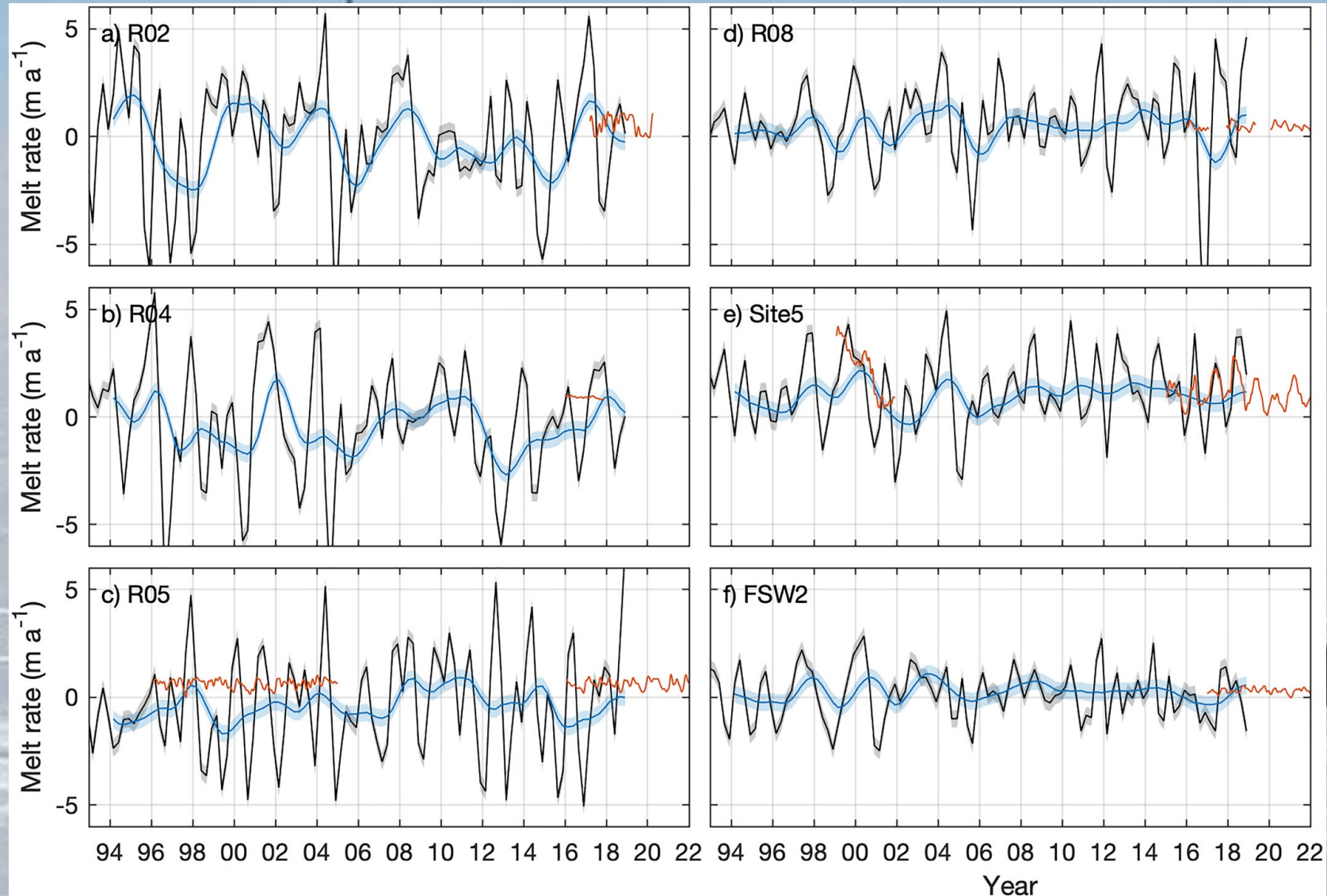


Malyarenko et al 2020



Vaňková and Nicholls 2022  
 (Sat derived MR from Adusumilli et al 2019)

# Comparison of time series data



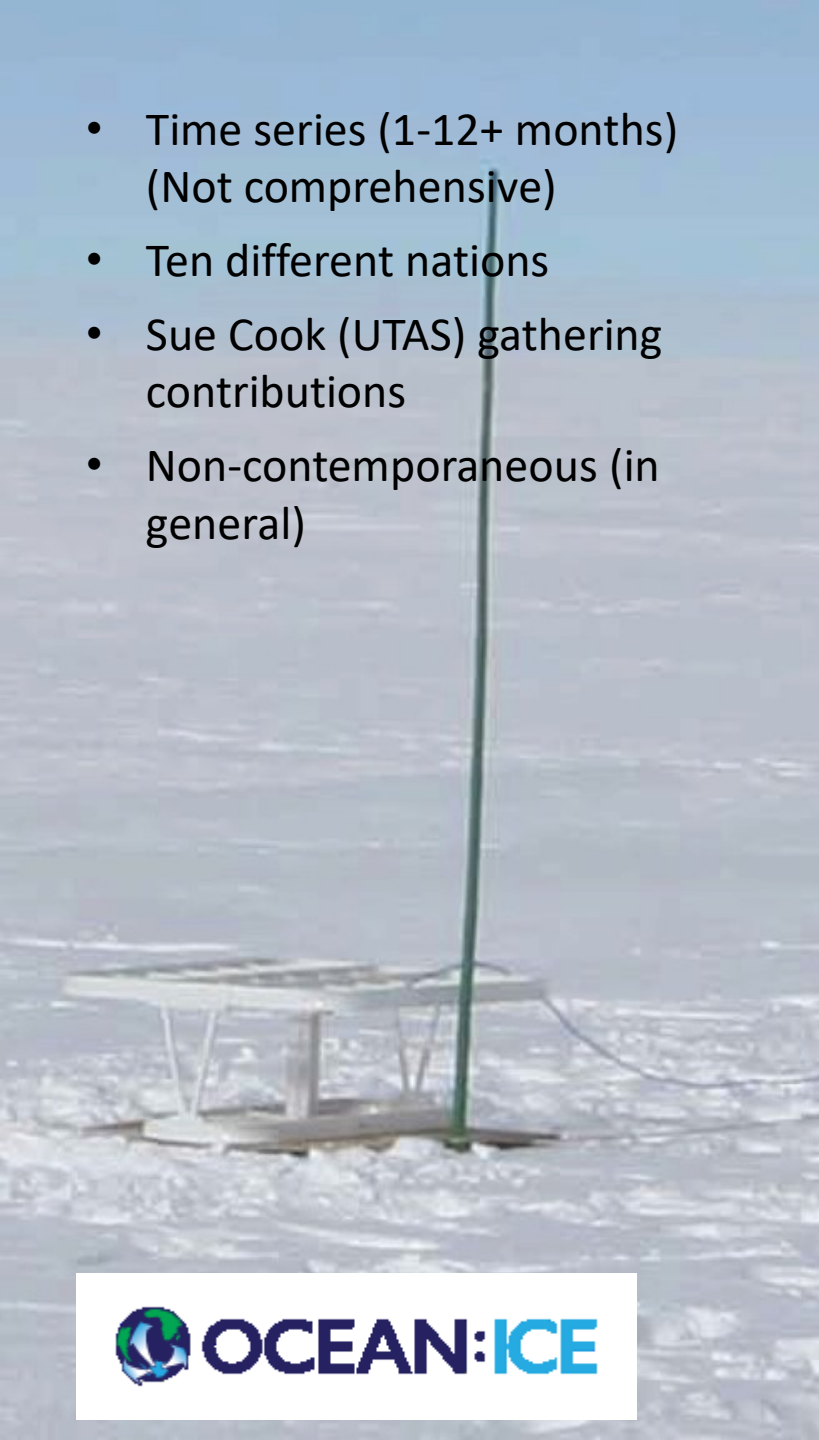
Black: 3-monthly SDM  
Blue: 3-yearly SDM  
Red: Direct observation

Vaňková and Nicholls 2022

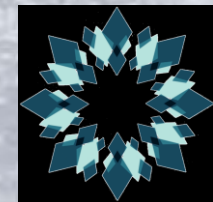


The NECKLACE project: a SOOS-endorsed initiative to collect and collate **time series** of **in situ** observations of basal melt rates from Antarctic ice shelves

- Time series (1-12+ months)  
(Not comprehensive)
- Ten different nations
- Sue Cook (UTAS) gathering contributions
- Non-contemporaneous (in general)



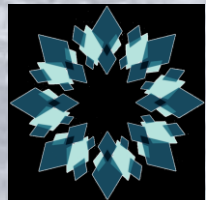
Groups from 10 nations



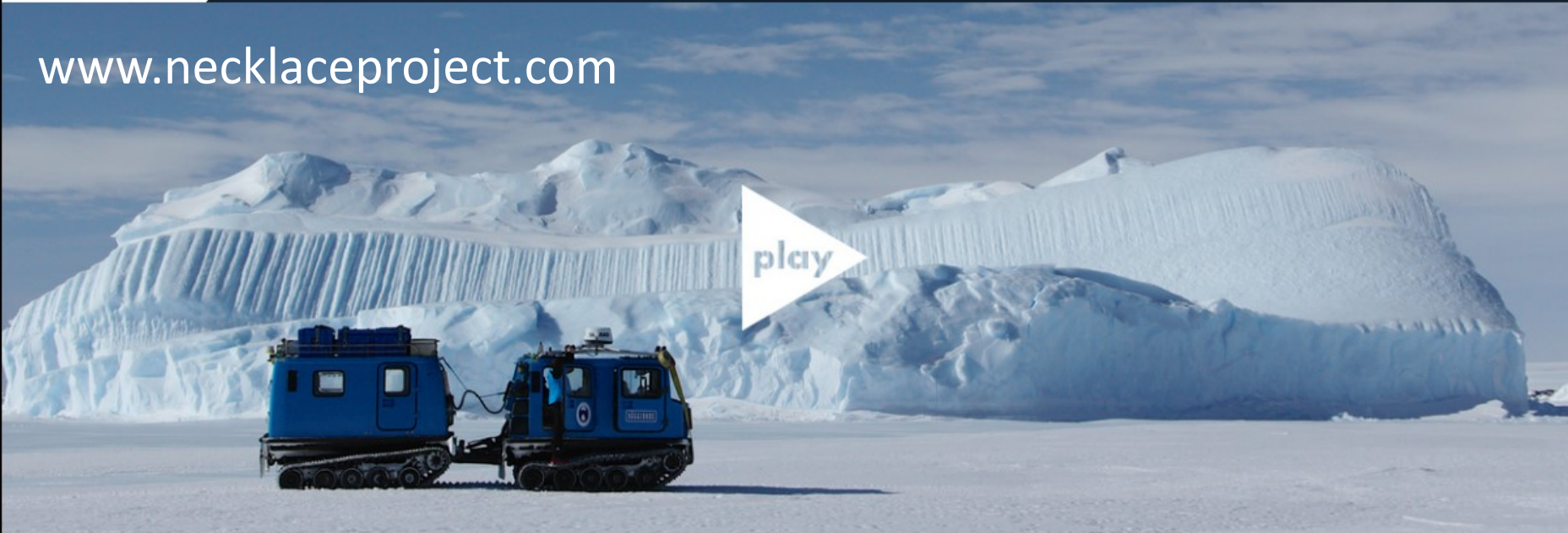
## NECKLACE website

Funding obtained for website: <https://necklaceproject.com>

- Technical information about deploying instruments
- Firmware
- Documentation (manuals etc)
- Links to data (soon)
- Processing scripts (soon)



[www.necklaceproject.com](http://www.necklaceproject.com)



Melting underneath the floating ice shelves around Antarctica is one of the most important but hardest to observe processes driving mass loss from the ice sheet. Measuring this melt is key to understanding and predicting the continent's future.

The NECKLACE project seeks to collate data on ice shelf melt, gathered by research teams around the world. Results are standardised and collated into a single data product that can be used by glaciologists, oceanographers, and ice sheet modellers to compare with their own results. By building on each team's individual effort, we aim to create a continent-wide, open-access data product.

NECKLACE is supported by the following partners:



Cook, S., Nicholls, K.,  
Vaňková, I., Thompson, S., &  
Galton-Fenzi, B. (2023). Data  
initiatives for ocean-driven  
melt of Antarctic ice shelves.  
*Annals of Glaciology*, 1-6.  
doi:10.1017/aog.2023.6

