West Antarctic coastal ice cores
High-fidelity records of atmosphere-ocean forcing on outlet glaciers

Reference Elevation Model of Antarctica
Howat et al., 2019

University of Minnesota (Aug. 2020)

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Pine Island Bay
Ross Sea
Amundsen Sea
WAIS Divide
Roosevelt Island
Getz Ice Shelf
Ross Ice Shelf
Thwaites Glacier
Sulzberger Bay
Marie Byrd Land
Pine Island
Thwaites Glacier
Sherman Island
Paciﬁc Southern Ocean

KILOMETERS
MILES
West Antarctic coastal ice cores

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WAIS Coastal Cores

Infill sparse sampling

Capture coastal dynamics
(Accum., temp., melt gradients)

PIG / Thwaites thinning
Centennial ocean-atmosphere forcing
WAIS Coastal Cores

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WAIS Coastal Cores

Infill sparse sampling

Capture coastal dynamics
(Accum., temp., melt gradients)

PIG / Thwaites thinning
Centennial ocean-atmosphere forcing

Shepherd et al., 2019

Reference Elevation Model of Antarctica
Howat et al., 2019
Winds drive Circumpolar Deep Water upwelling beneath ice shelves

Tied to Pacific variability

- Westerlies strengthening -

Human caused?

P. Holland et al., 2019; D. Holland et al., 2020

Reference Elevation Model of Antarctica

Howat et al., 2019

Modified from Scambos et al., 2017
Under the current situation of a warming global atmosphere, this situation could change under a changing climate, leading to mass loss. Additionally, a warming atmosphere can hold more moisture, increasing precipitation in regions like the Antarctic. This implies that the mass balance and implied sea-level change, perhaps the most significant implication of decreasing Antarctic ice, will be of utmost importance for the ongoing integrated field, remote-sensing, and numerical model studies.

The winds were created using a global climate model that simulates large, natural, decadal variability in the climate system, principally originating in the Pacific Ocean. The winds were found to interact with the Southern Hemisphere wind regimes, particularly the Antarctic Circumpolar Trough (ACT). This creates an upwelling of the subsurface Circumpolar Deep Water (CDW), which can cause it to interact with the Antarctic Ice Sheet (AIS). Whether this interaction occurs or not depends on the possibility of it crossing onto the shelf and interacting with the AIS. Whether or not this interaction occurs will significantly affect the ongoing ice loss and sea-level rise.

The winds were found to be positive wind values that are likely being forced by anthropogenic sources. The study suggests that this upward trend will lead to an increase in warm water reaching the shelf, which will lead to an increase in warm water reaching the shelf, which will in turn lead to changes in wind variability.

Reference:
WAIS Coastal Ice Domes: site features

Siple Island

Accumulation at divide
1.3 m/yr

Lenaerts et al., 2017
Siple Island

Accumulation at divide 1.3 m/yr

Lenaerts et al., 2017
WAIS Coastal Ice Domes: site features

Double divide ridges
Indicative of dynamic stability
Likely Raymond arch

Martín et al., 2009

Reference Elevation Model of Antarctica
Howat et al., 2019
**WAIS Coastal Ice Domes: site features**

**Elevated above ice shelf melt**

Ice divides in reach of only most significant melt events

Reference Elevation Model of Antarctica
Howat et al., 2019
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Coastal Dome

moisture transport

Glaciology
Modern + Paleo-climate
Oceanography
Altimetry / Mass Balance
Surface Hydrology

Bedmap2

ice

bedrock

WAIS Divide

Peter Neff

April 2, 2020