In the dark: paradigms of Arctic ecosystems during polar night challenged by new understanding

Talks during the session today:

- The polar night

  13:30-13:45 Berge (new)

- Examples of new insights / discoveries

  13:45-14:00 Last

  14:00-14:15 Cottier

  14:15-14:30 Daase (moved from 13:30)

  14:30-14:45 Cohen

  14:45-15:00 Pekkoeva

Prof. Jørgen Berge (UiT/UNIS)

Dr Finlo Cottier (SAMS)

Prof. Stig Falk-Petersen (APN/UiT)

2007 2008
POLARÅRET

NORKLIMA
Et av Norges forskningsråds Store programmer

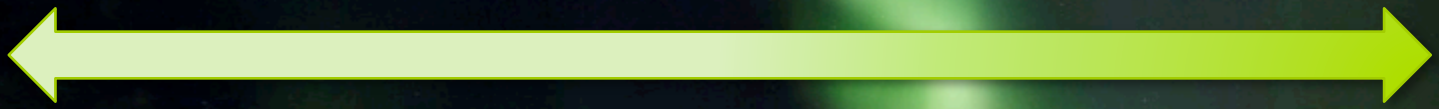
Arctic Frontiers

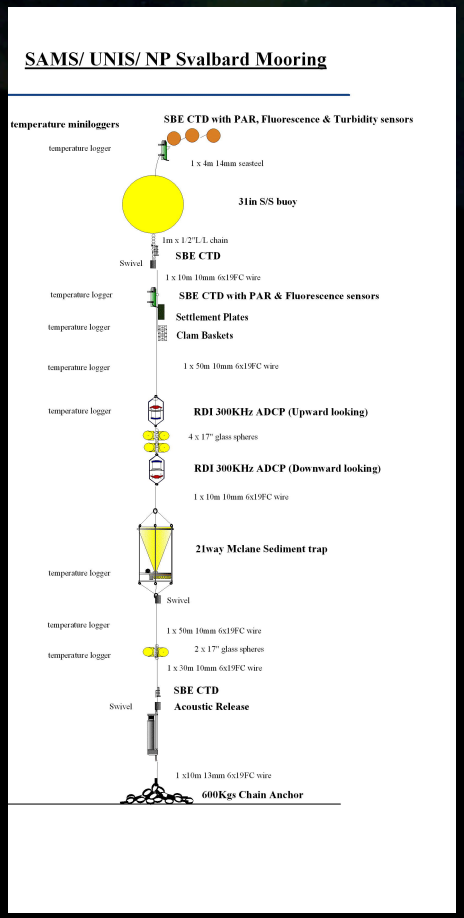
NORSK POLARINSTITUTT

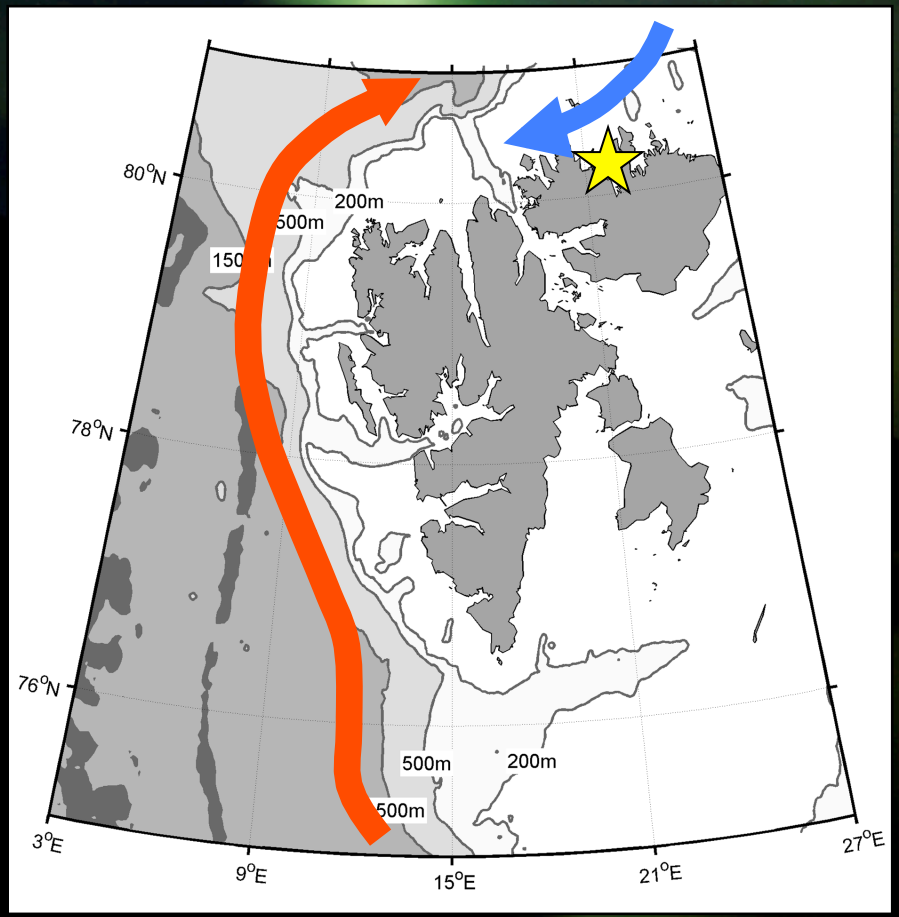
UNIS

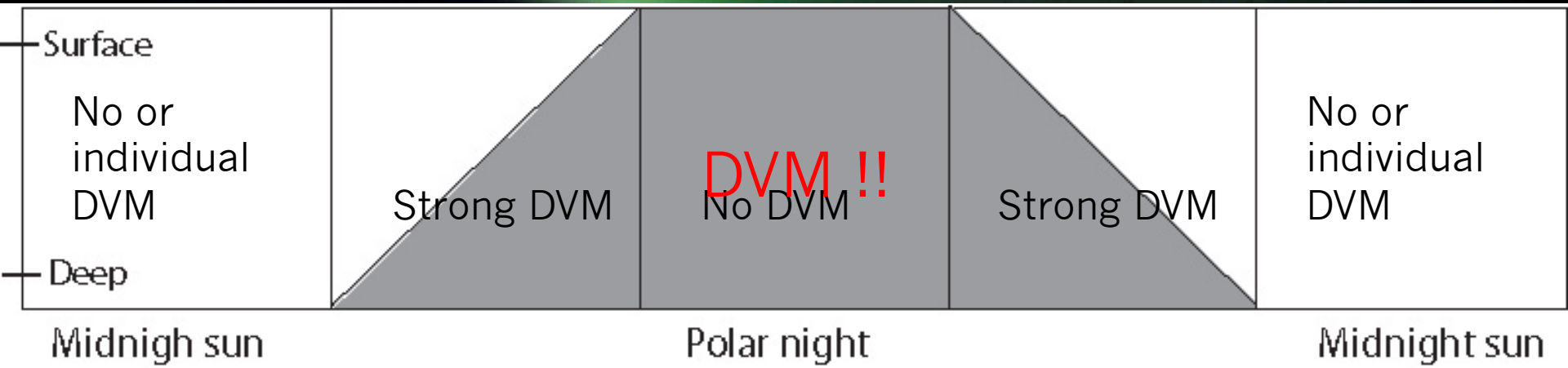
Research Network ARCTOS

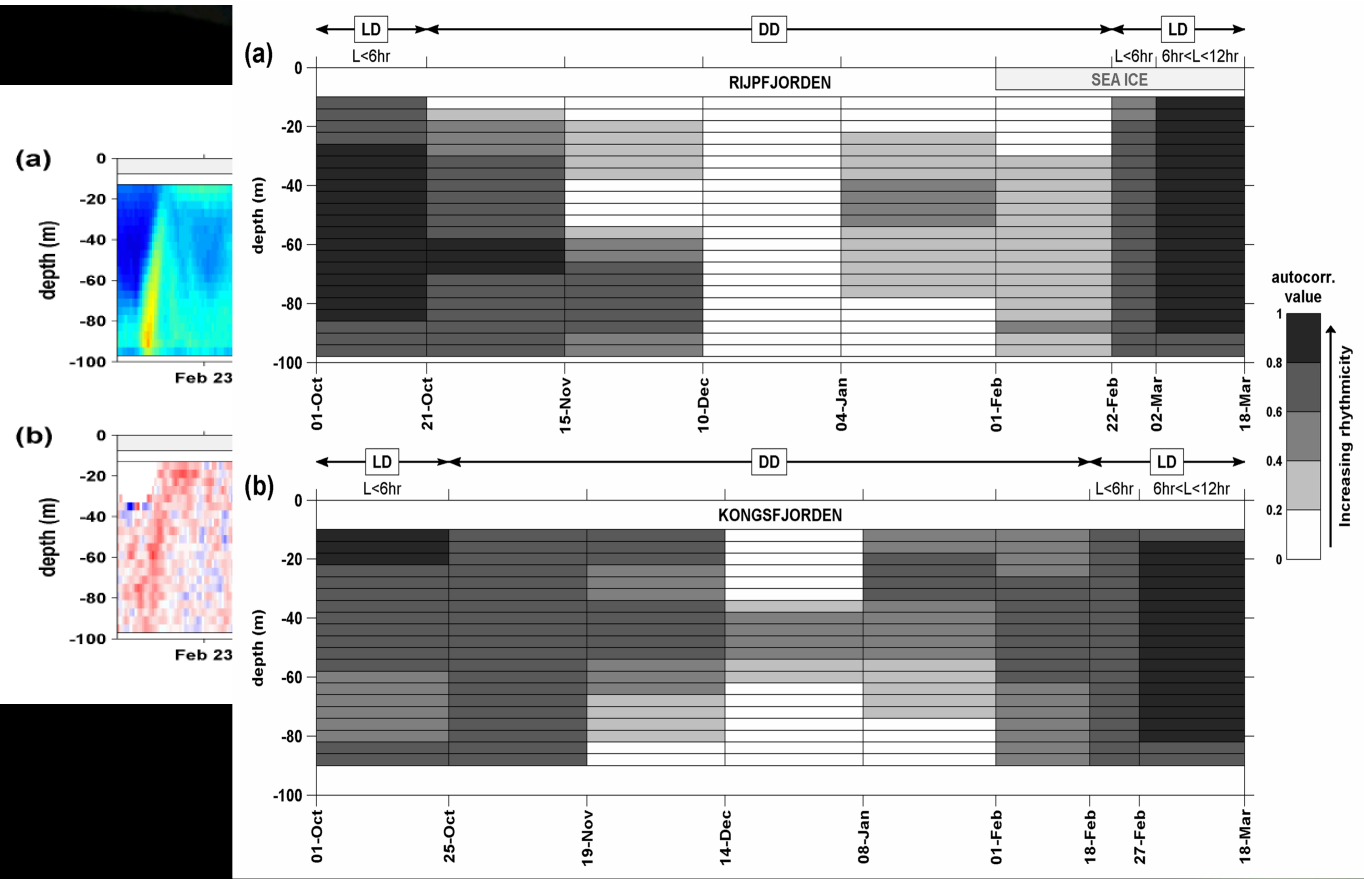

Jan
Febr
Mar
Apr
May
June
July
Aug
Sep
Oct
Nov
Dec
Snow
Sea ice
Ice algae
Snow
Sea ice




SAMS/ UNIS/ NP Svalbard Mooring
temperature miniloggers
SBE CTD with PAR, Fluorescence & Turbidity sensors
temperature logger
1 x 4m 14mm seasteel
31in S/S buoy
1m x 1/2"L/L chain
Swivel
SBE CTD
1 x 10m 10mm 6x19FC wire
temperature logger
SBE CTD with PAR & Fluorescence sensors
Settlement Plates
temperature logger
Clam Baskets
temperature logger
1 x 50m 10mm 6x19FC wire
temperature logger
RDI 300KHz ADCP (Upward looking)
4 x 17" glass spheres
RDI 300KHz ADCP (Downward looking)
1 x 10m 10mm 6x19FC wire
21way Mclane Sediment trap
temperature logger
Swivel
temperature logger
1 x 50m 10mm 6x19FC wire
temperature logger
2 x 17" glass spheres
1 x 30m 10mm 6x19FC wire
SBE CTD
Swivel
Acoustic Release
1 x10m 13mm 6x19FC wire
600Kgs Chain Anchor


80°N
78°N
76°N
3°E
9°E
15°E
21°E
27°E
200m
500m
150
500m
200m
500m

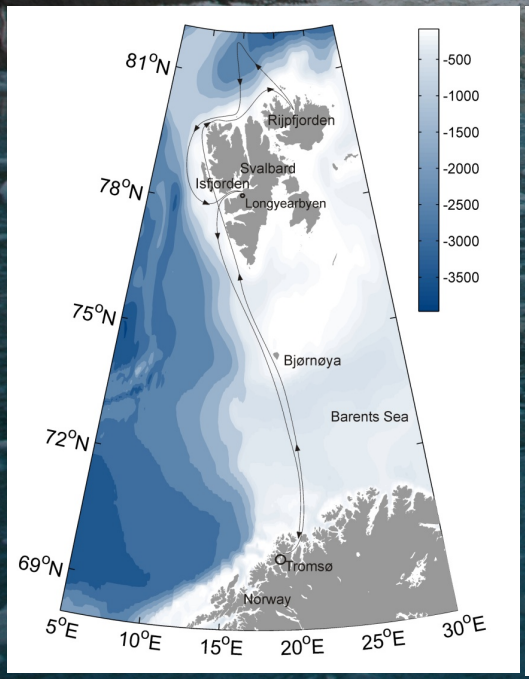


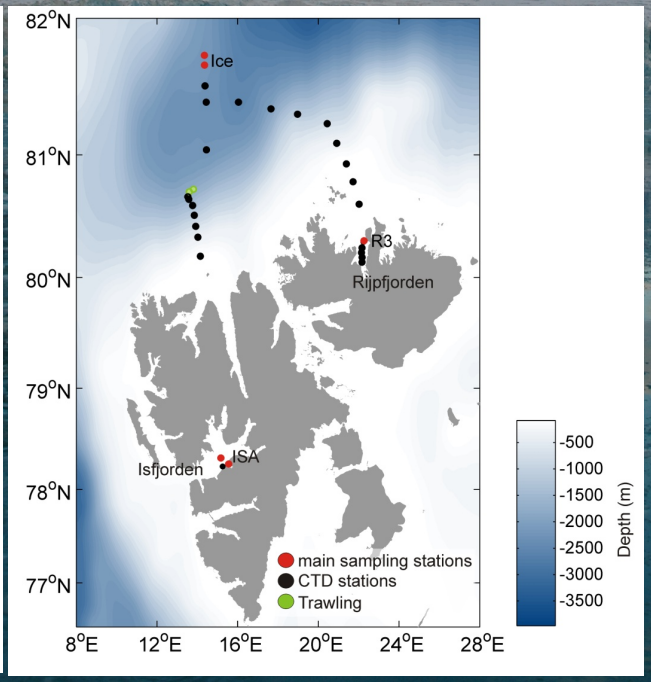


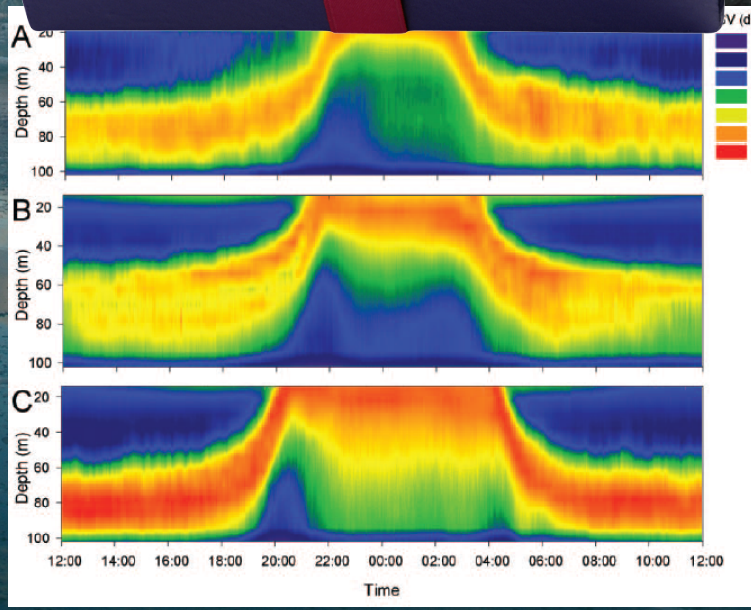
)VM signal in the
t 80°N in February
recalculated as
2006: warmer colours
vertical velocity:
vements, colder (blue)
ss in the water
ın is about to reach
vas covered by up to
ıts later in the season
available light
ow, leaving the
light state long into

Berge et al 2009

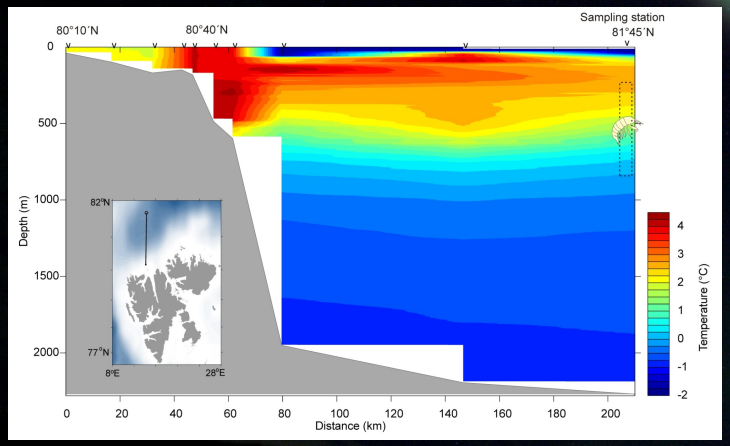
- Consistent pattern over years and locations
- Who? How? Why?
- NRC funded project (CircA) from 2010
- Polar Night cruises from 2011

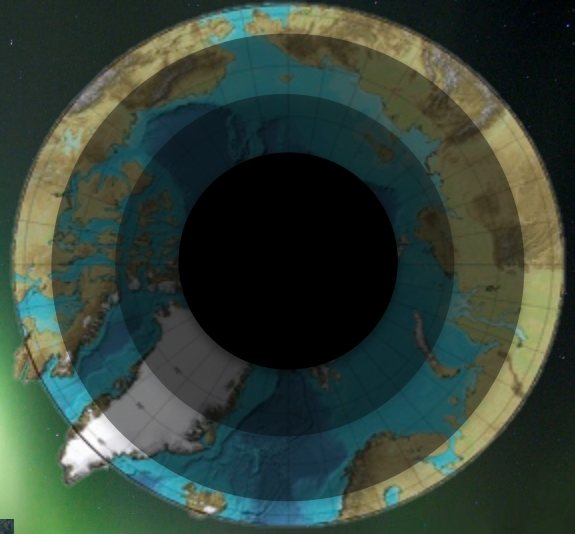


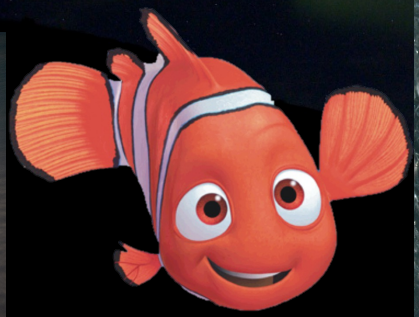


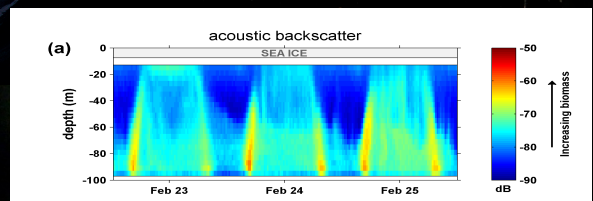


What did this box of treats contain?



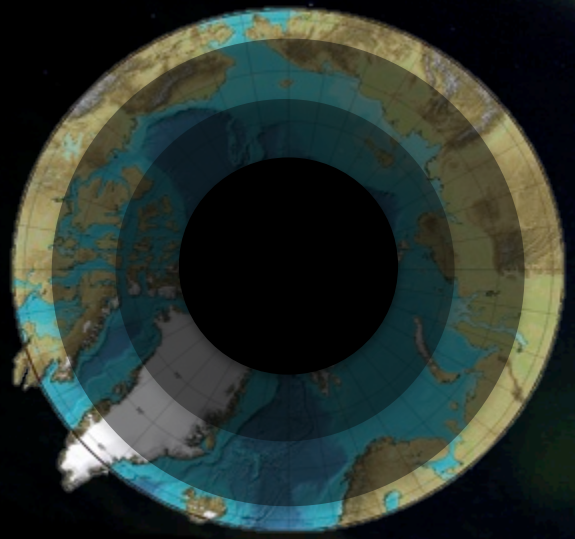






Alle alla
Uria lomvia
Cepphus grylle
Fulmaris glacialis
Larus hyperboreus
Rissa tridactyla

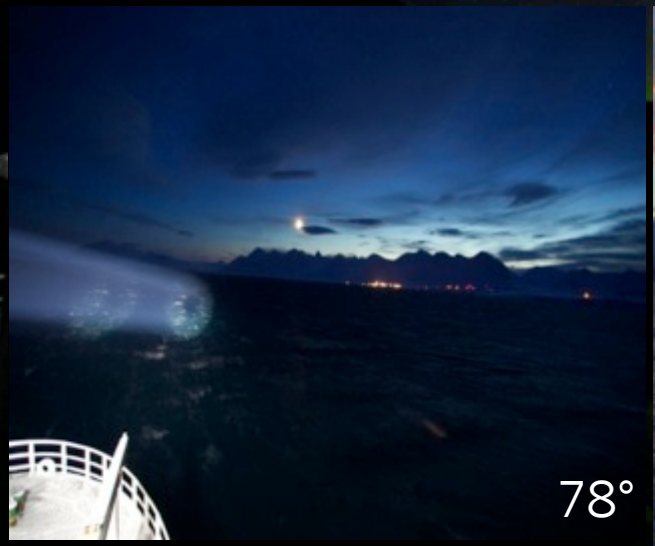
A homogenous polar night?



The black box becomes darker at higher latitudes

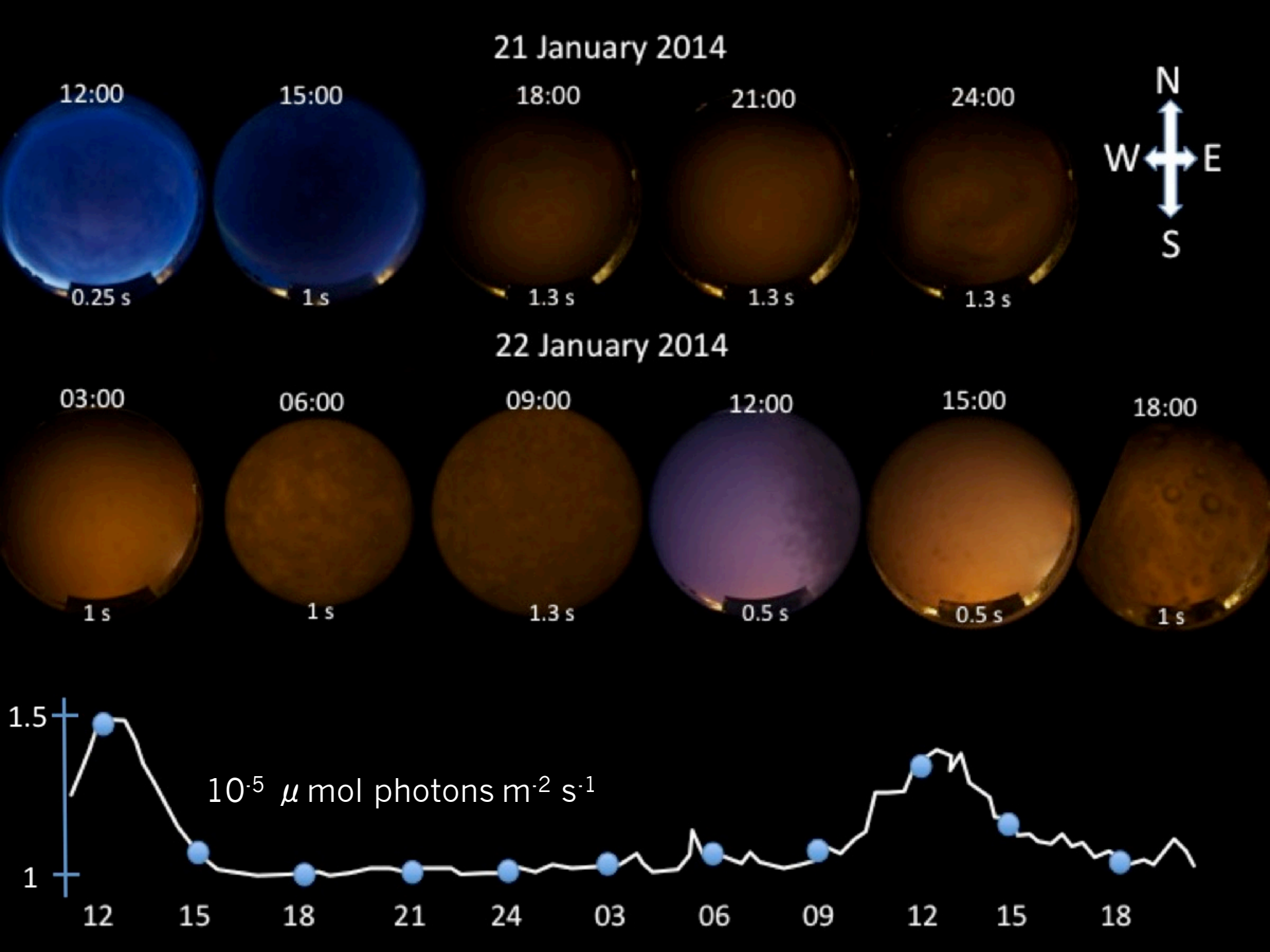
Nautical polar night at latitudes >78°N. Defined by the sun below 12° under the horizon. DARK!

Civil polar night at latitudes between 72° and 78°N (sun between 6° and 12° under the horizon). Darkish



Civil twilight at latitudes between polar circel and 72°N (sun between 0° and 6° under the horizon). Dark?

All pictures taken at noon onboard RV *Helmer Hanssen* mid January 2013


21 January 2014
12:00
15:00
18:00
21:00
24:00
0.25 s
1 s
1.3 s
1.3 s
1.3 s
N
W
E
S
22 January 2014
03:00
06:00
09:00
12:00
15:00
18:00
1 s
1 s
1.3 s
0.5 s
0.5 s
1 s
1.5
1
10^{-5} μ mol photons m^{-2} s^{-1}
12
15
18
21
24
03
06
09
12
15
18

Status of knowledge summary

1. The classical paradigm of a biological dessert contradicted by a number of basic discoveries during the last years

2. A Pandoras box is opened – the polar night represent one of our major gaps in knowledge regarding our understanding of high latitude ecosystems!

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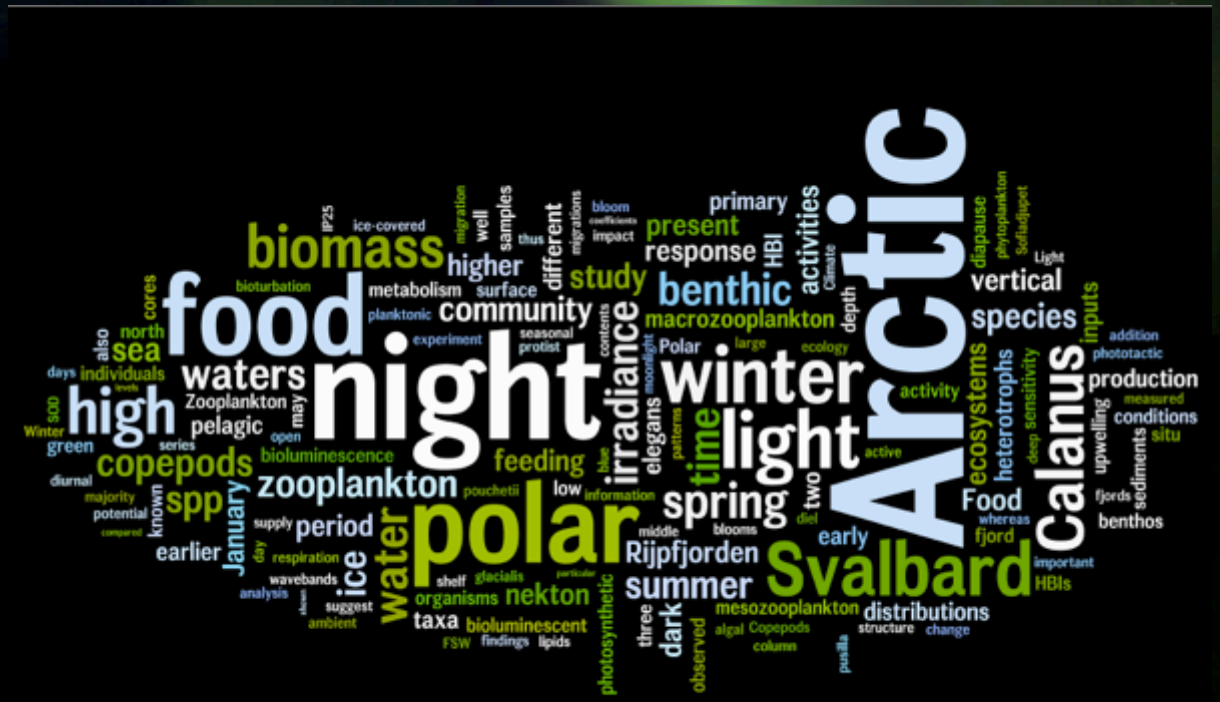


Thank you for your attention!