

# A new hydrodynamic model for terrestrial run off in West Antarctic Peninsula

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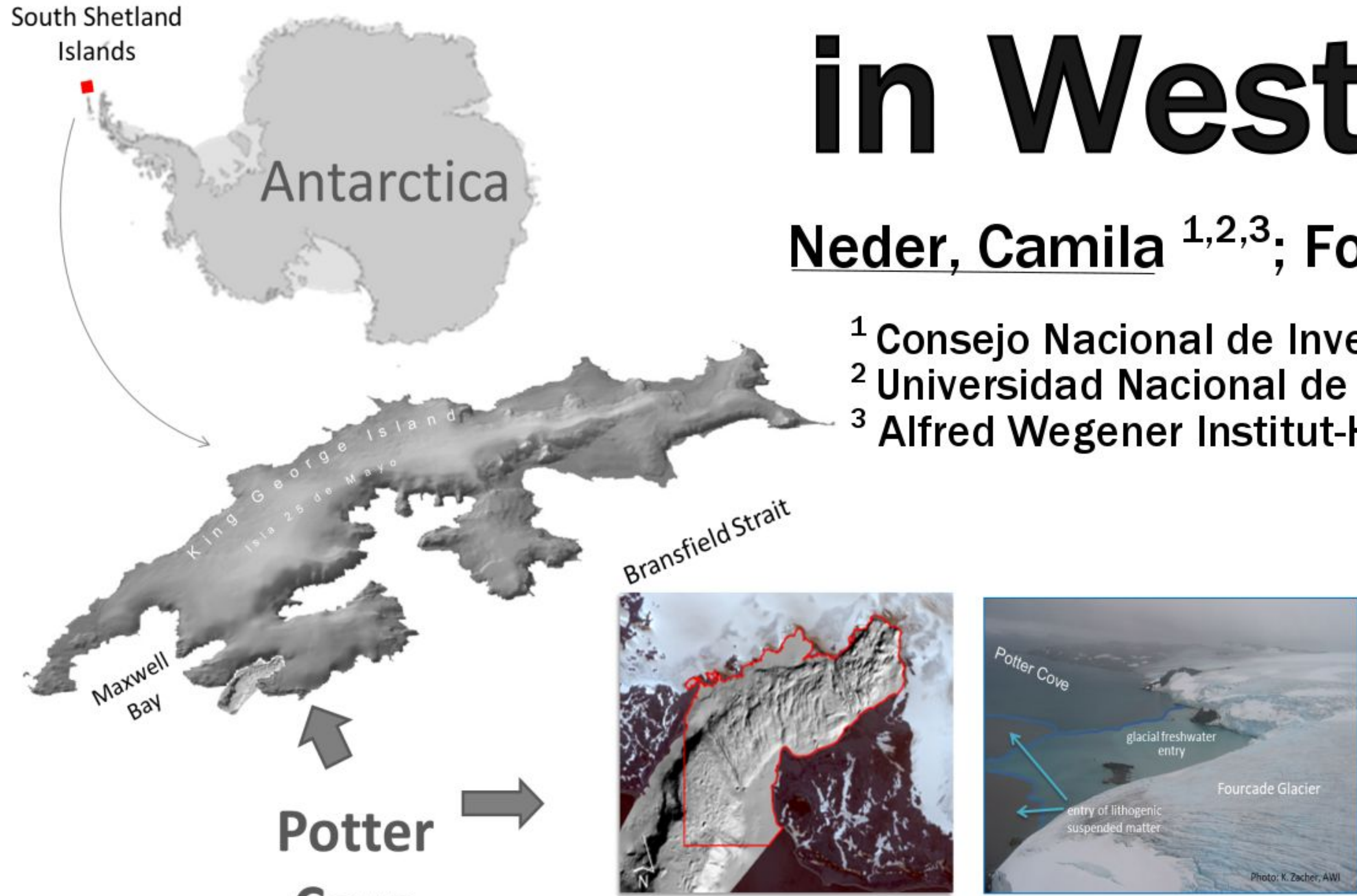
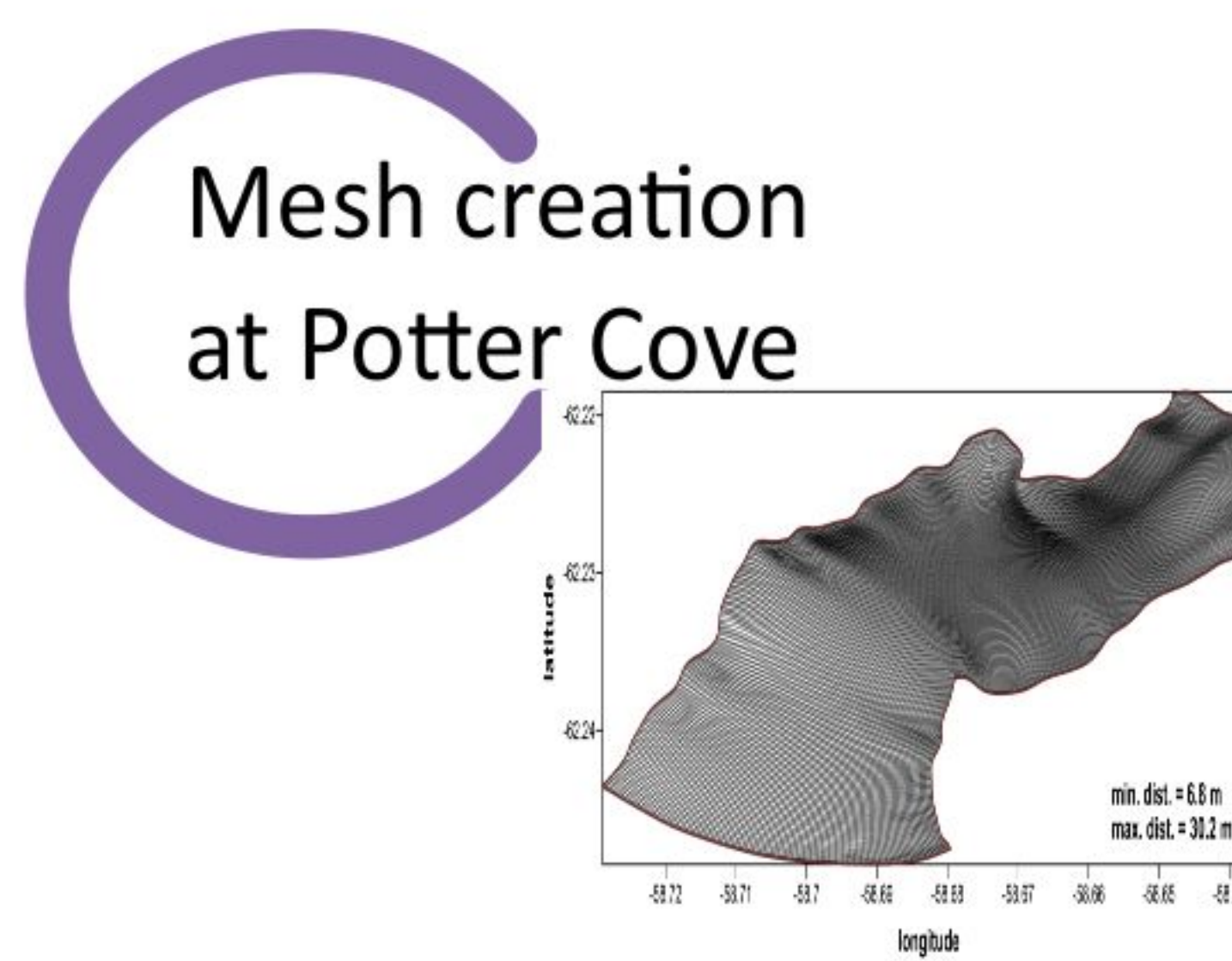


Fig. 1: Jerosch et al 2018, modified<sup>1</sup>.

## FESOM- C MODEL

Is a numerical model applied to coastal simulations (Fofonova et al.2018) 6 which relies on the Finite-volume Sea ice - Ocean Model (FESOM2). Differences:

- an unstructured-mesh of triangles and quads
- it follow the terrain in vertical coordinate
- it works on hybrid meshes improving efficiency scaling quantities at mesh vertices and the horizontal velocities at the centre of the cell
- it combine smooth changes among coastlines FESOM-C scales



FESOM-C application

Values calculation at each cell

Equations based on conservation laws  
 Momentum  
 Mass

Forcing to study

Tide transport

Tide mixing

Coriolis simulation + Tide source data + Wind direction and speed data + Meltwater input flow 11hm<sup>3</sup>/90 days in 4 streams

Analysis on **SPM tracer** explain the dynamic of the system without extra forcing showing that particles (green and red) are retained longer time in the inner cove meanwhile other (pink) are accumulated in Potter Peninsula coast-

## BACKGROUND

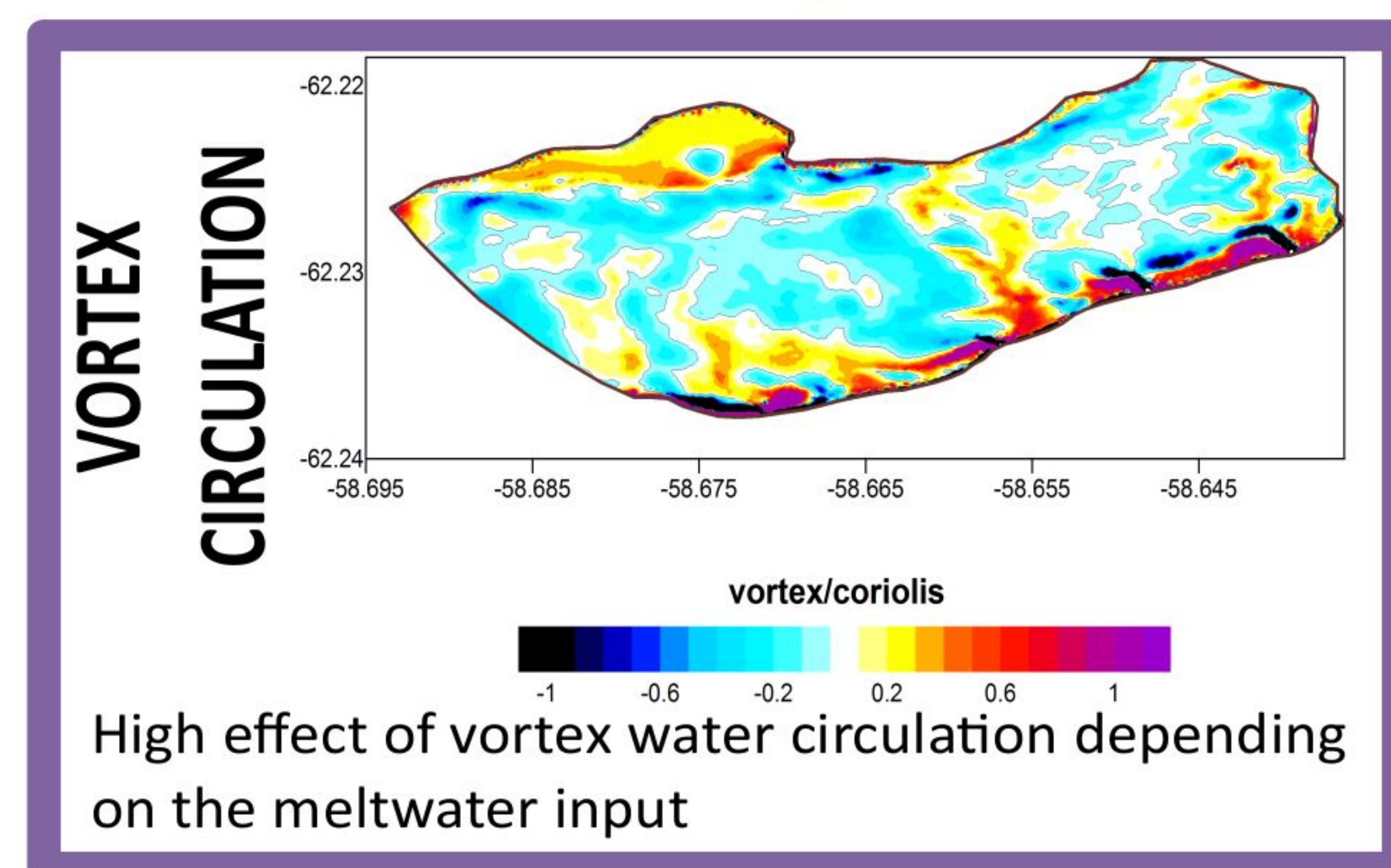
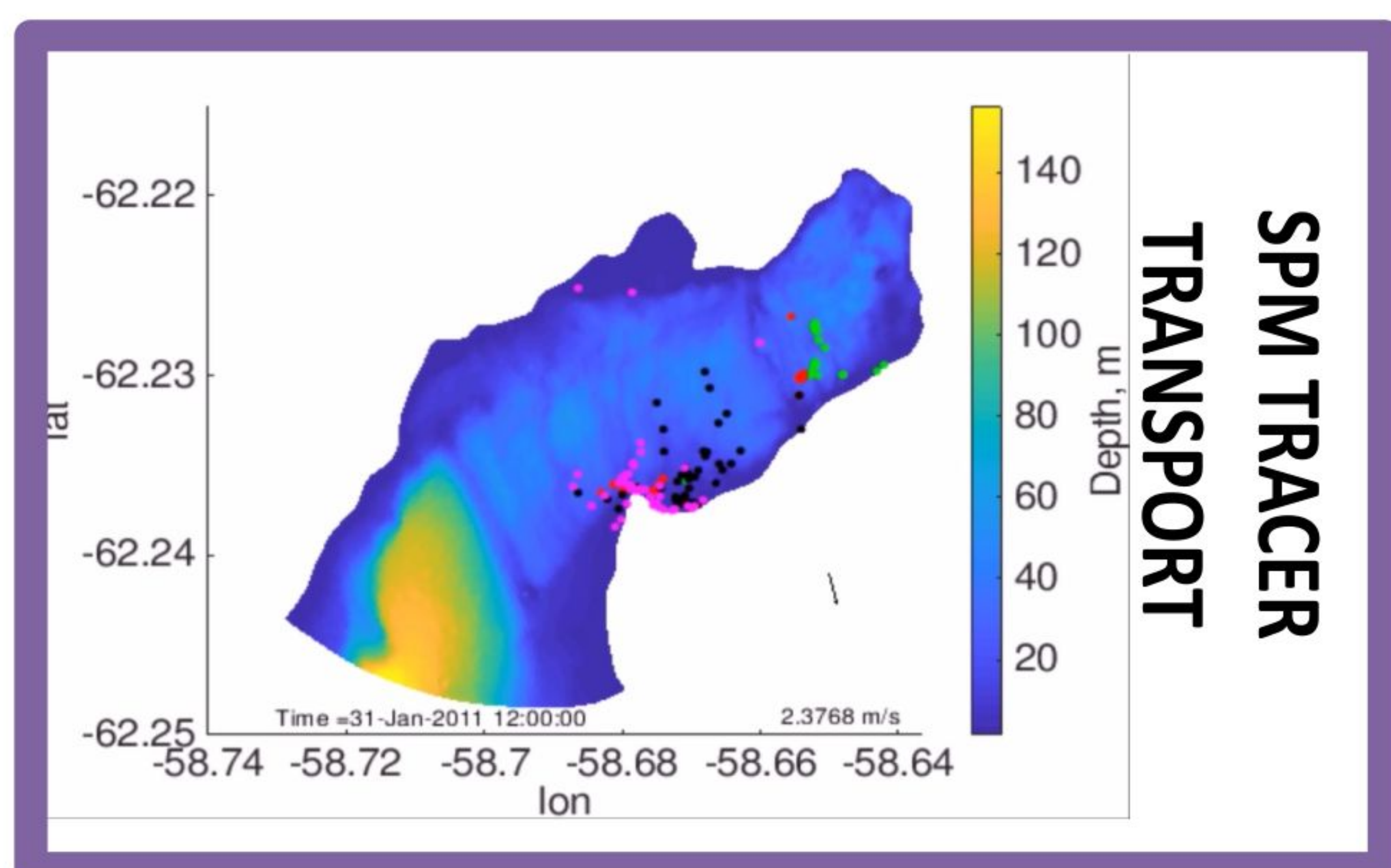
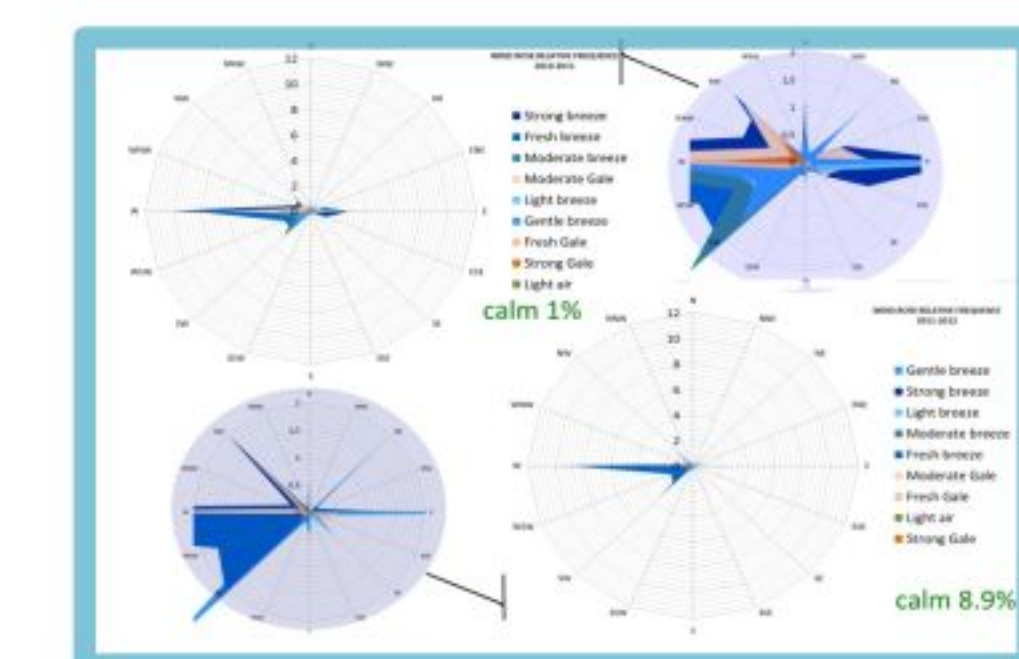
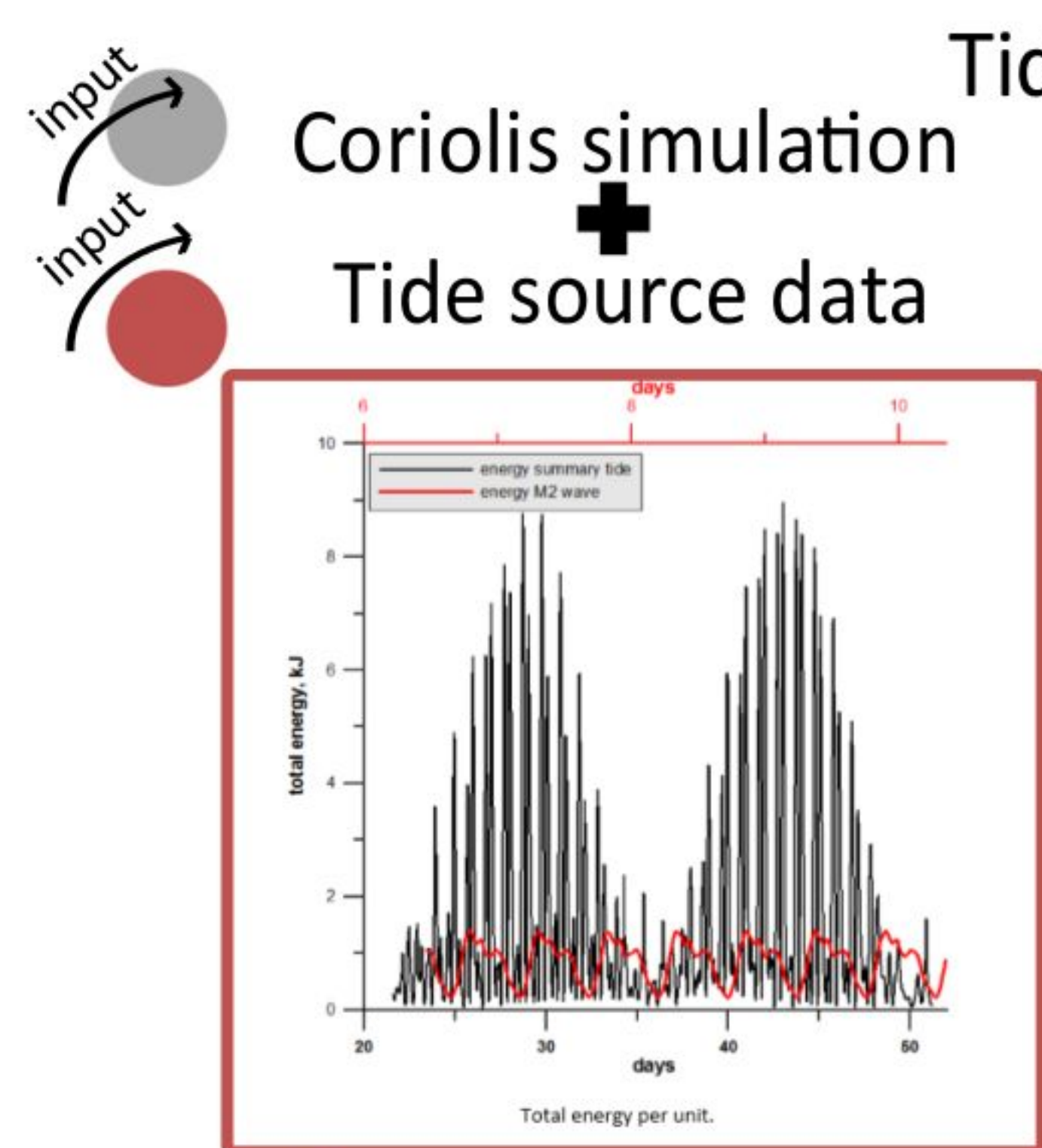
Rapid frontline retreat and melting of tidewater glaciers along the Antarctic Peninsula cause surface erosion resulting in a washout of suspended particulate matter (SPM) into coastal surface water (Fig. 1).

- affecting light availability and increasing turbidity (Monien 2014)<sup>2</sup>
- organic matter concentrations (Monien 2014)<sup>2</sup>
- species distribution and abundances (Lagger et al. 2017)<sup>3</sup>
- community structure (Sahade et al. 2015)<sup>4</sup>

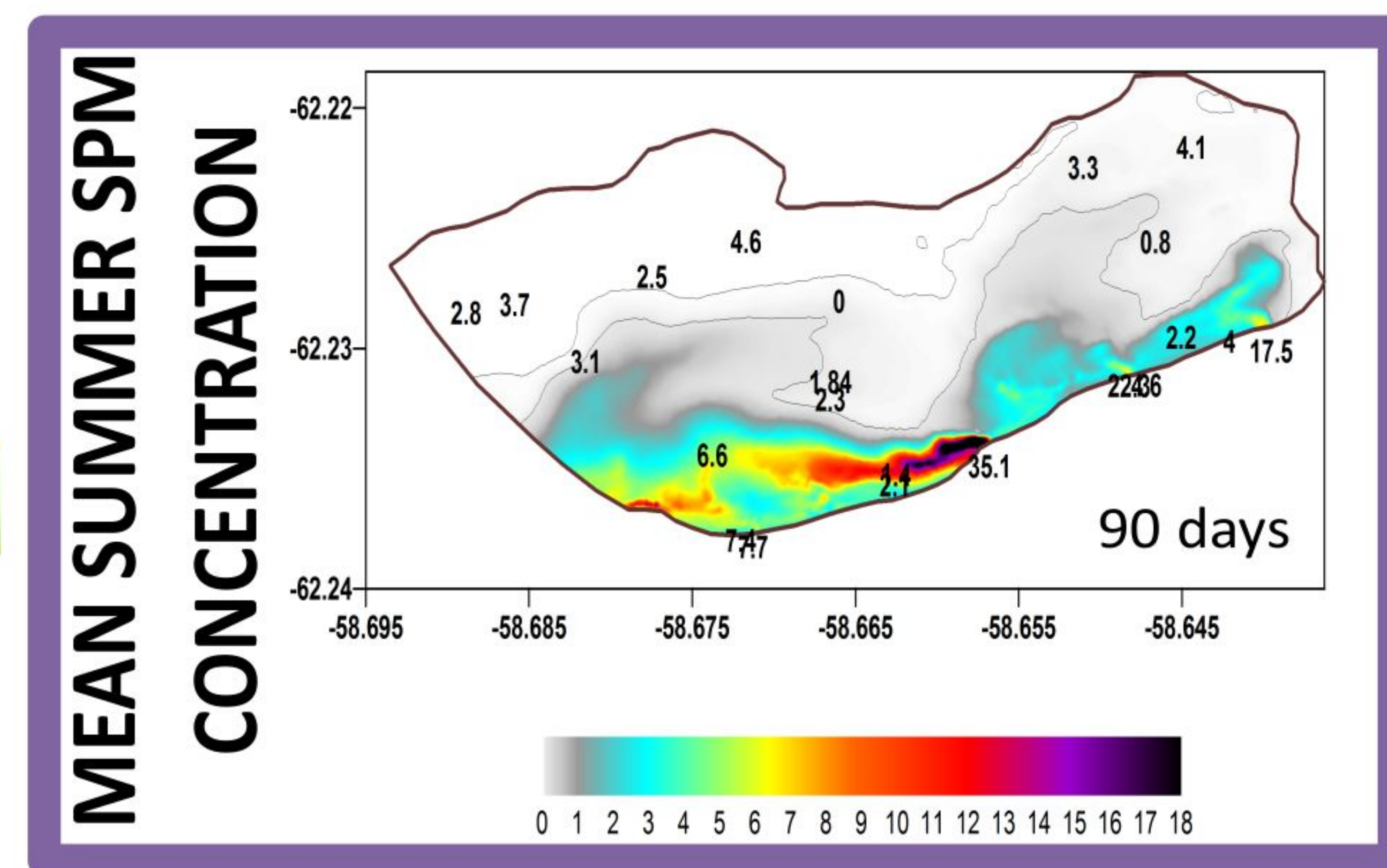
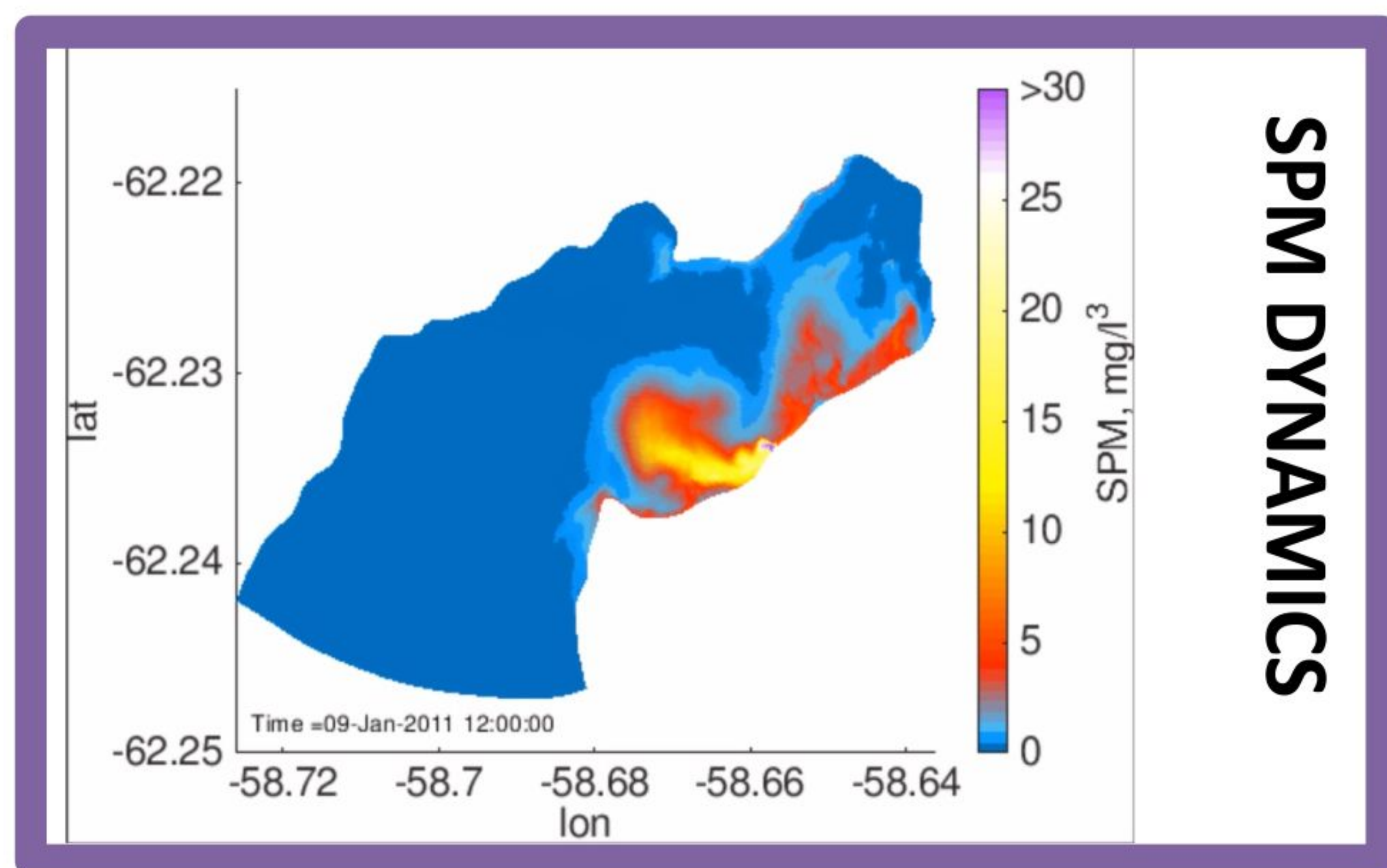
In Potter Cove, a fjord of ~8.5km<sup>2</sup> surface area meltwater streams transport is estimated in 23000-39000 tons/years (Monien et.al 2017)<sup>5</sup>.

We **aim** to model the spatial dynamics of the sediment plume in Potter Cove based on SPM circulation.

As final result, the **dynamic of SPM** is explained over a typical summer period based on measured data during summer 2010/2011. Eroded input sediment varies in spatial expansion due wind and tide showing higher SPM impact in the East coast reaching in some occasion the inner West coast.



2nd forcing. Specific forcing on SPM equation



Meltwater stream discharge data + Input SPM particle characteristics (size <0.063mm and pore water >40%) + SPM concentration in 28 stations

References:  
 1. Jerosch K, Peltke H, Schaff F, Weber L, Braun MH, Abele D. Benthic meltwater fjord habitats formed by rapid glacier recession on King Subject Area - Philosophical transactions of the Royal Society A. 2018;376: 201706.  
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 6. Fofonova V, Danilov S, Rakovsky N, Kuznetsov I, Witthore KH, Androsov A, et al. FESOM-C: coastal dynamics on hybrid unstructured meshes. Geoscientific Model Development Discussions. 2018;20(4):1-32.

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