



# The importance of wind on East Antarctic ice shelf stability

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## 1. Project framework

- Importance of ice shelf dynamics in Antarctic mass balance
- Impact of the firn conditions on the “health” of these ice shelves
- Effect of wind on the firn conditions and emergence of blue ice areas not well known and modeled

## 2. Setting

The study area is the King Baudouin ice shelf, located in Dronning Maud Land, East Antarctica. It extends ~100 km towards the ocean and is constrained by two ice rises.

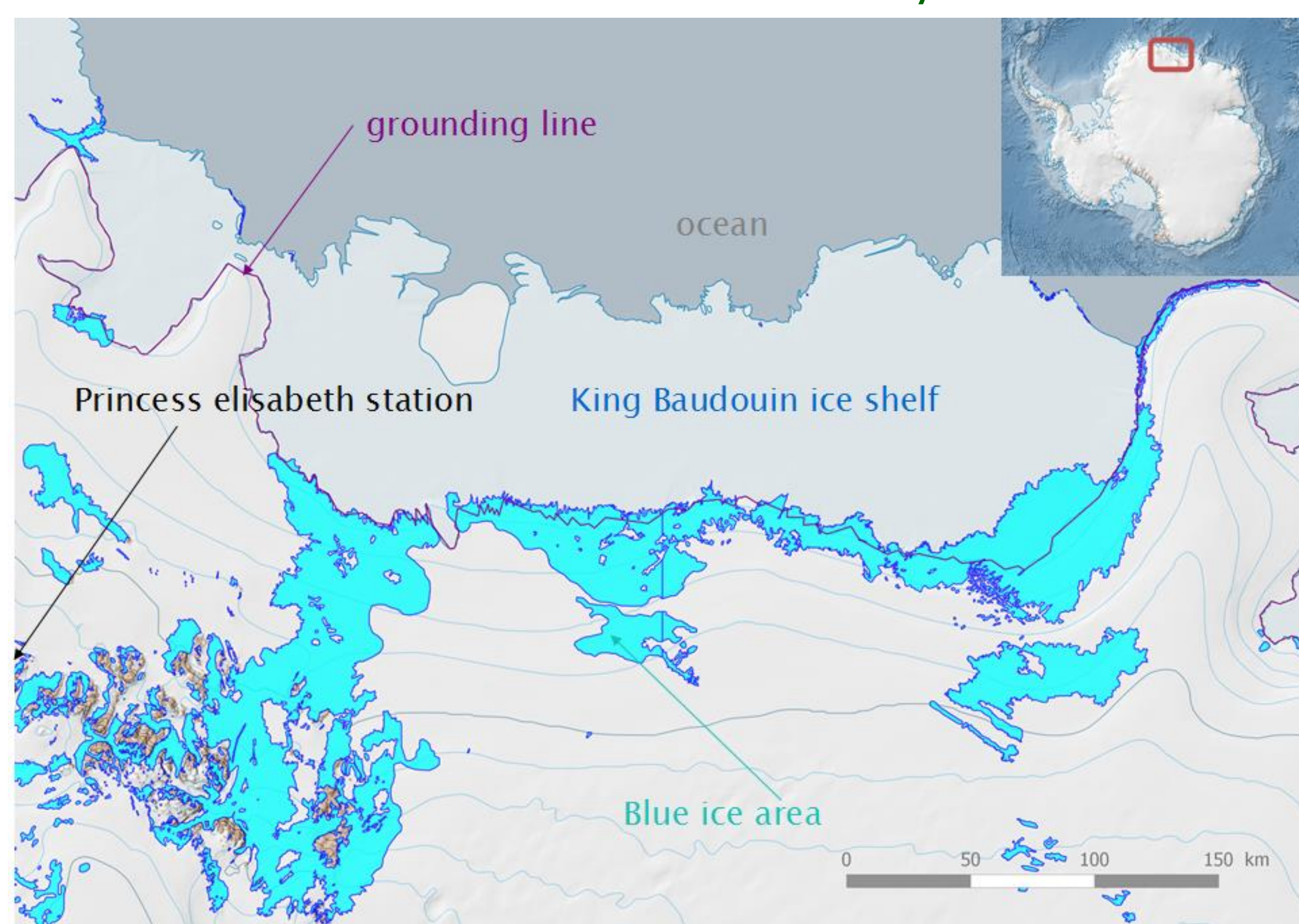


Fig 1: The King Baudouin Ice shelf, and blue ice areas  
Upper inset: the location of the ice shelf in Antarctica

The area is prone to the emergence of blue ice, due to the strong down slope winds induced by steep surface slope from the center of Antarctica towards the coast and ice shelves.

## 3. Why study drifting snow?

Fig 2: Drifting snow event, 22.04.2016 at the princess Elisabeth station. Picture recorded by the webcam around 10h00.



The wind relocates snow particles at the surface of the ice sheet. This has an impact on the surface energy balance and surface melt of the ice. In addition, the relocation of drifting snow particles and sublimation locally lead to the emergence of blue ice areas. These have a lower albedo than snow, that invoke a positive feedback enhancing local surface melting, common in the vicinity of ice shelves grounding line, leading to firn air depletion process. The latter could be a strong decadal pre- conditioning of ice shelf collapse due to hydrofracturing .

## 4. Method

- Use of unprecedented long-term ground observations from the cloud observatory set up at the Princess Elisabeth station (72°S -23°E)
- To parameterize and include drifting snow physics in a non-hydrostatic, high-resolution Regional Climate Model, coupled to a multi-layer snowpack model.

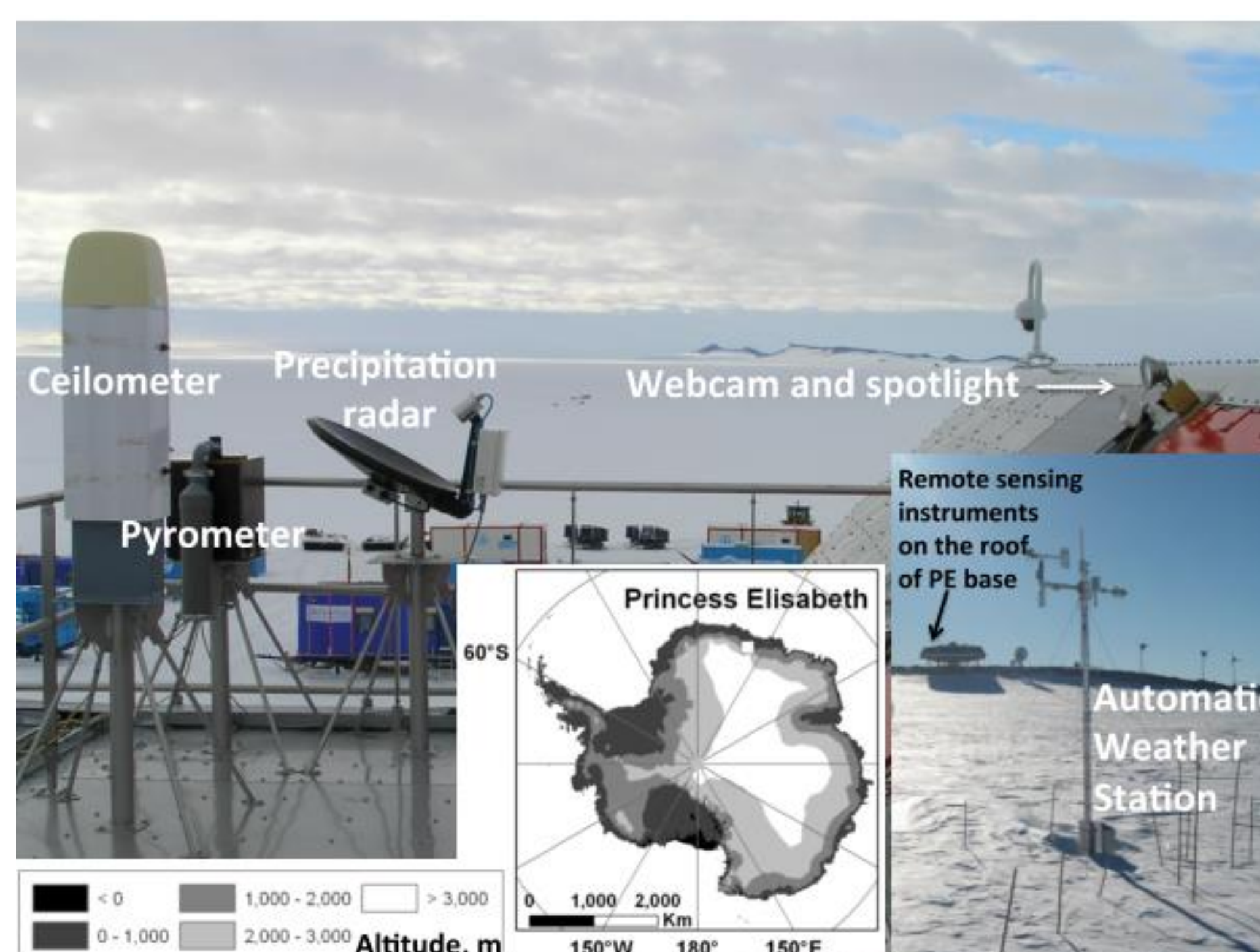


Fig 3: the clouds observatory set up at the Princess Elisabeth station.

## 5. The research questions

- (1) How can we combine different measurements (satellite and ground-based) for the study of snow drift and related drifting snow sublimation?
- (2) How can we use this knowledge to evaluate and improve the performance of the coupled CLM model for snowdrift events and assess the ability to reproduce blue ice on the Antarctic ice sheet?
- (3) Based on the previous, how can we gain a better understanding of the role of drifting snow on the existence of blue ice areas and their role in surface melt over the ice shelves?
- (4) How do the blue ice areas surface melt impact the firn thickness and ice shelf health, and related effects on ice shelf basal melt and dynamics?

## References

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