The Antarctic Peninsula Föhn Wind-induced Melt Regime from 1979-2018

Objective

- Use AWS observations to train a machine learning (ML) model to identify the föhn signature in ERA5 reanalysis and RACMO2 output.
- Quantify the spatial and temporal extent, drivers, evolution of föhn-induced surface melt from 1979-2018.

Approach

- Created a Föhn Detection Algorithm (FonDA) to identify föhn wind events in AWS data.
- We use XGBoost Gradient Boosting decision tree Machine Learning.
- We use AWS identified föhn events to train two Machine Learning models to identify föhn in ERA5 and RACMO2 output.

Impact

- These results will be used to assess the fidelity of climate model (E3SM) simulations of the causes of melt and freshwater ocean inputs around the Antarctic Peninsula.
- The findings in the study provide the first long-term and spatial melt estimates of föhn wind-induced surface melt on the Antarctic Peninsula and will be used to evaluate the fidelity of climate simulations.
- The use of weather stations to inform a Machine learning model to identify when and where föhn winds occur represents the first use of machine learning with ground based data to inform model output, and a useful tool for climate analysis.

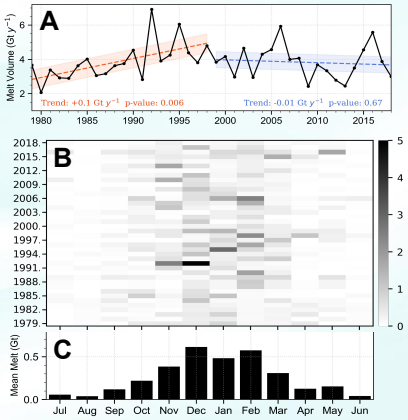

Figure: (A) Annual föhn-induced meltwater volume. (B) RACMO2 monthly meltwater production concurrent with föhn over the AP. (C) Mean monthly (1979–2018) meltwater volume concurrent with föhn winds.

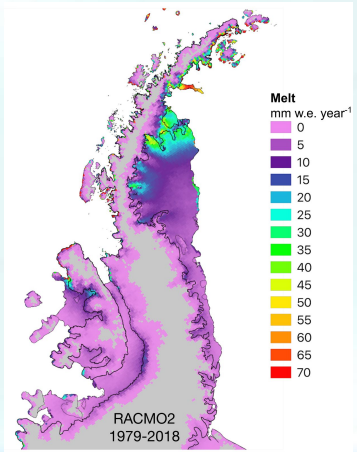

Figure: Föhn-induced spatial melt pattern averaged from 1979 to 2018

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