Physical Processes

Ice Core

East Core West Core

What this means

ISW Plume

Model

Model Schematic

Extension to Se Ice

Sea Ice processes

Preliminary Results

Observations

Observations

Thanks to

# Propagation of Ice Shelf Water beneath McMurdo Sound Sea Ice

Ken Hughes

Otago University

#### Physical Processes

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Model Model

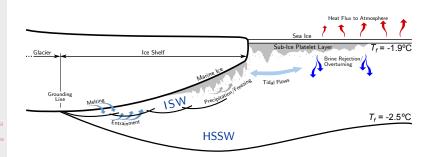
Extension to Se Ice

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Observed:---

Caala

Thanks to



Ken Hughes

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Location

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What the means

ISW Plum Model

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Preliminar Results

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### Location

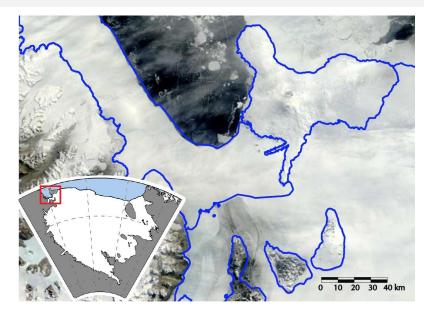


Image Source - NASA Rapid Response MODIS Subsets

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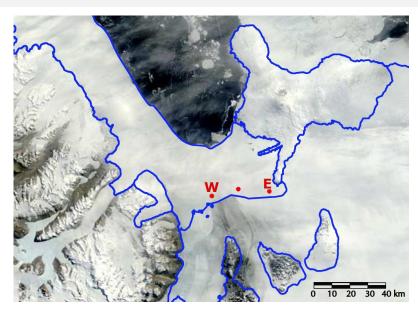


Image Source - NASA Rapid Response MODIS Subsets

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Model Model Schematic

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Preliminar Results

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### ${\sf Spring/Summer\ Circulation}$

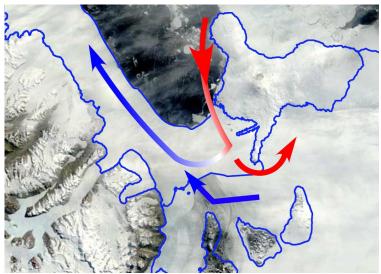


Image Source - NASA Rapid Response MODIS Subsets

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Preliminar Results

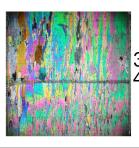
Observation

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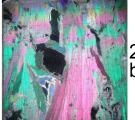




31-40 cm

62-71 cm





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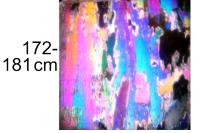
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Physical Processes

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Sea Ice processes

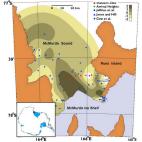
Preliminar Results

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Thanks to

Percentage of platelet ice greater than other studies

• We found 70-90% platelet ice



Dempsey (2010)

Platelet ice formation driven by oceanic processes

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Physical Processes

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East Core
West Core

What this means

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Preliminar

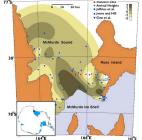
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Ice Core

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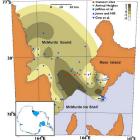
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Location

Ice Core

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## What this means

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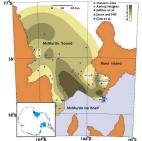
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### Numerical Plume Model

#### Ken Hughes

Physical Processes

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Schematic

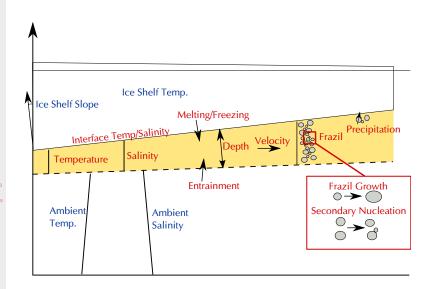
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### Extension to Sea Ice

Ken Hughes

Physical Processes

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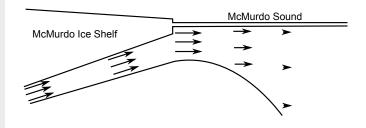
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Preliminar Results

Observations

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### Extension to Sea Ice

Ken Hughes

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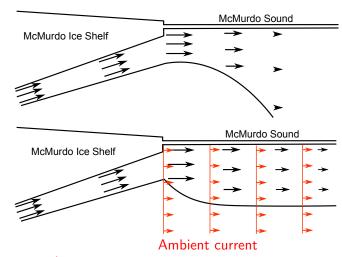
Sea Ice processe

Preliminary Results

Observations

Caala

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(wind-driven circulation, geostrophic currents, tidal rectification, topographic effects)

Physical Processe

Ice Cores

East Core West Core

means

Model

Schematic Extension to

Sea Ice processes

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Thanks to:

### • Significant heat flux

- Freezing (not melting) regime
- Rougher basal surface

But we have Salinity and Temperature measurements below the sea ice

Sea Ice processes

- Significant heat flux
- Freezing (not melting) regime

But we have Salinity and Temperature measurements below

Physical Processe

Ice Core

East Core West Core

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#### Sea Ice processes

Preliminar Results

Observations

Observation:

Thanks to

Significant heat flux

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Rougher basal surface

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### Sound Ken Hughes

Ice Shelf

Water in

Physical Processe

Ice Cores

East Core West Core

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#### Sea Ice processes

Preliminar Results

Observation

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Thanks to

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### Preliminary Results

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Physical Processes

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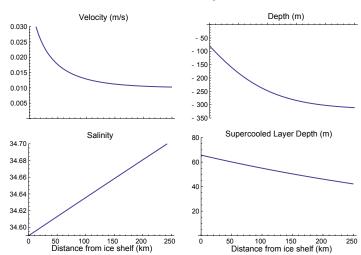
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# Heat flux ✓, ambient current ✓, freezing regime ✓ no frazil ice yet



Physical Processes

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Preliminary Results

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### Do we see this happen?

Physical Processes

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West Core

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Model Schematic Extension to Sea Ice Sea Ice processes

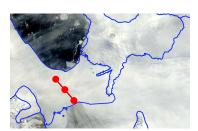
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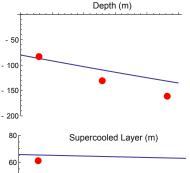
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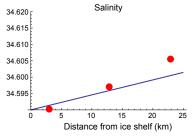
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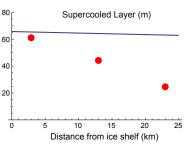
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### Observation and Results









Physical Processes

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#### Goals

Thanks to

### Reproduce field measurements, and extrapolate to predict the evolution of the supercooled water

- Compare with other predictions e.g.
  - Stevens et al. (2009) Supercooled water can persist 250 km from edge of McMurdo Ice Shelf
  - Large-scale models e.g. Hellmer (2004)

Physical Processes

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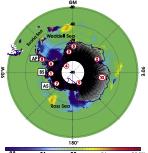
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### Acknowledgements

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Thanks to:

Thanks to my supervisors:

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