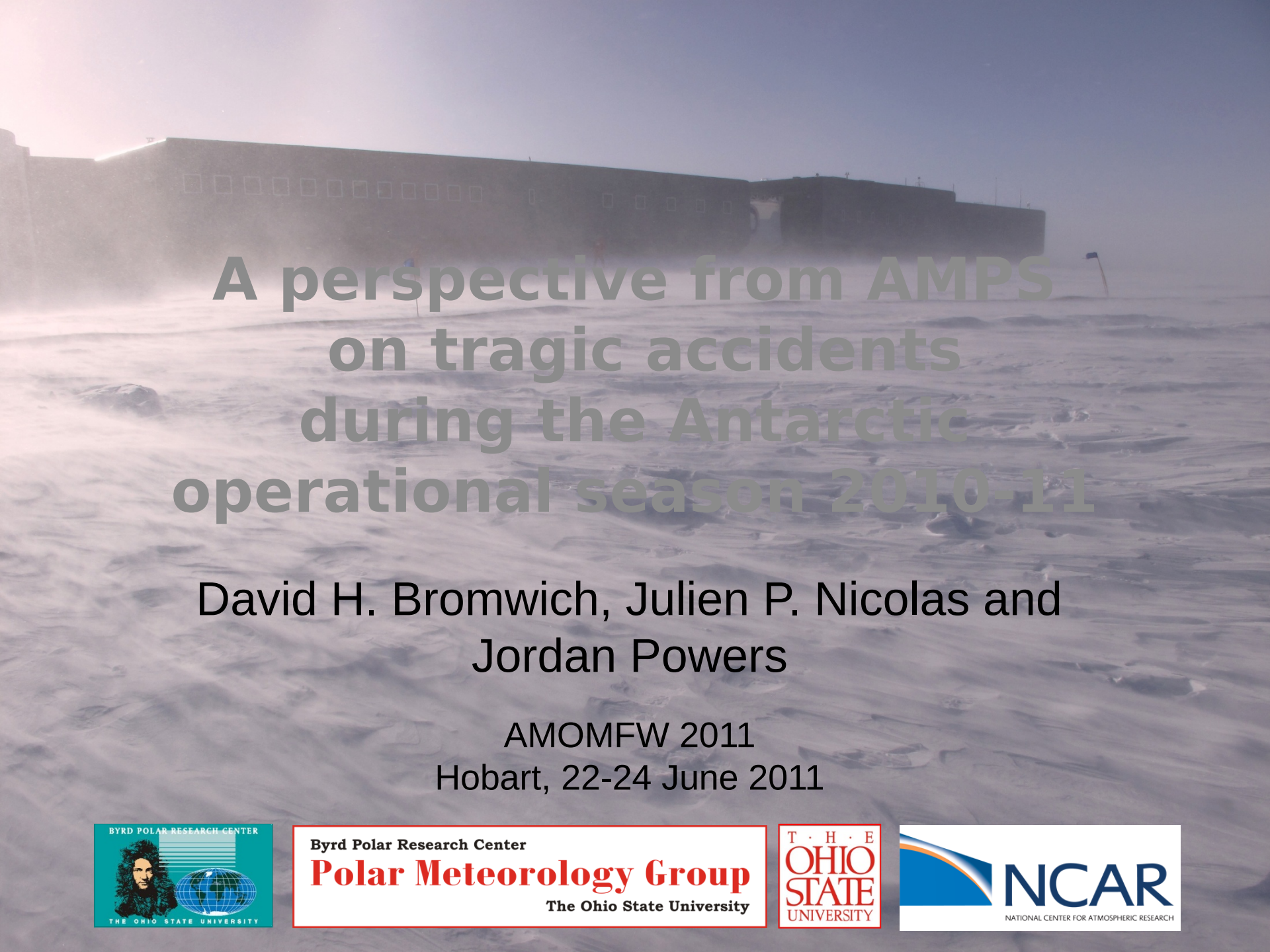


A perspective from AMPS on tragic accidents during the Antarctic operational season 2010-11

David H. Bromwich, Julien P. Nicolas and Jordan Powers

AMOMFW 2011
Hobart, 22-24 June 2011

Byrd Polar Research Center
Polar Meteorology Group
The Ohio State University

Objectives

Two tragic accidents during last Antarctic OS:

- Crash of a French helicopter off Adelie Land in Oct. 2010 (4 victims)
- Sinking of a Norwegian ship in the McMurdo Sound in Feb. 2011 (3 victims)

Both coincided with intense storms

Our goal here:

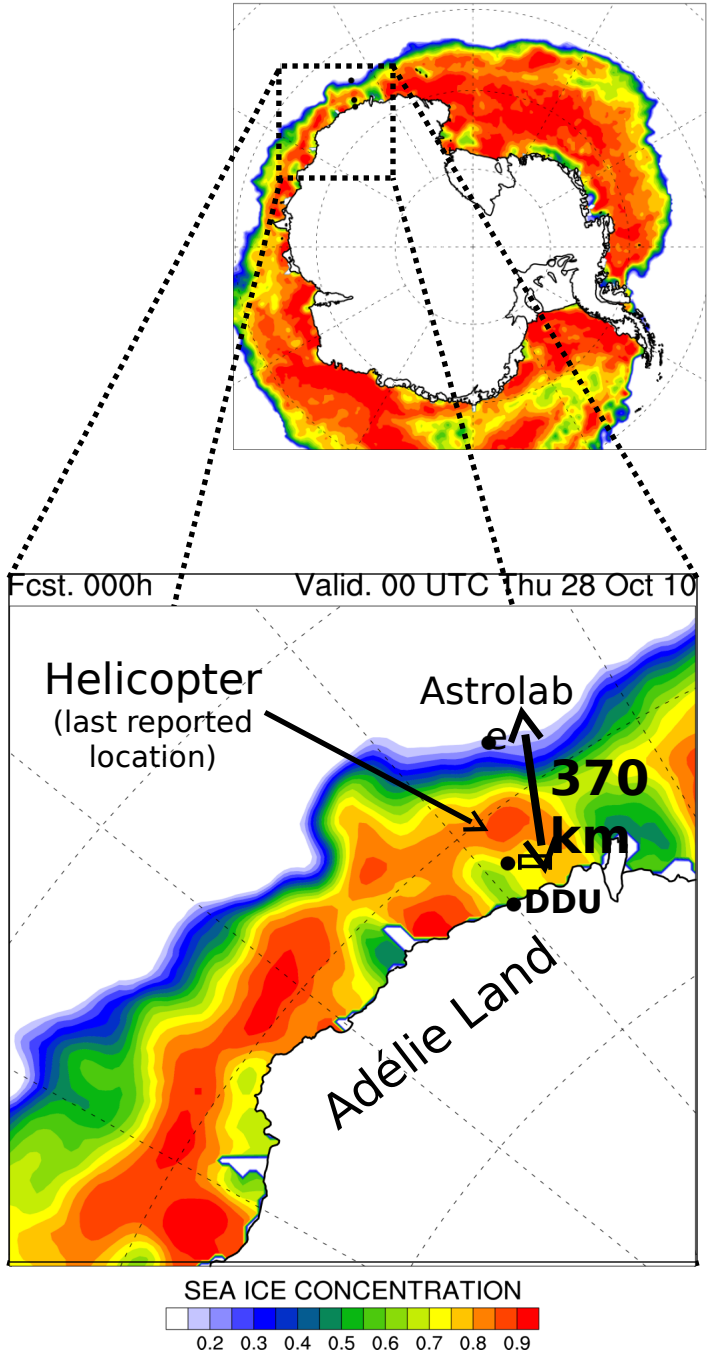
- investigate how well/how far ahead these two storms were forecast by AMPS
- NOT to establish the precise causes of the accidents

I. French helicopter crash off the coast of Adélie Land

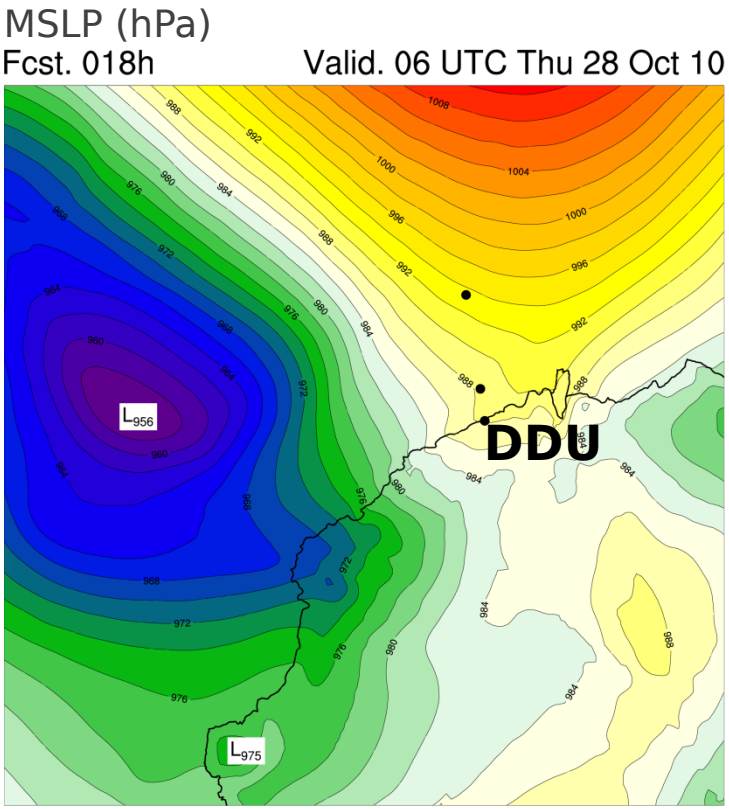
(28 October 2010)

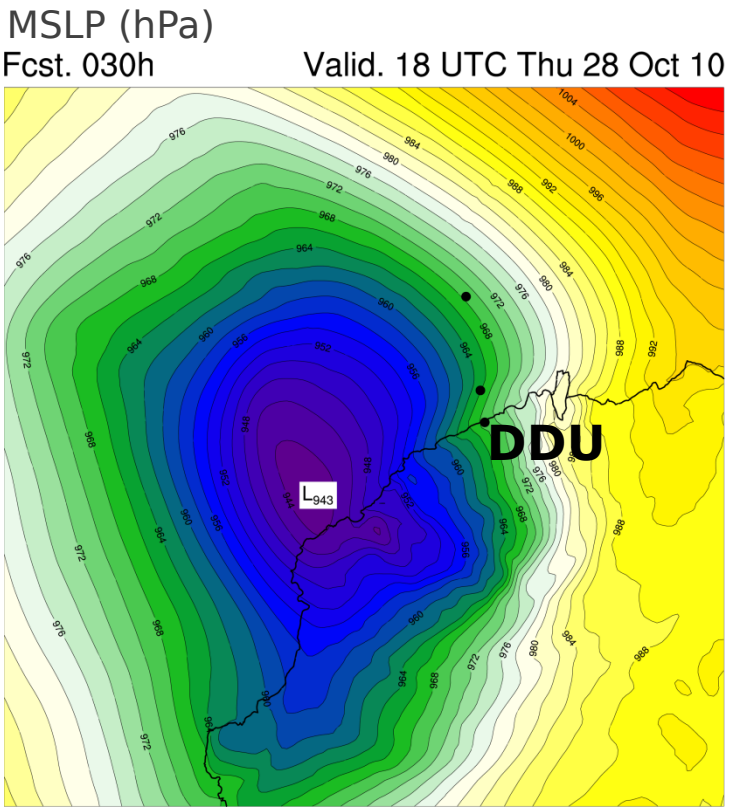
What happened?

Last October, the icebraker Astrolabe was forced to remain 370km offshore from DDU because of sea ice
Late on 28 Oct., a first helicopter took off from the Astrolabe with personnel and supplies and reached DDU
20 minutes later, a 2nd helicopter left the Astrolabe. It crashed ca. 100km from DDU, killing all 4 people onboard
▭ Suggests rapid deterioration of the weather conditions



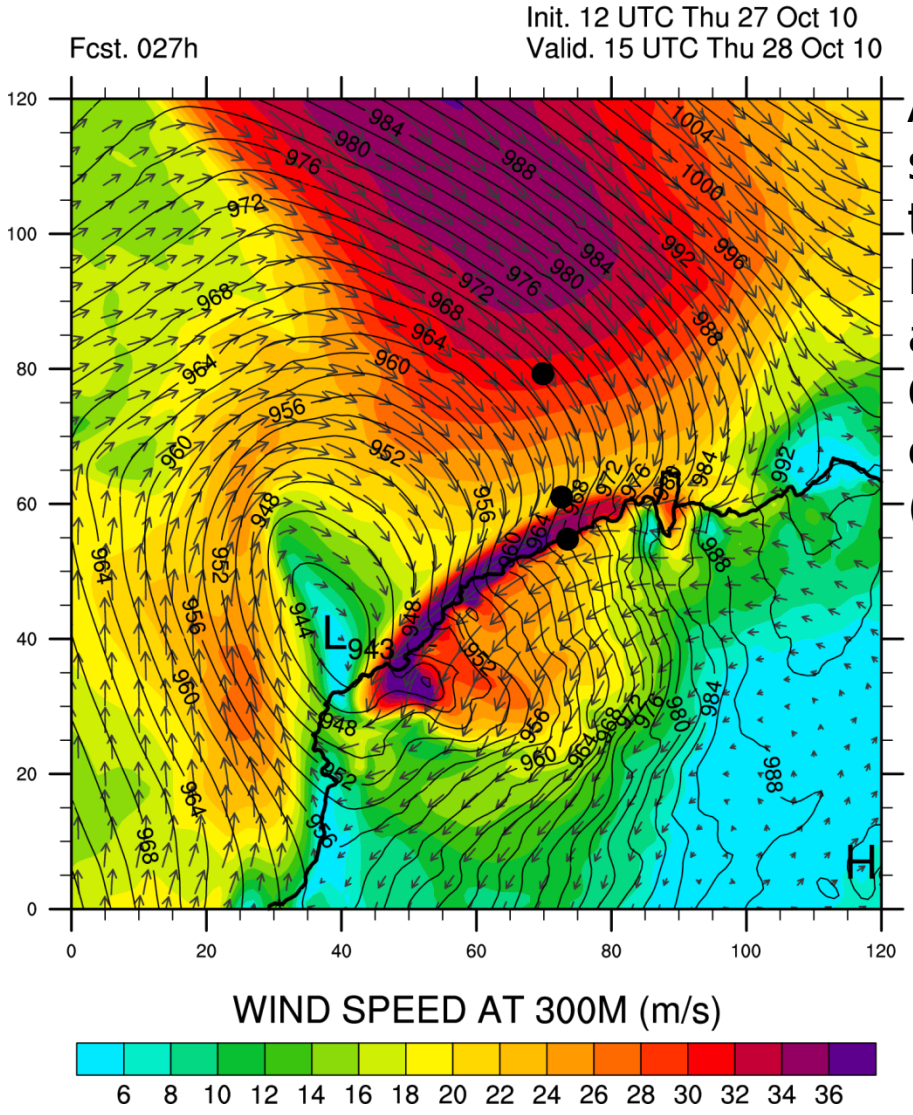
Synoptic environment





Low pressure system to the west of DDU moving toward the continent
Air piling up along the coast to the east of the low creates pressure gradient perpendicular to the coast ⇨ typical setup for barrier winds

The storm

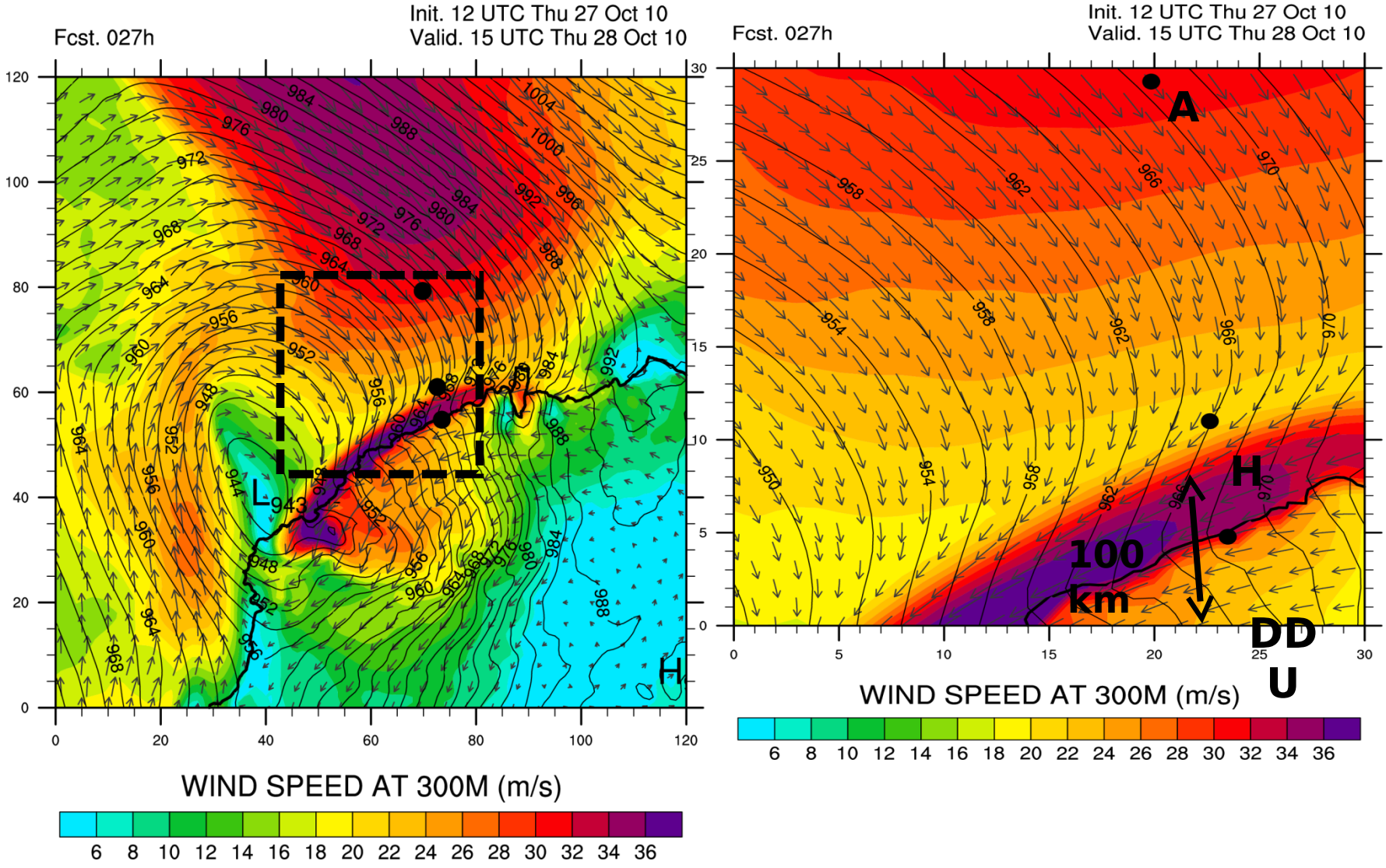


AMPS forecast for 15 UTC 28 Oct, shortly after the reported time of the accident

Barrier wind flow ca. 80km wide along the coast of Adelie Land

Crash site located right on the edge of the barrier wind flow (next slide)

The storm


Fcst. 027h
Init. 12 UTC Thu 27 Oct 10
Valid. 15 UTC Thu 28 Oct 10
WIND SPEED AT 300M (m/s)
6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
Fcst. 027h
Init. 12 UTC Thu 27 Oct 10
Valid. 15 UTC Thu 28 Oct 10
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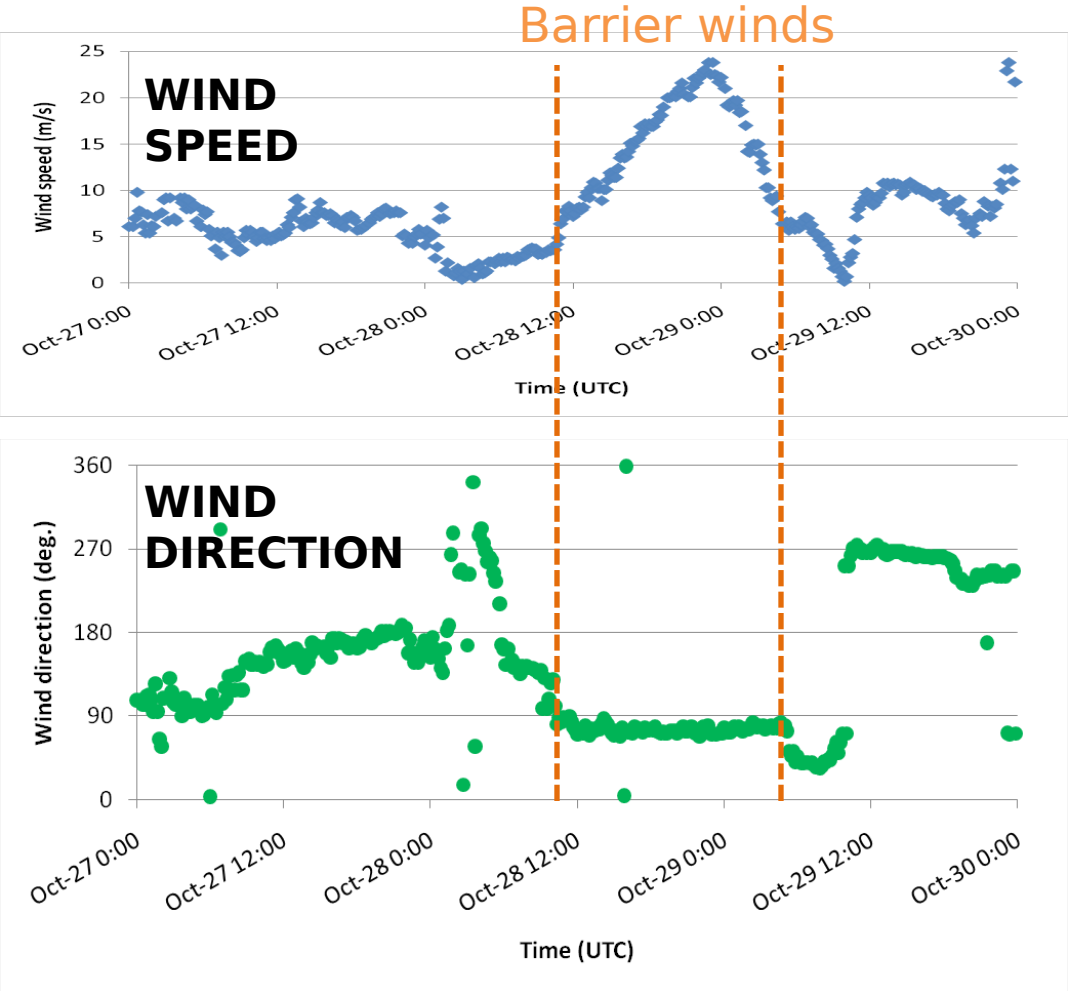
WIND SPEED AT 300M (m/s)
6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36

Observations from D-10 AWS (near DDU)

Timing of the barrier wind event reflected in AWS observations
Shift to easterly wind shortly before 12 UTC on Oct 28 with intensification from then onward
Max wind intensity offshore

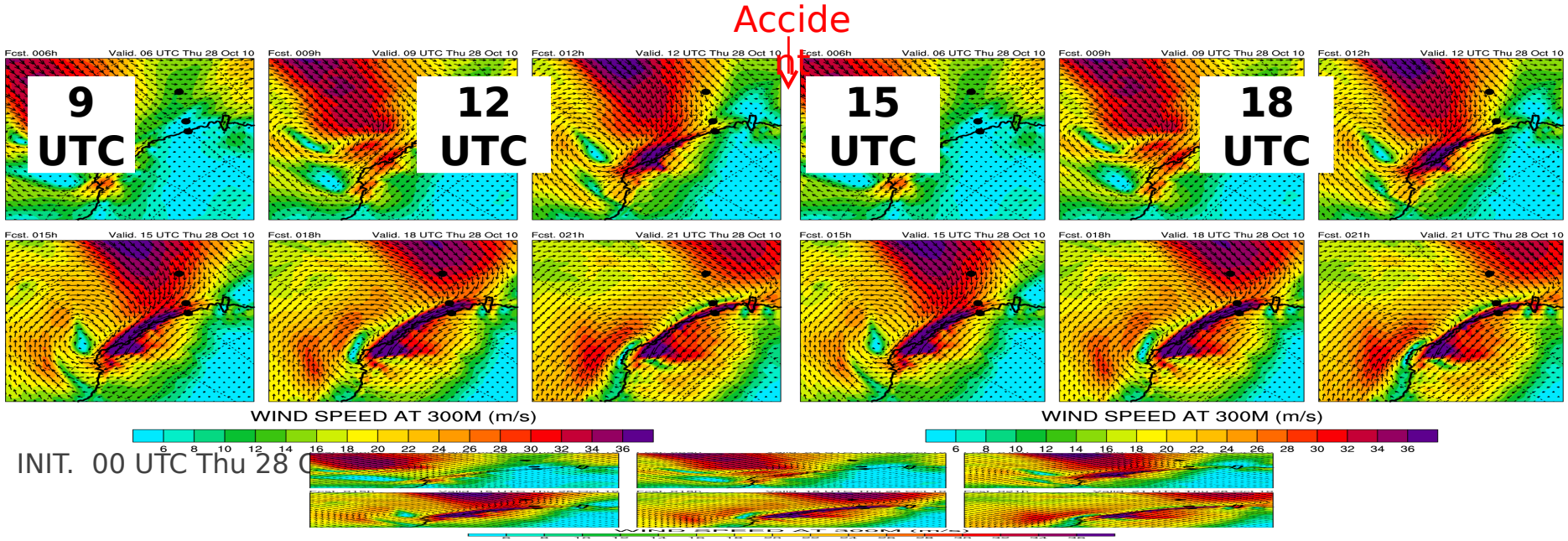


Timing of the barrier wind flow in AMPS

In AMPS, the barrier winds set up between 12 and 15 UTC
- agrees well with the AWS observations

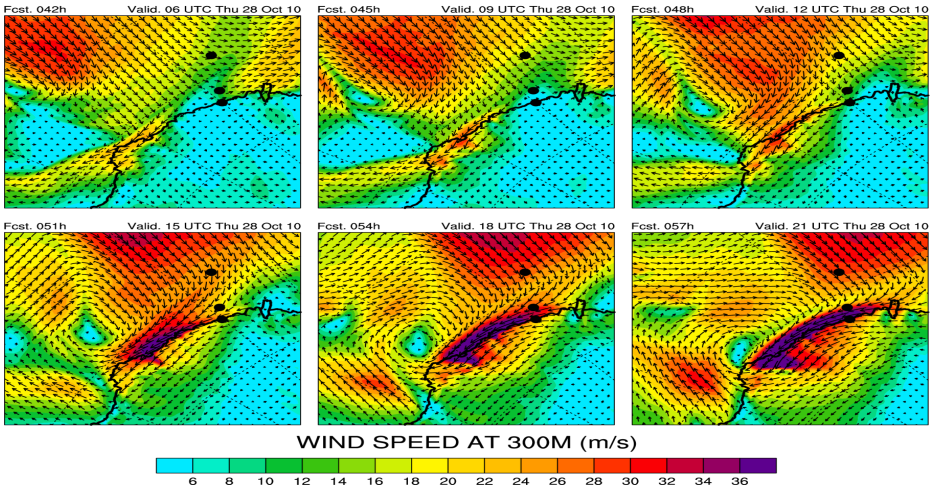
Between the Astrolabe and DDU, the wind conditions change from gentle to stormy within 3 hours

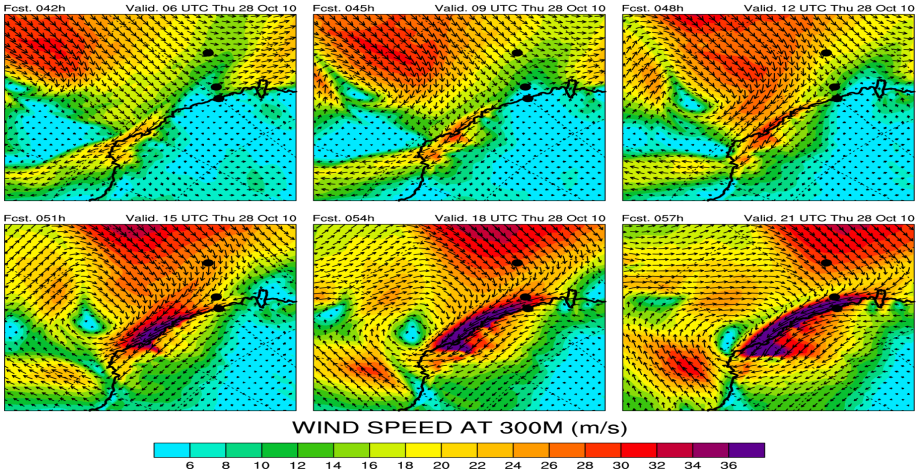
Intense lateral wind flow creates dangerous flying conditions for the helicopter



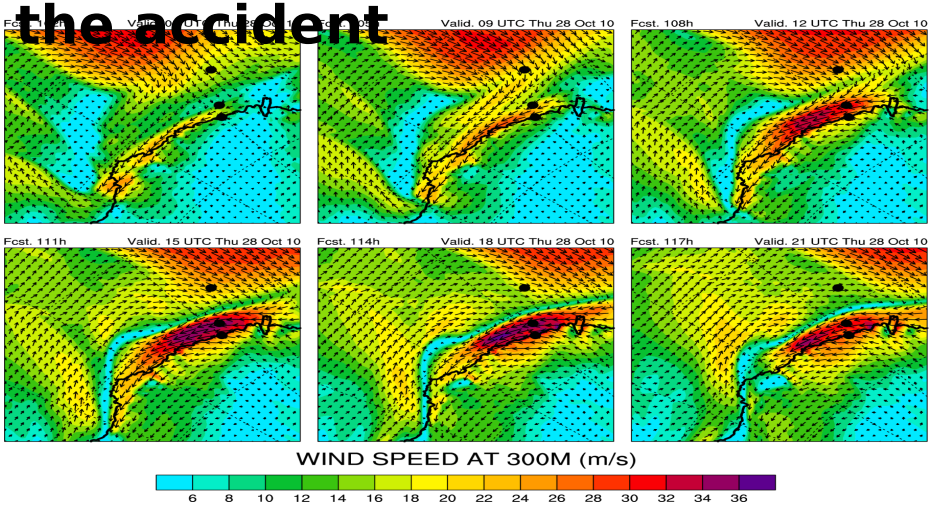
How far ahead was this wind event predicted by AMPS?

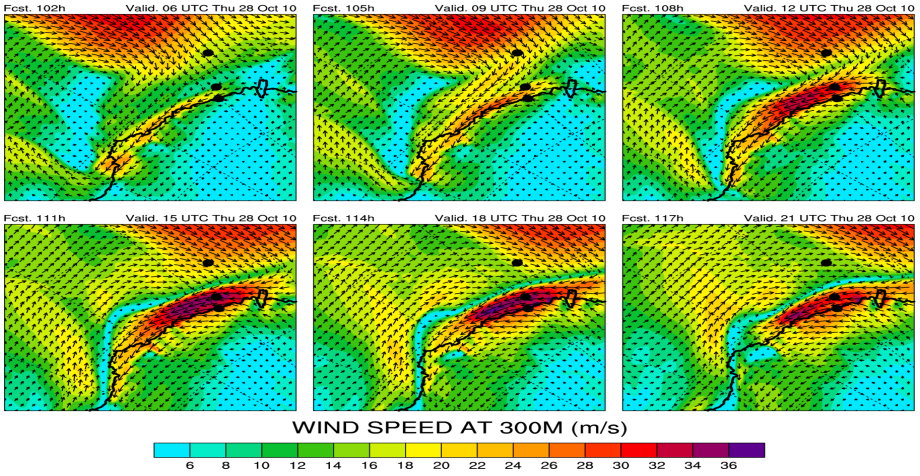
AMPS forecasts initialized 48h prior to the accident





AMPS forecasts initialized 4.5 days prior to the accident



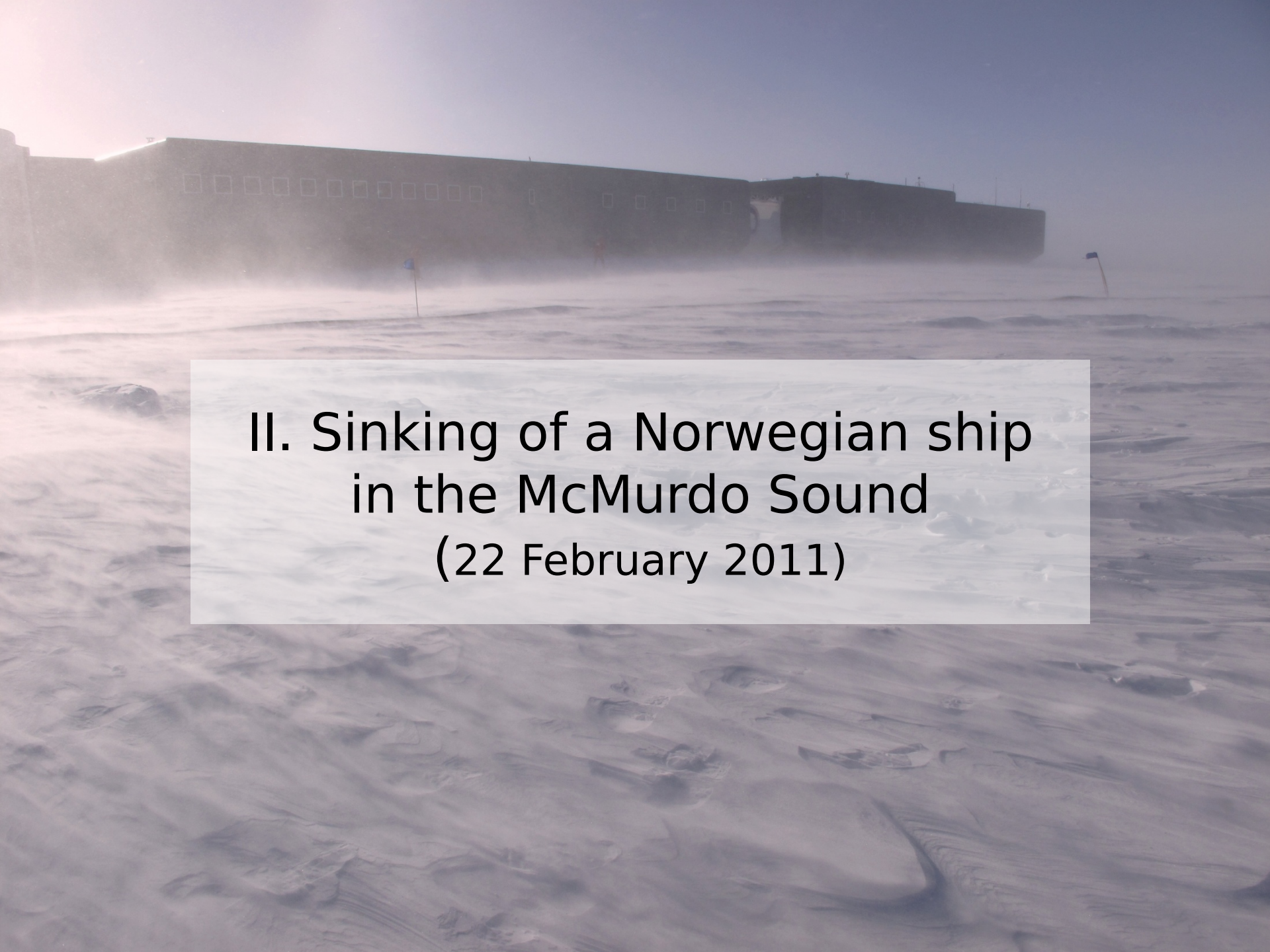


Conclusions

Although the validation of AMPS from observations is limited here, it suggests that AMPS correctly forecasts the timing of the barrier wind event

The long flight between Astrolabe and DDU (370km, approx. 3-4 hours) left the helicopters exposed to the rapidly changing wind conditions

Ongoing judicial investigation to determine the precise causes of the accident



II. Sinking of a Norwegian ship in the McMurdo Sound

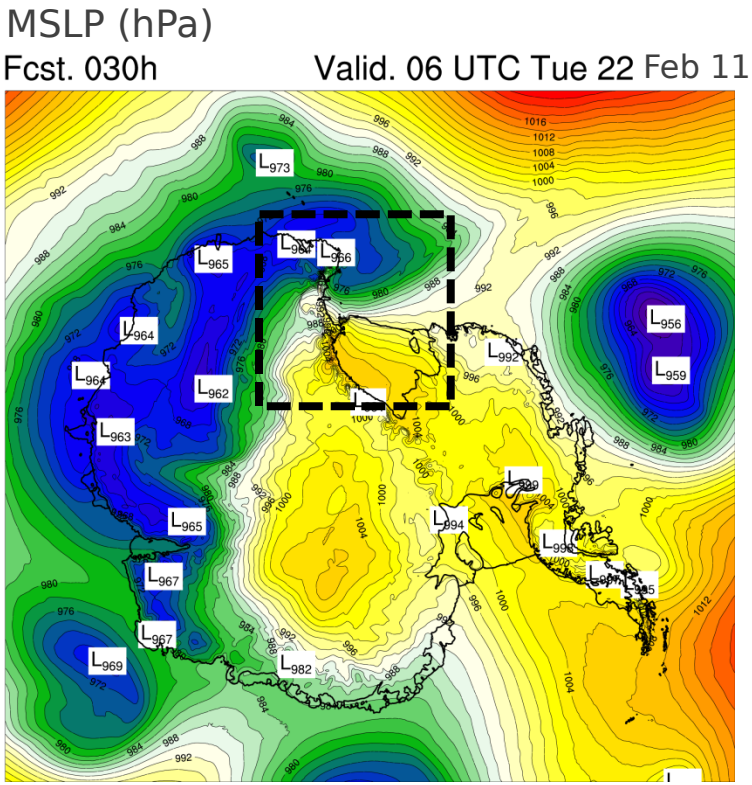
(22 February 2011)

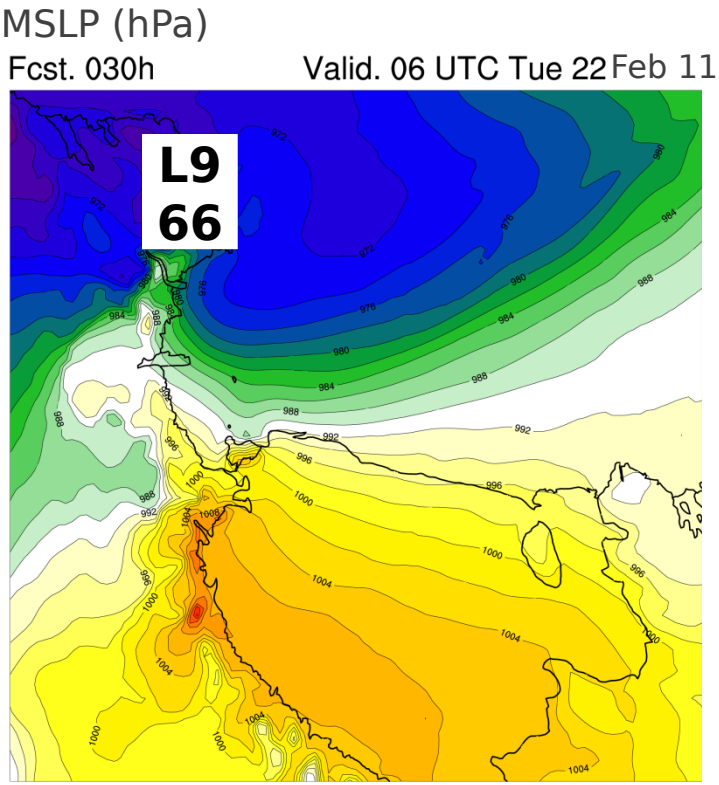
What happened?

In Feb 2011, a group of 5 Norwegians set off to reach the South Pole on… quad bikes from the Ross Island area.
On 22-24 Feb, their yacht, *Berserk*, was caught in an intense storm and disappeared in the McMurdo Sound with 3 men aboard.
The two other crew members had been dropped on the Ross Ice Shelf with squad bikes before the storm. They made it safely to Scott Base before being repatriated to NZ

Photos from http://www.sailingforsos.com/

Synoptic environment

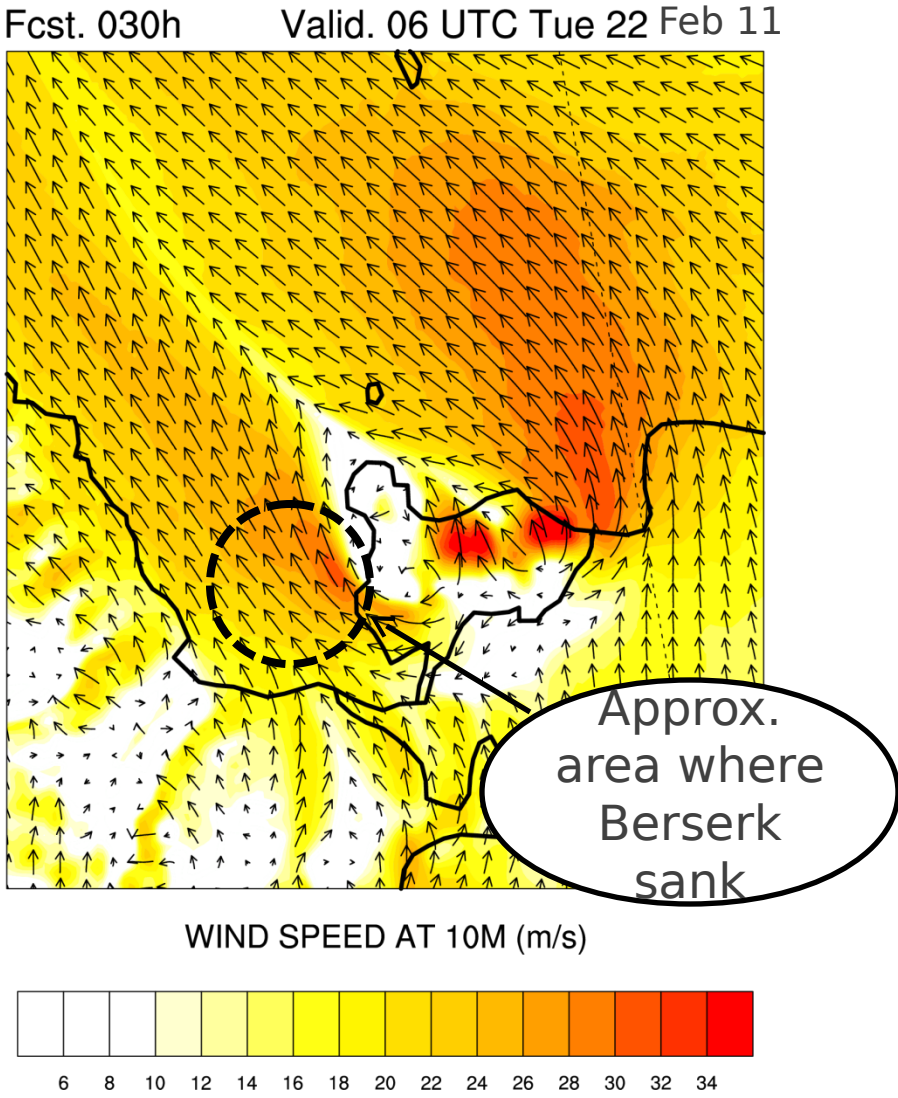




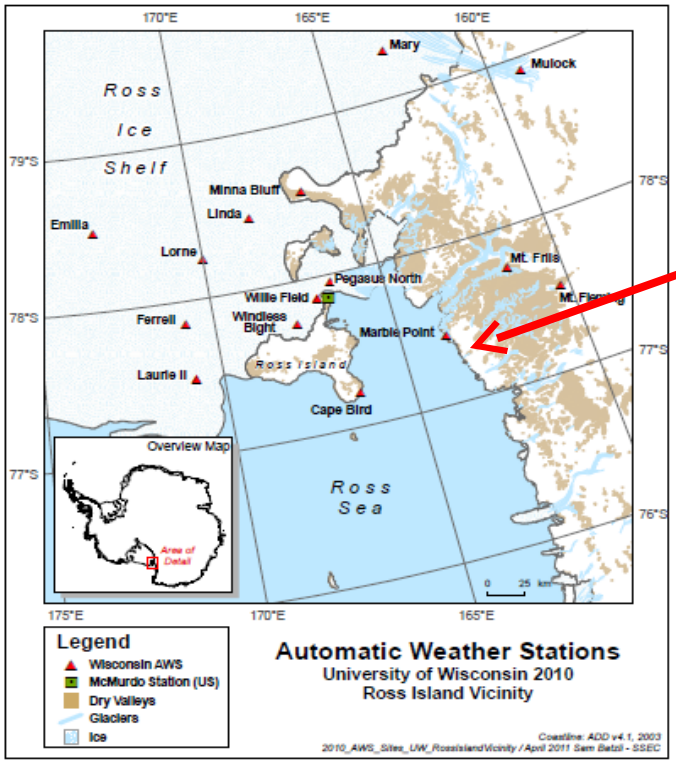
Low pressure system near Victoria Land, to the north of the Ross Sea
Easterly flow in the western Ross Sea
Flow blocked by the Transantarctic Mountains ⇒ southeasterly

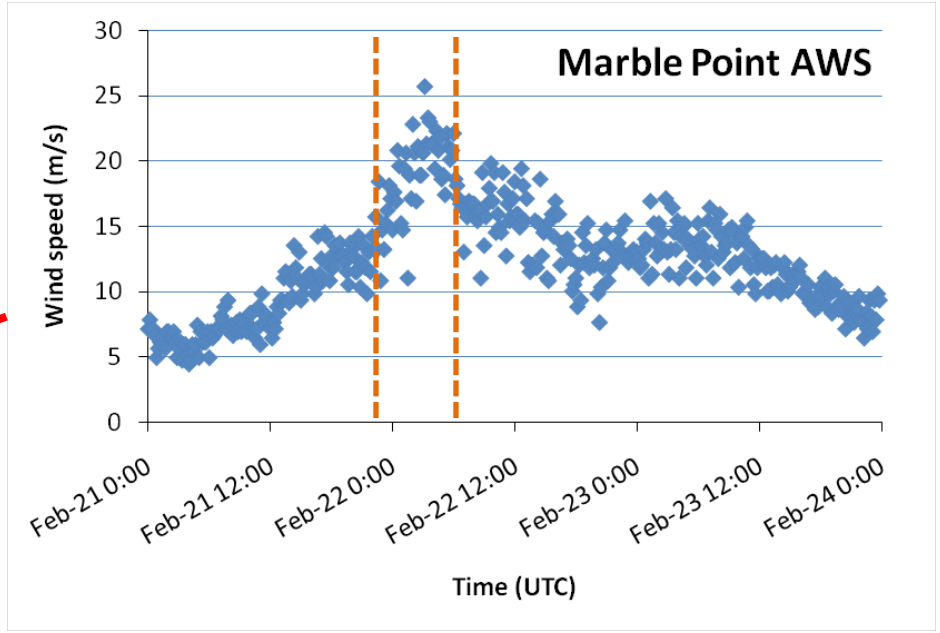
The storm

AMPS forecast for 06 UTC 22 Feb (max storm intensity) with the 1.6km grid
Typical flow splitting around Ross Island, causing wind intensification
Where Berserk sank, wind reached >60kts
Winds >80kts in eastern Ross Island



What the observations show



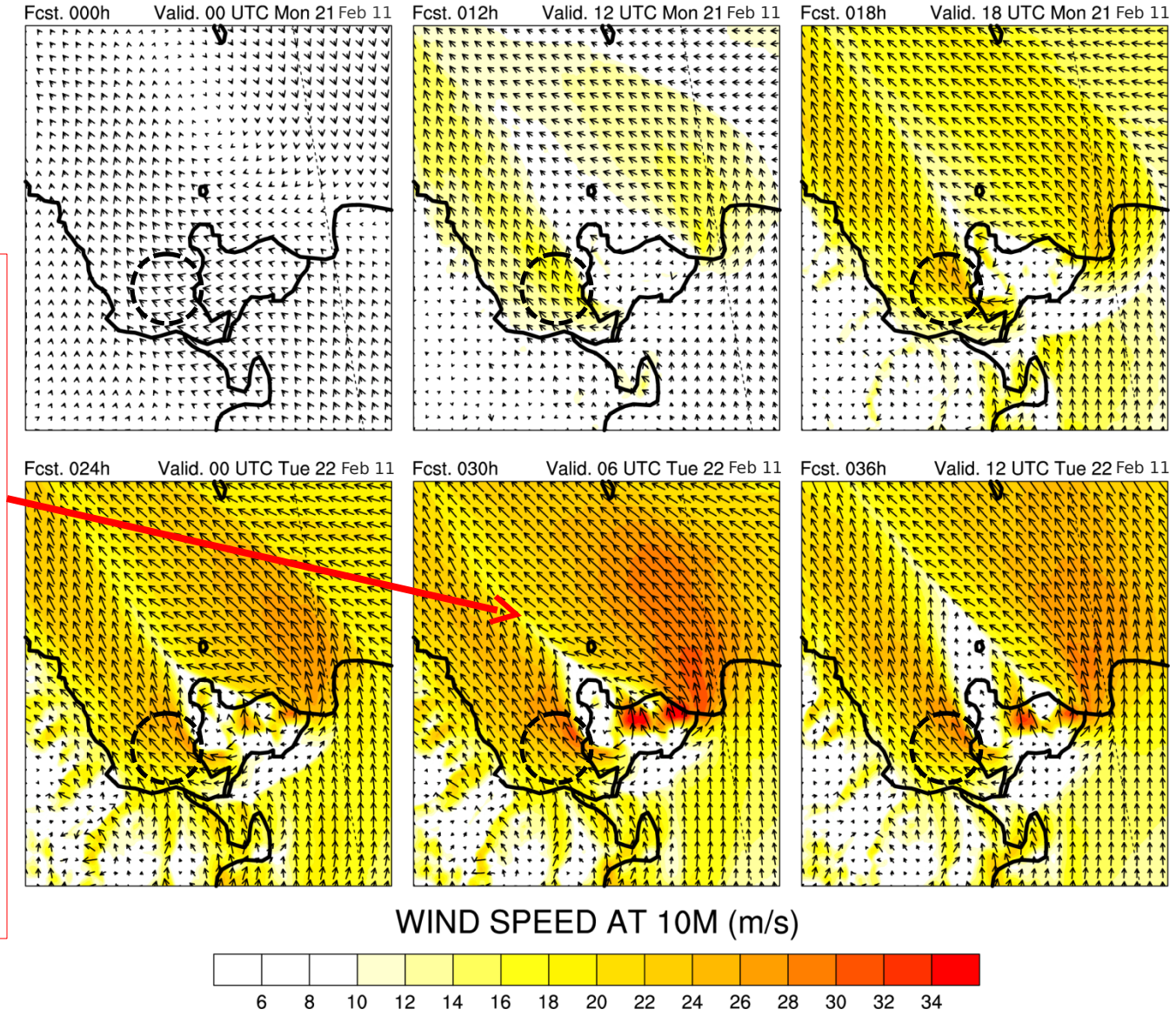


Courtesy from AMRC/SSEC

Observations from Marble Point: the storm reached its maximum intensity between on 22 Feb, between 00 and 12 UTC

The storm (1.6km grid)

- 30h ahead, AMPS forecasts max storm intensity around 06 UTC 22 Oct
  - consistent with the observations

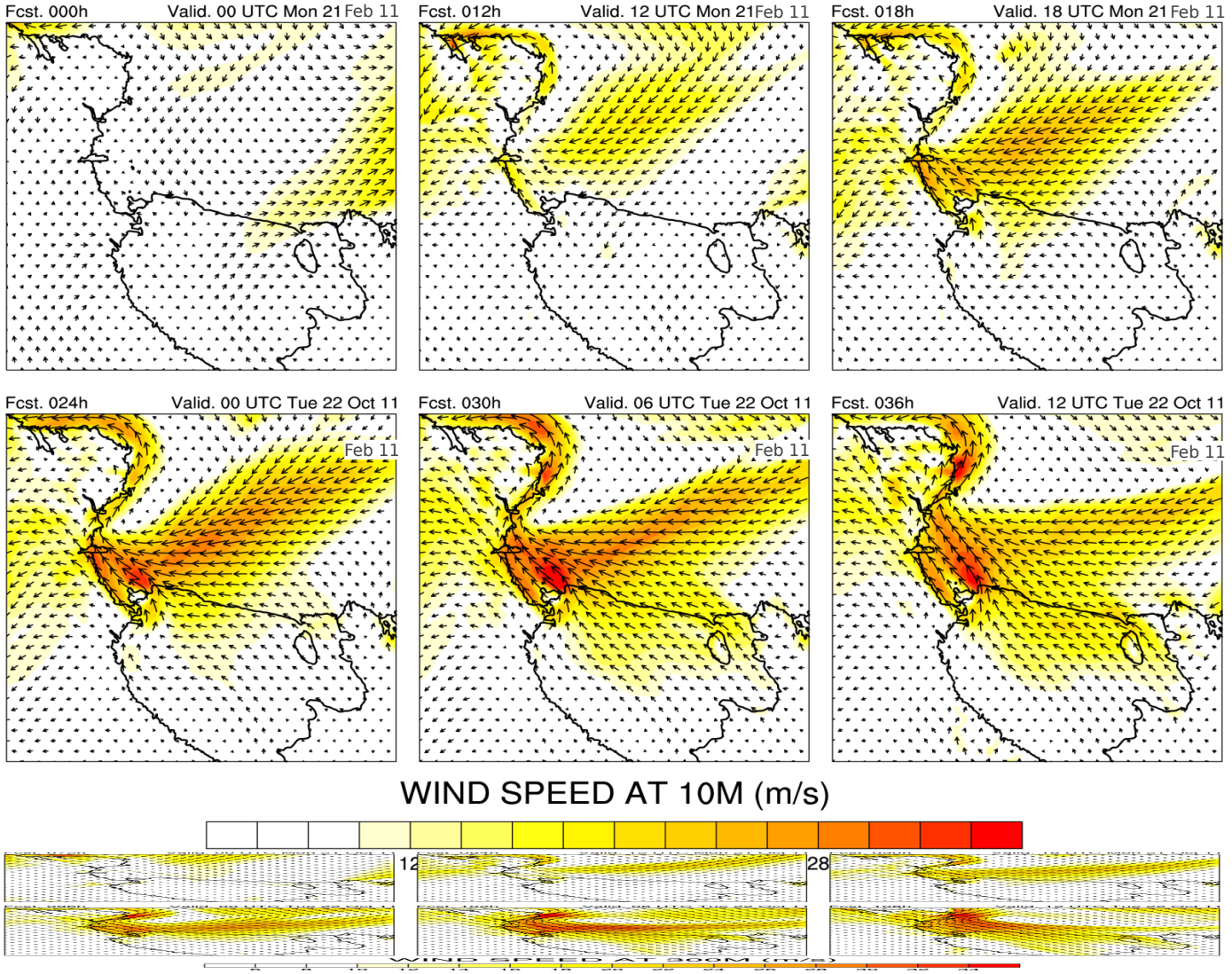


How far ahead was the storm predicted by AMPS?

For the 1.6km grid, AMPS forecasts are available up to 36h
In the following slides, we look at the forecasts from the 15km grid (up to 120h)

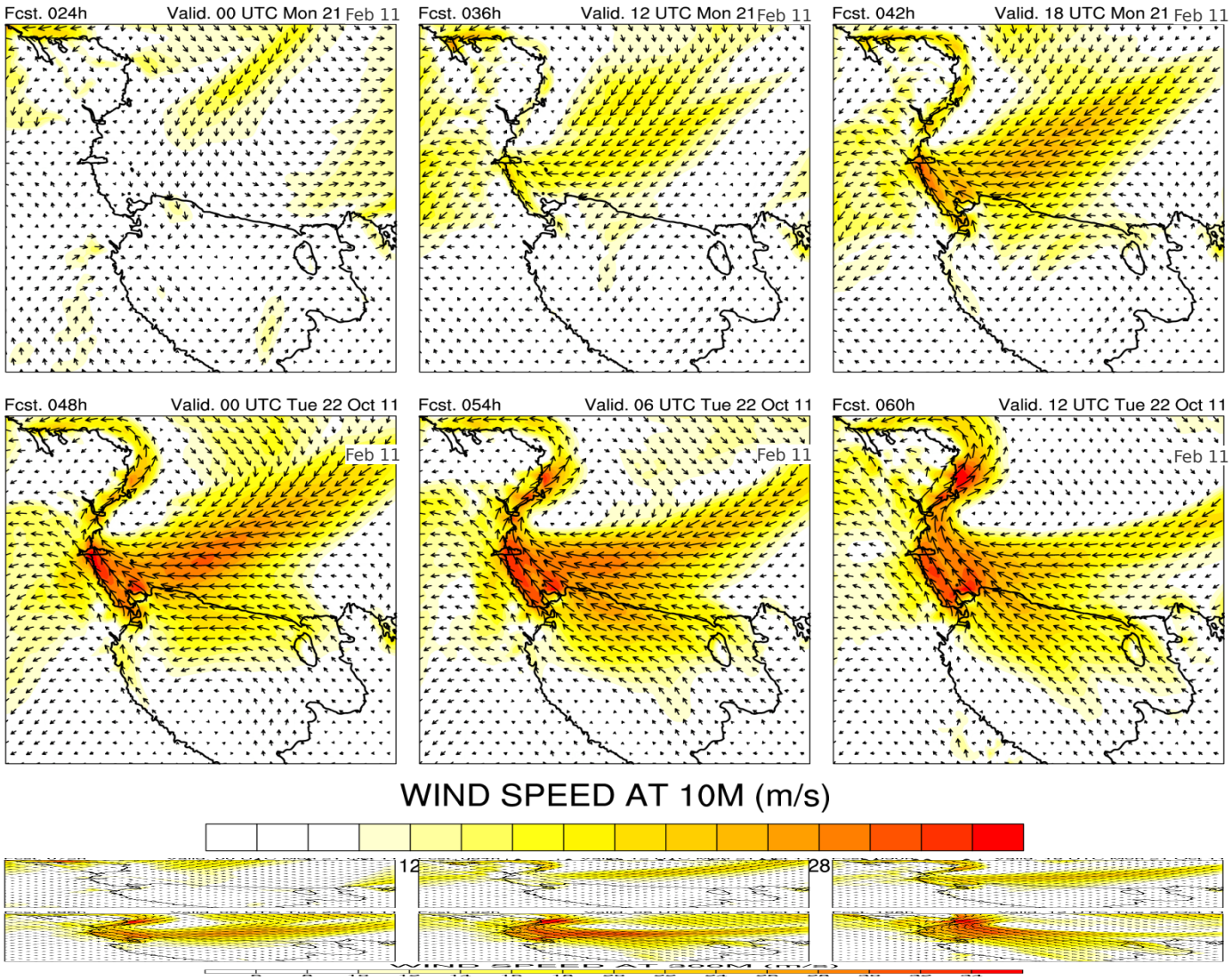
The storm (15km grid)

- Initialized 00 UTC 21 Feb = **30h** before storm max intensity



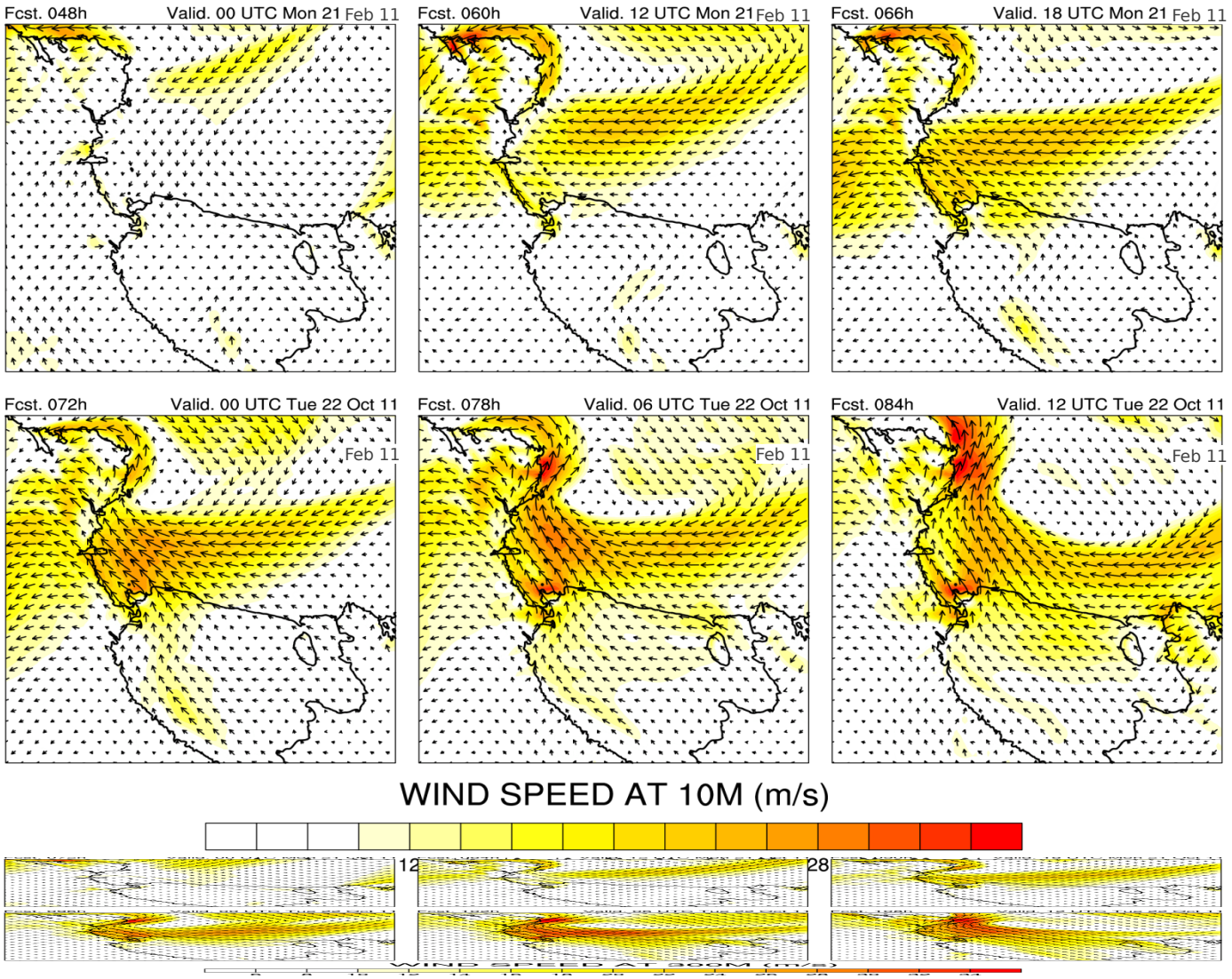
The storm (15km grid)

- Initialized 00 UTC 20 Feb = **54h** before storm max intensity



The storm (15km grid)

- Initialized 00 UTC 19 Feb = **78h** before storm max intensity



Conclusions

The Norwegian ship sank in a highly exposed area in the McMurdo Sound
The timing of the storm was correctly forecast by AMPS 30h ahead
In the earlier forecasts, AMPS predicts weaker storm intensity as it places the low pressure system farther north from Ross Island
A barrier wind component parallel to the Transantarctic Mountains likely contributed to intensify the wind in the Ross Island area

Sources

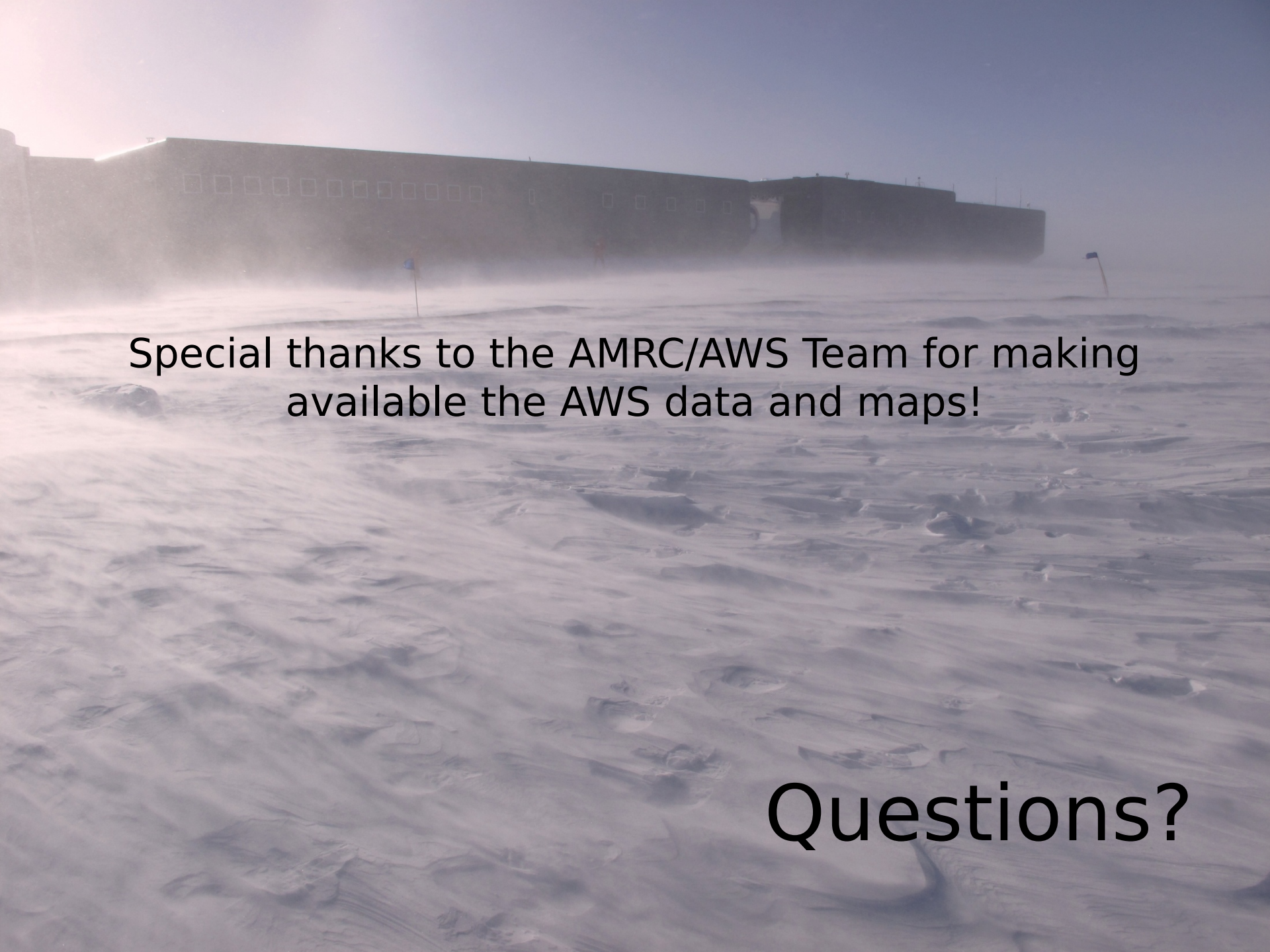
French helicopter

http://www.southpolestation.com/trivia/10s/squirrel.ht

http://blogs.nature.com/news/thegreatbeyond/2010/1

Norwegian ship

http://www.stuff.co.nz/national/4709377/Three-die-in-



Special thanks to the AMRC/AWS Team for making available the AWS data and maps!

Questions?