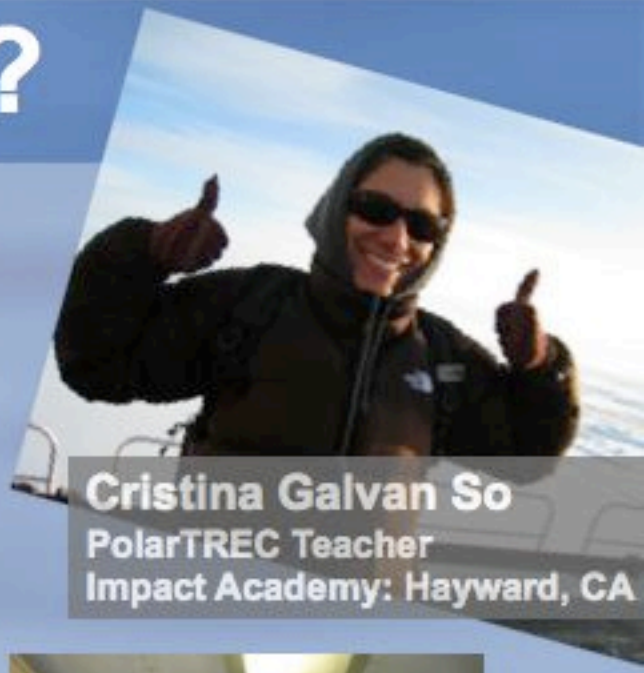
How do polar bears cope with ice free summers?

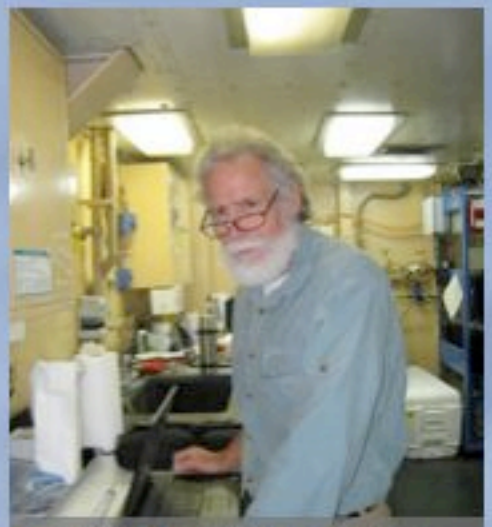
Who are we?

John Whiteman
University of Wyoming

Dr. Merav Ben David
University of Wyoming



Cristina Galvan So
PolarTREC Teacher
Impact Academy: Hayward, CA



Dr. Hank Harlow
University of Wyoming

Where Are We?


(10/4)
(10/3)
77 22.101N 167 05.09W (10/5)
(10/2)
(10/1)
(9/30)
(9/29)
72 15.243N 155 02.513W (9/27)
(9/28)
Barrow, AK
Chukotka
Alaska
Image IBCAO
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Polar Bear Information

Largest living carnivore on land
- Males 1100 lb (to 1700+ lbs?)
- Females 550 lbs

Closest relative is the brown bear
- Diverged 300,000 years ago

Diet: mainly seals
- Grinding teeth reduced
- Stabbing teeth pronounced
- Wait for seals to come up to surface to breath through holes in ice.
- Hunting is dependent on ice, so unlike other bears, their hardest time to hunt is summer/fall

Sea Ice: Annual Sea Ice Melt

March 10th, 2008

September 10th, 2008

Credit: John Whiteman

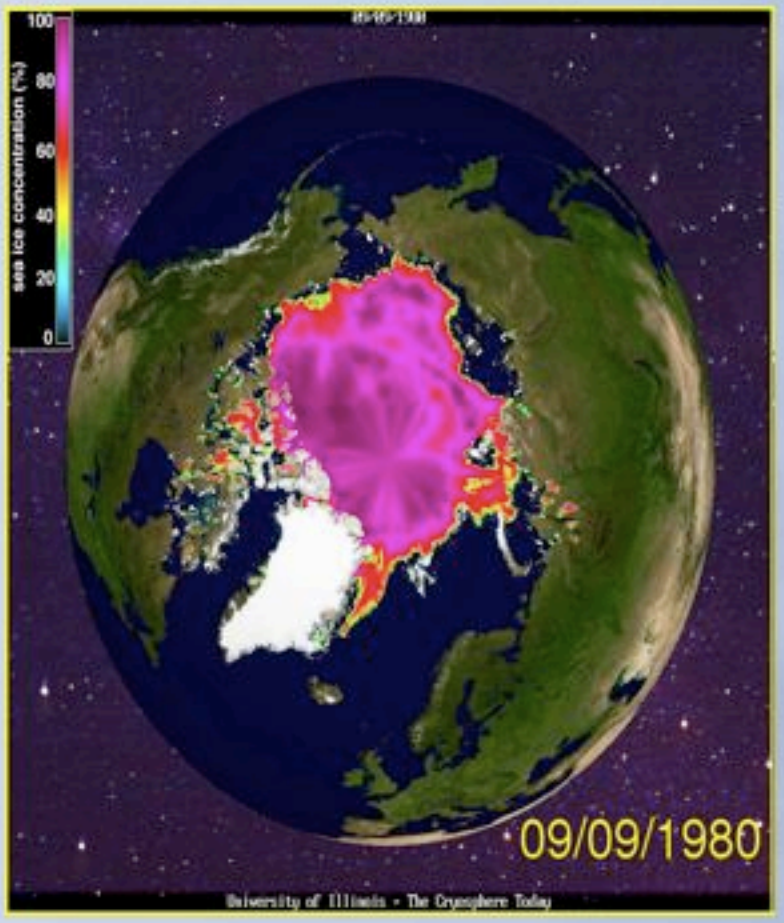
Polar bears need sea ice for traveling and hunting

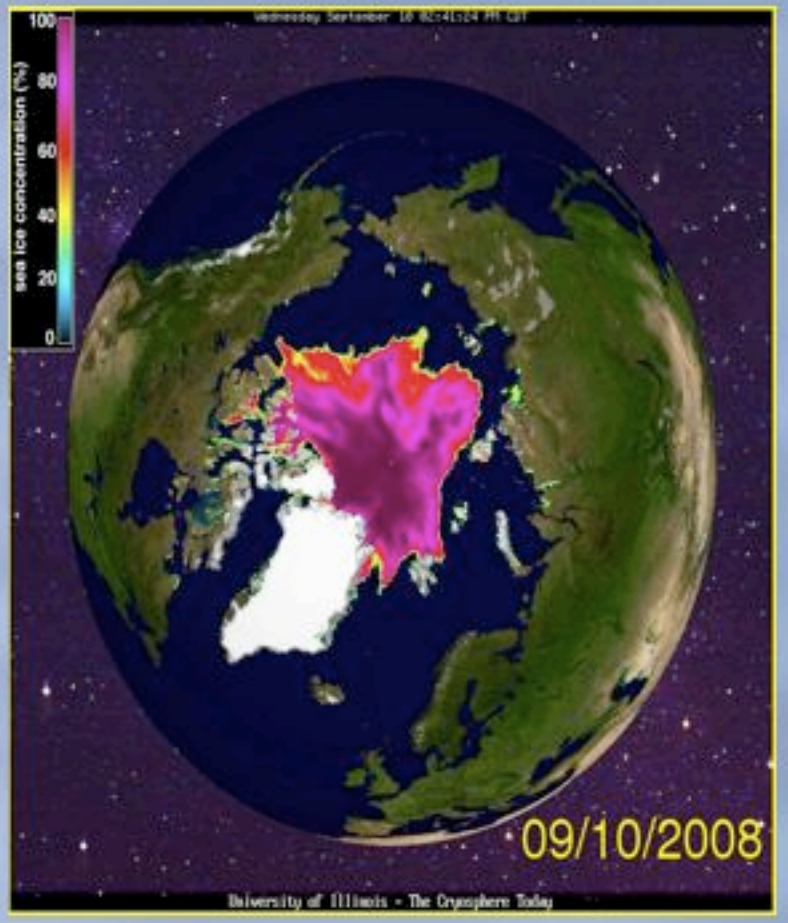
Winter and Spring
Active and hunting
Pregnant females: denning

Summer and Fall
Ice-free period: no hunting?

Credit: John Whiteman

Sea Ice Changes Since 1980





Project Overview: Research Questions

1) How do polar bears cope with ice-free conditions in the summer?

2) How will polar bears be affected by longer ice-free summers?

POLAR TREC

Follow the ice north

Cooler temperatures?
Seal predation?
Avoid fasting?
Maintain metabolic rate?
Maintain activity?

Stay on shore

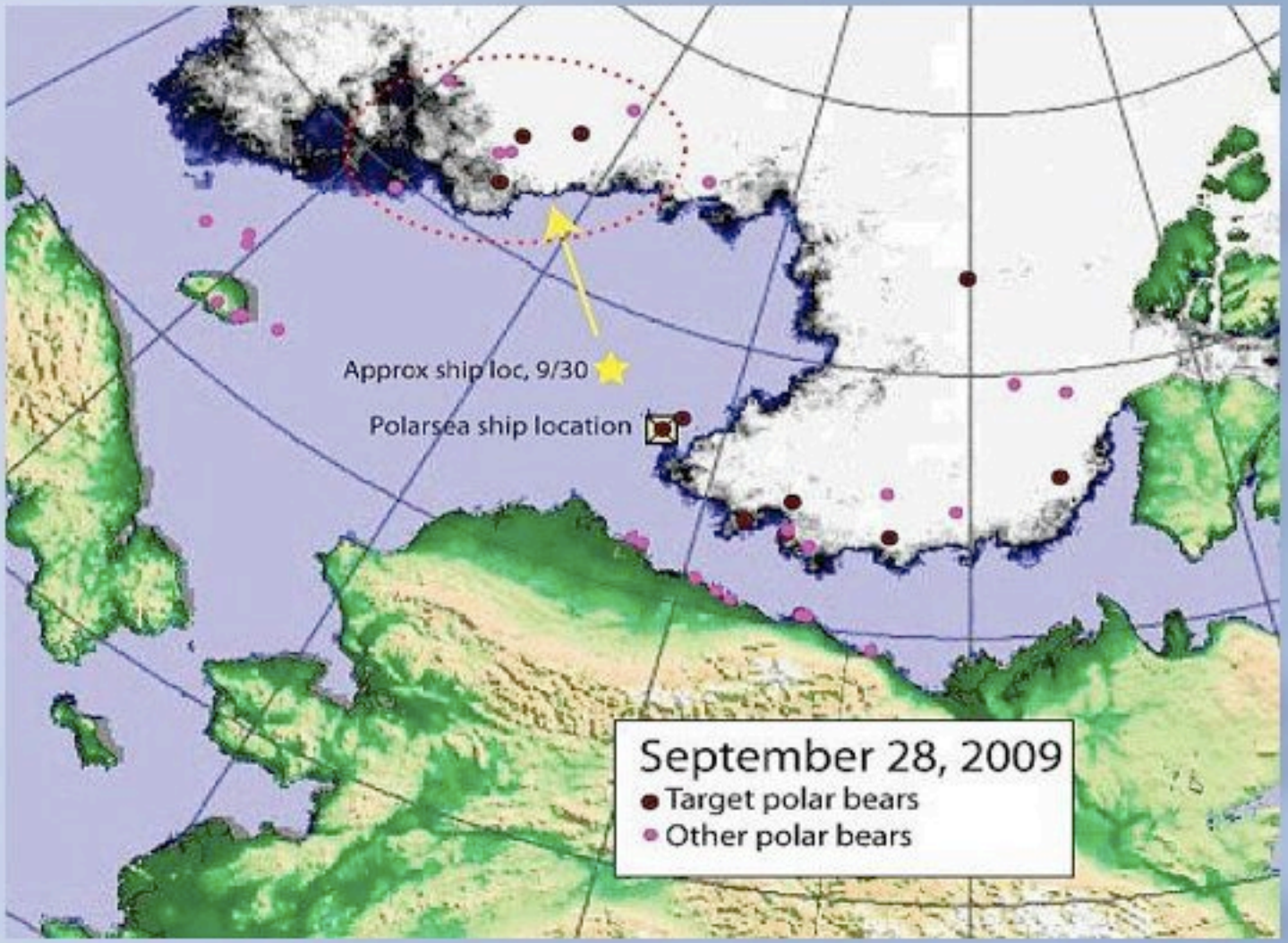
Warmer temperatures?
Lack of prey?
Fast?
Reduce metabolic rate?
Reduce activity?

Project Overview: Schedule

Early summer	Summer	Late summer
Capture bears on ice near shore, based on coast	Some stay on shore	Recaptures, based on coast
	Some follow ice north	Recaptures, based on ship

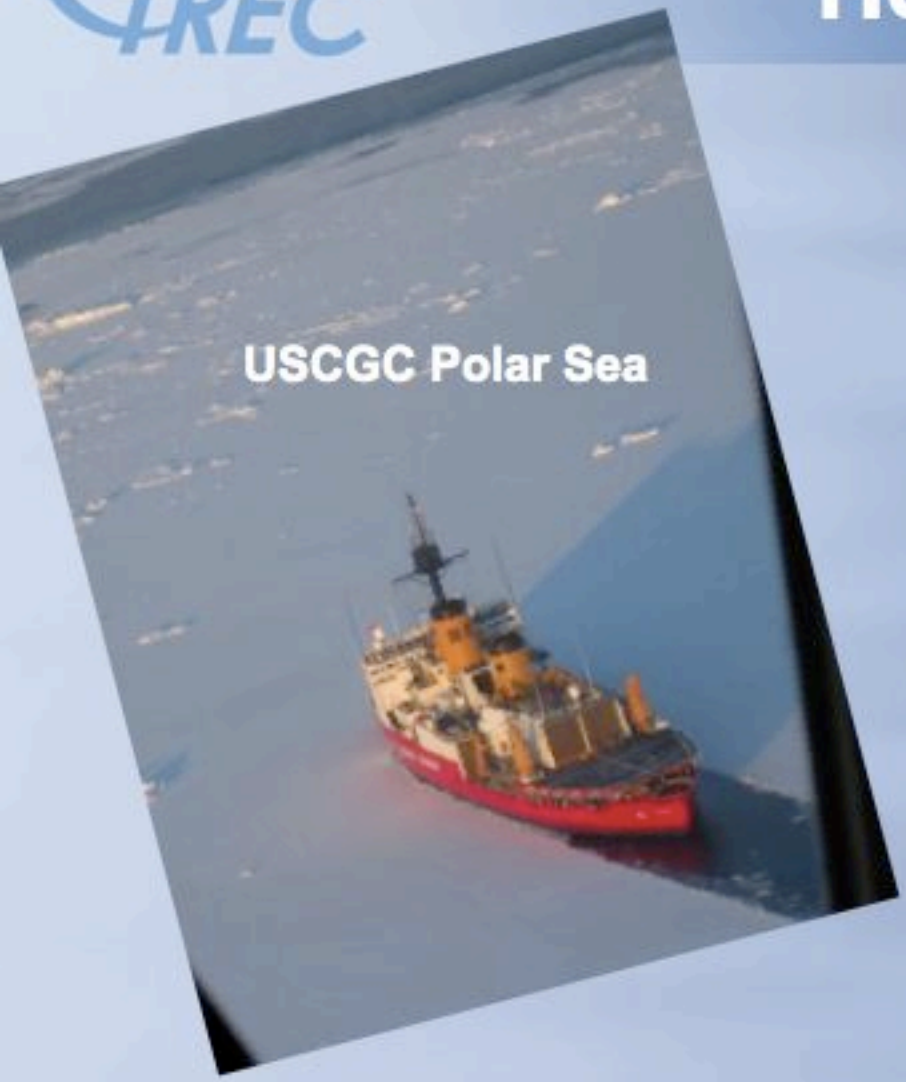
This is the part of the project that we are involved in right now.

What are we doing?



POLAR TREC

How do we get there?



Credit: R. Powell

POLAR TREC

How do we find the bears?

What do we do with the bears?

POLAR TREC

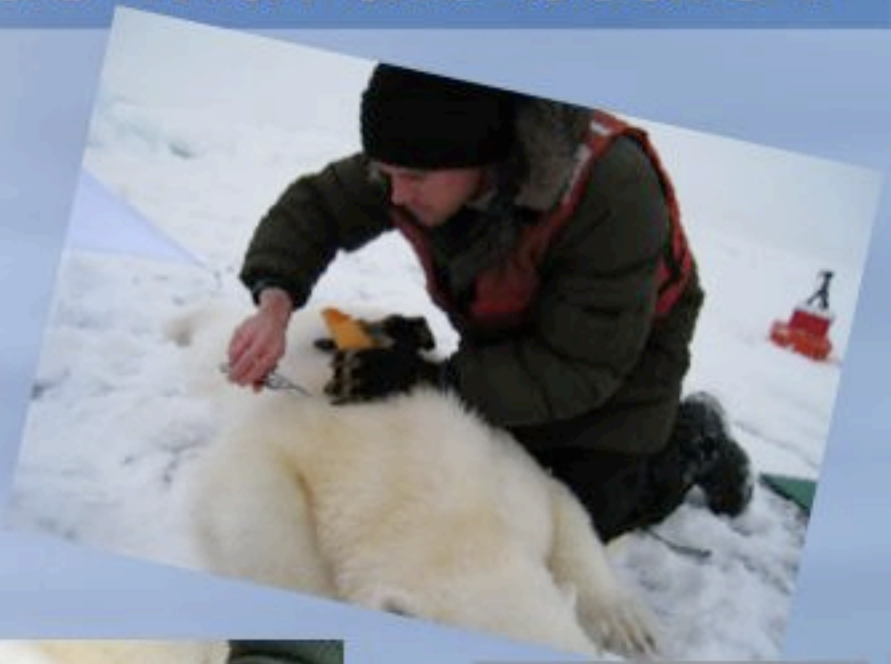
What do we do with the bears?

Blood Samples

Milk Samples

What do we do with the bears?

Breath Samples



Fur Samples

Tooth Sample

What do we do with the bears?

iButton Temperature Monitor

Processing the Samples

What information can we get from all this data?

How much are the bears eating?

- Blood samples: serum ^{13}C, plasma triglycerides, cholesterol, RBC clot ^{13}C
- Breath Samples: breath ^{13}C, breath RQ
- Fat Samples: fat depth and lipid content of individual fat cells
- Fur Samples: isotope analysis to determine diet

Are the bears fasting?

- Muscle samples: muscle cell size, protein content, nitrogen content, ^{15}N signature, fiber type, RNA:DNA ratios
- Blood samples: serum indicators of protein breakdown

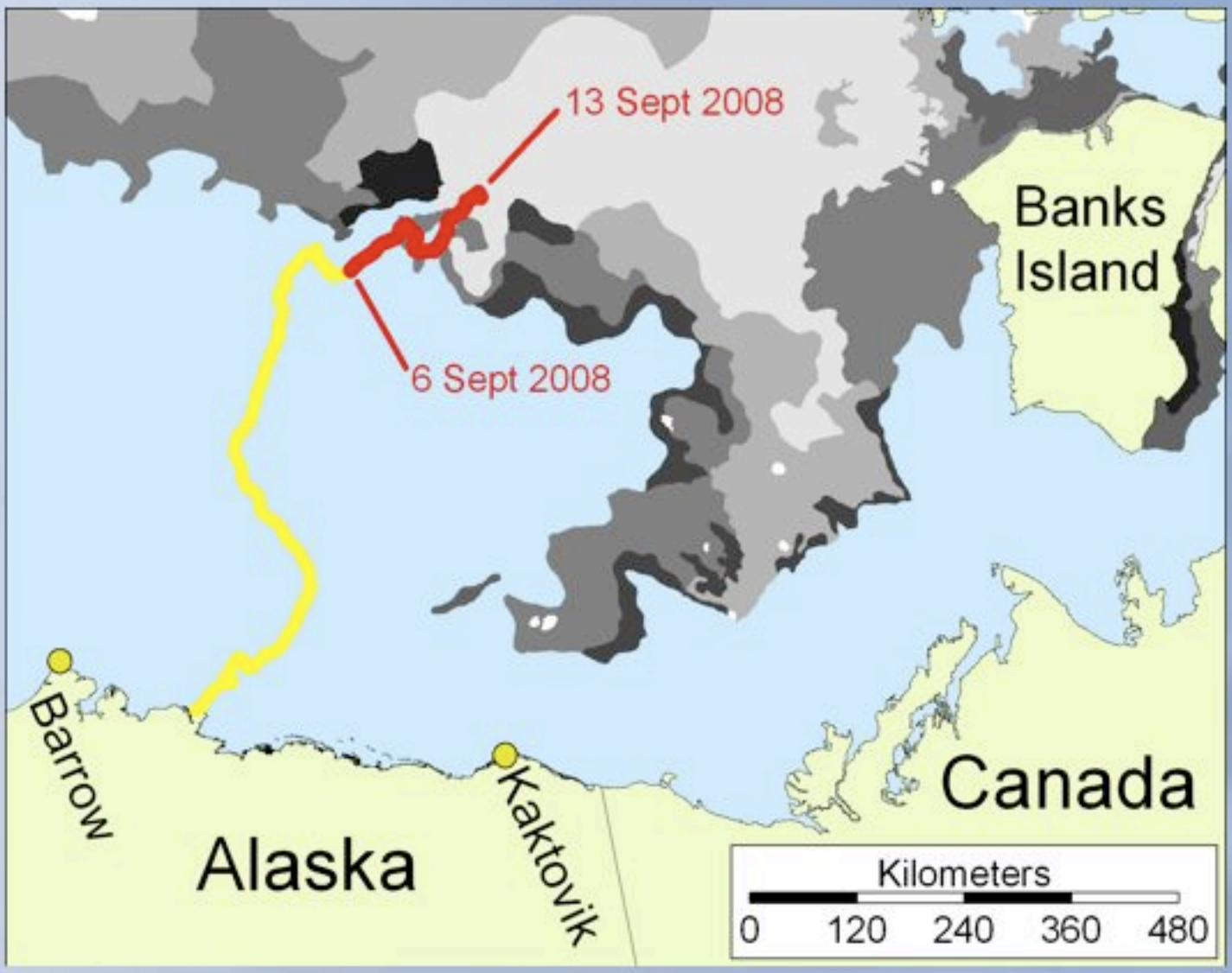
How much energy are the bears using?

- Collar - Activity Monitors: fine scale index of energy use
- Collar - GPS locations: broad scale index of energy use
- Collar - Conductivity probe: time swimming
- Collar - ambient temperature
- Temperature probe: deep-core body temperature

Where are they living?

- GPS locations: use of land, water, ice

Interesting Discoveries



Interesting Discoveries

Why are we doing this?

Questions?