南大洋顶级捕食者
的发展与研究

孟凡祎

Photo credit: MEOP

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The Commission for the Conservation of Antarctic Marine Living Resources(CCAMLR)

机构使命

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- 涉及渔业的关键物种保护(CEMP)

CEMP的贡献单位

- 英国极地调查局
- 其他

CEMP框架下的工作

英国极地调查局

生物观测

监测站点：

Cumberland Bay

Bird Island

Signy Island

Port Lockroy

监测物种：

Gentoo penguins

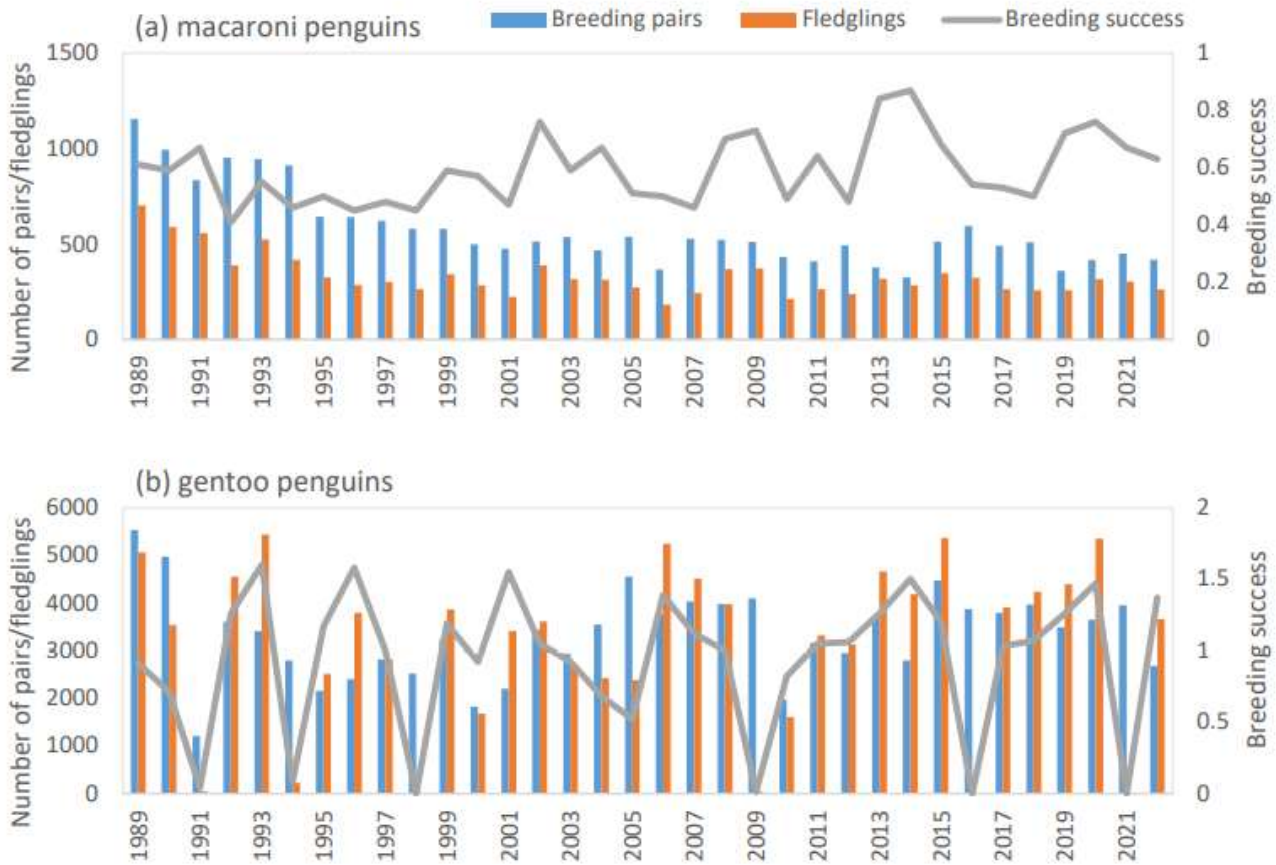
Antarctic fur seals

Black-browed albatrosses

Chinstrap penguins

Macaroni penguins

Adélie penguins



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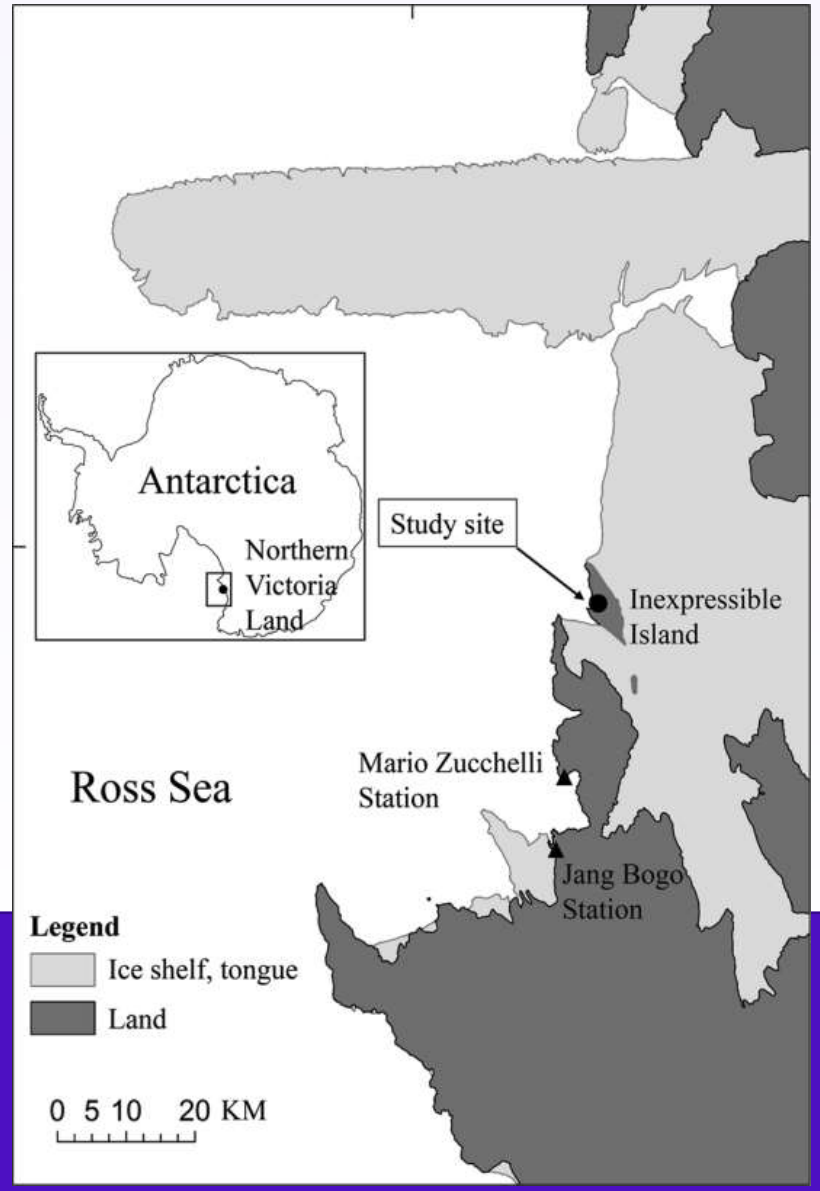
截止至2022年

韩国极地中心



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- 2017-2018年韩国极地中心在Seaview Bay观察到的罕见现象。
- 威德尔海豹也会对阿德利企鹅发动袭击，捕食方式与豹海豹相同。
- 发表于《polar biology》，业内认可期刊，曾报道南极海狗虐杀帝企鹅。
- 研究南极捕食者行为是一份非常有价值工作，在极地领域内广受认可。

Weddell seal feeds on Adélie Penguins in the Ross Sea,Antarctica

Won Young Lee Jin-Woo Jung Hosung Chung

韩国极地中心

Photo credit: KOPRI

MEOP简介

Marine Mammals Exploring the Oceans Pole to Pole,汇集了几个国家计划，以生成一个全面的质量控制数据库，该数据库包含在极地地区从仪器化海洋哺乳动物中获得的海洋学数据。









Photo credit: MEOP

南象海豹：最理想的生物浮标携带者

Photo credit: MEOP

运动行为分析

水平运动

运动方向、轨迹形状描述与解释，依赖环境背景

识别运动状态：驻留or定向

轨迹模拟、校正与数据增强

垂直运动

潜水的频次

潜水的深度

判定觅食行为

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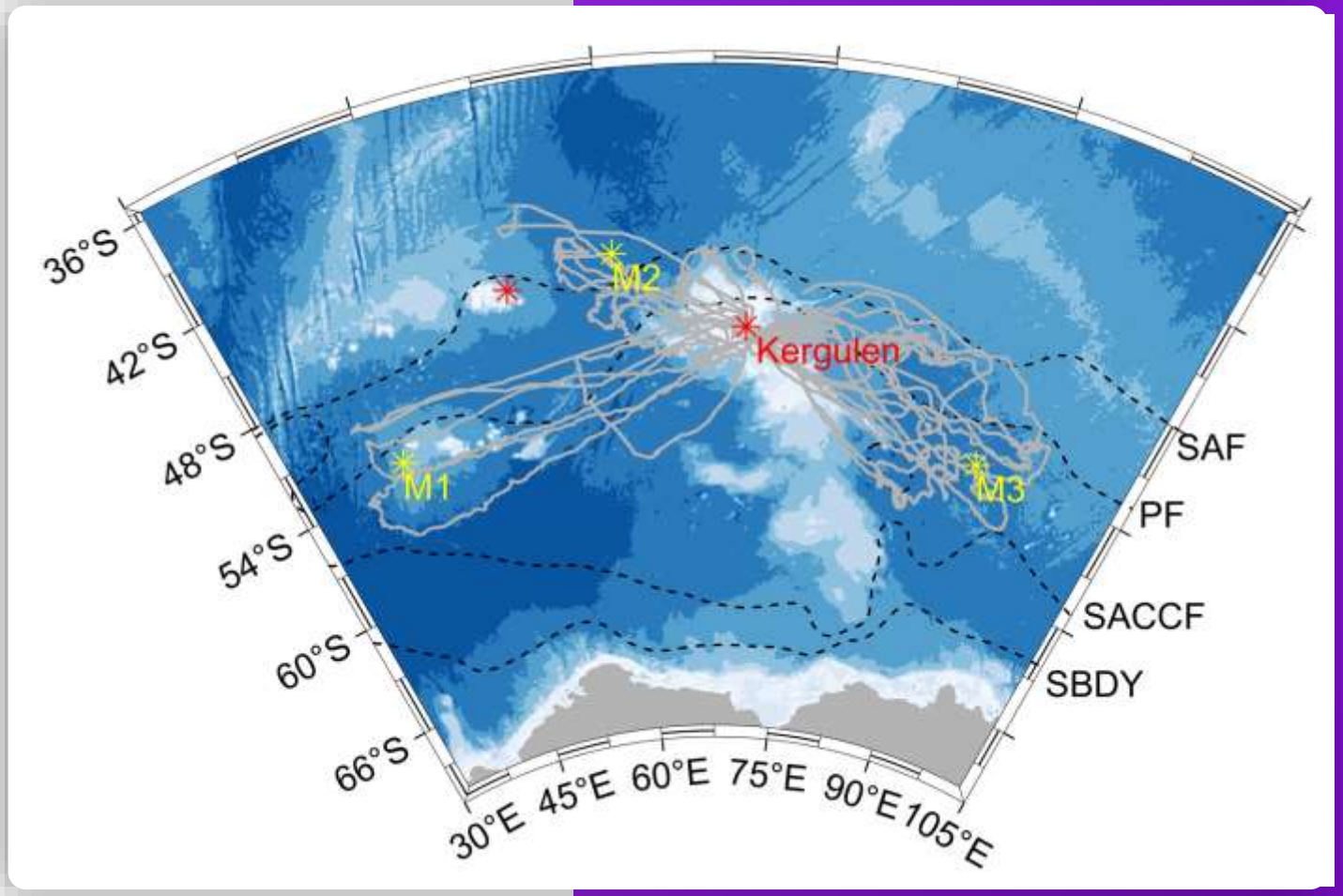

Photo credit: Meng

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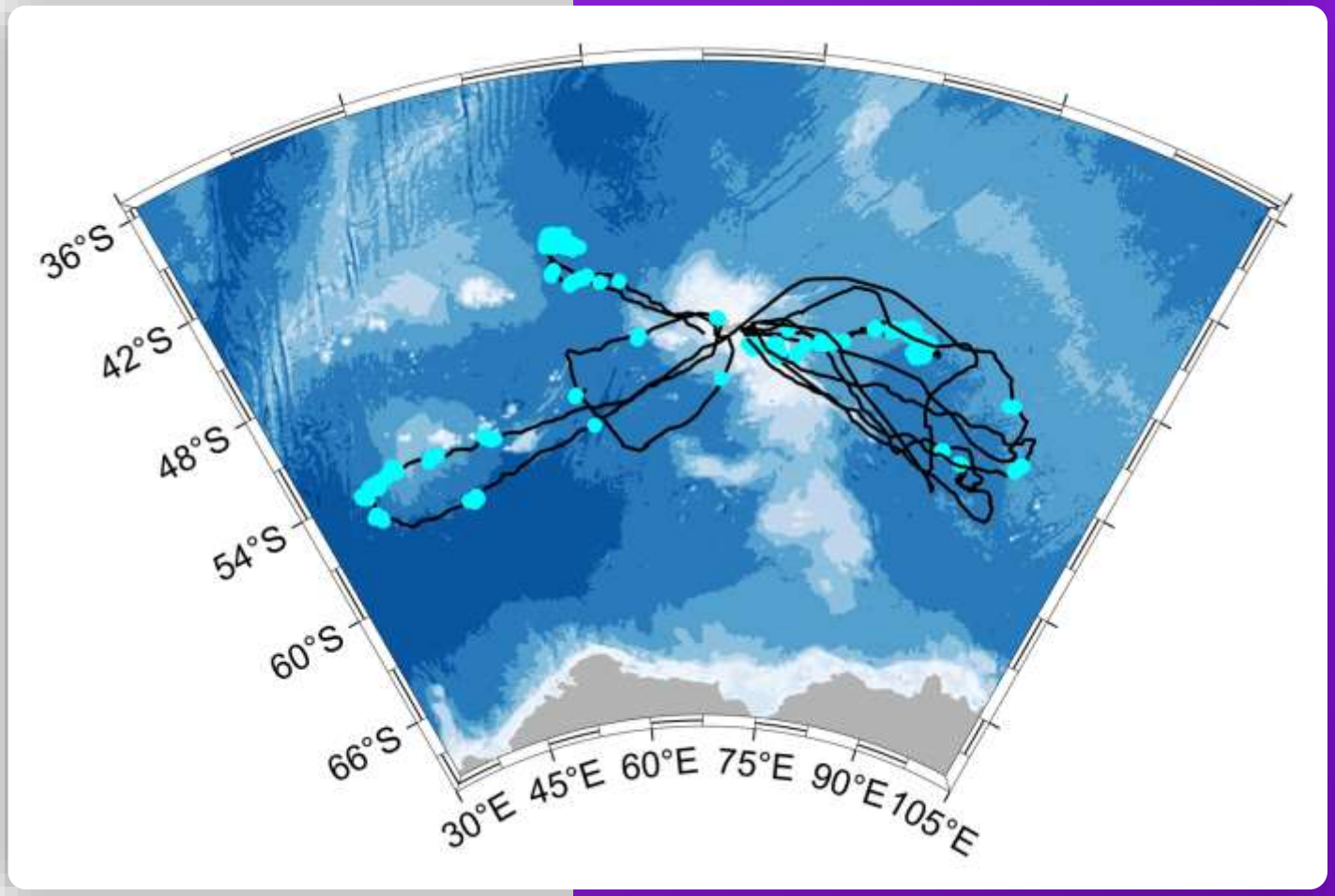

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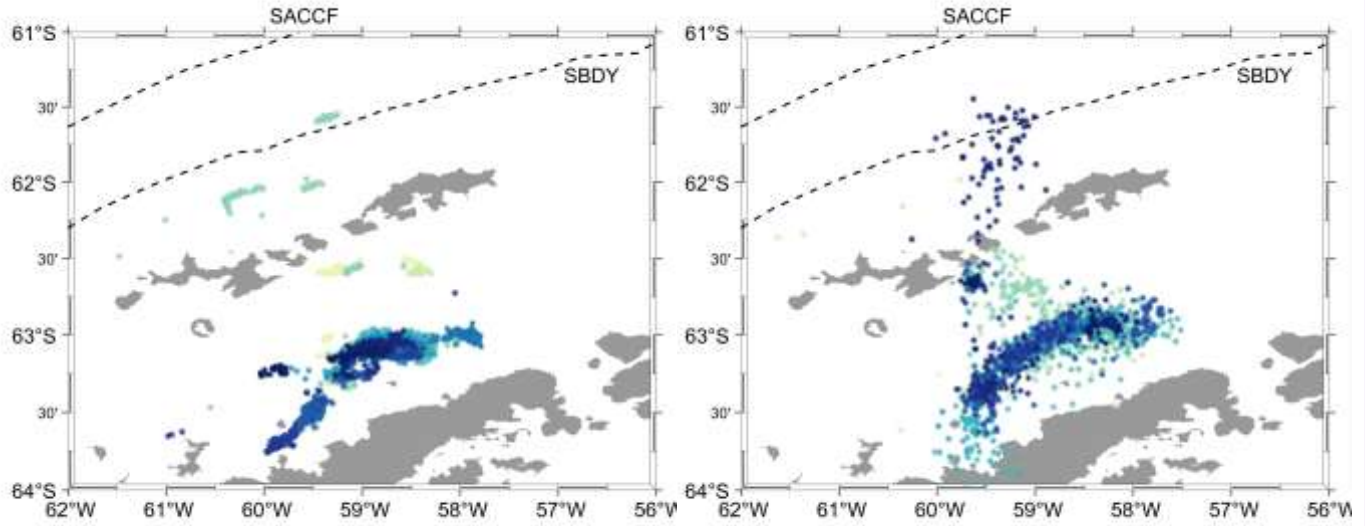

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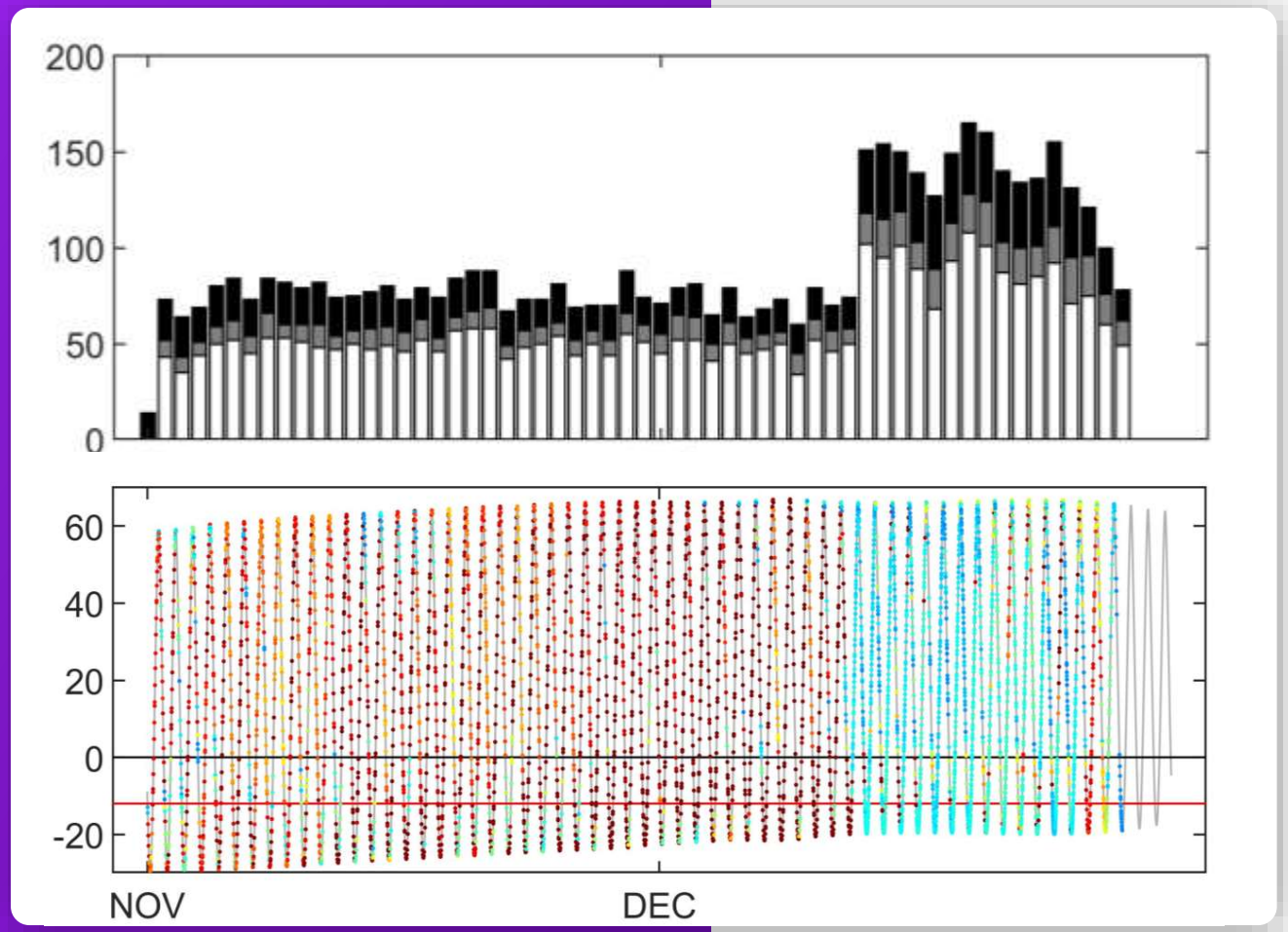
运动行为分析

垂直运动



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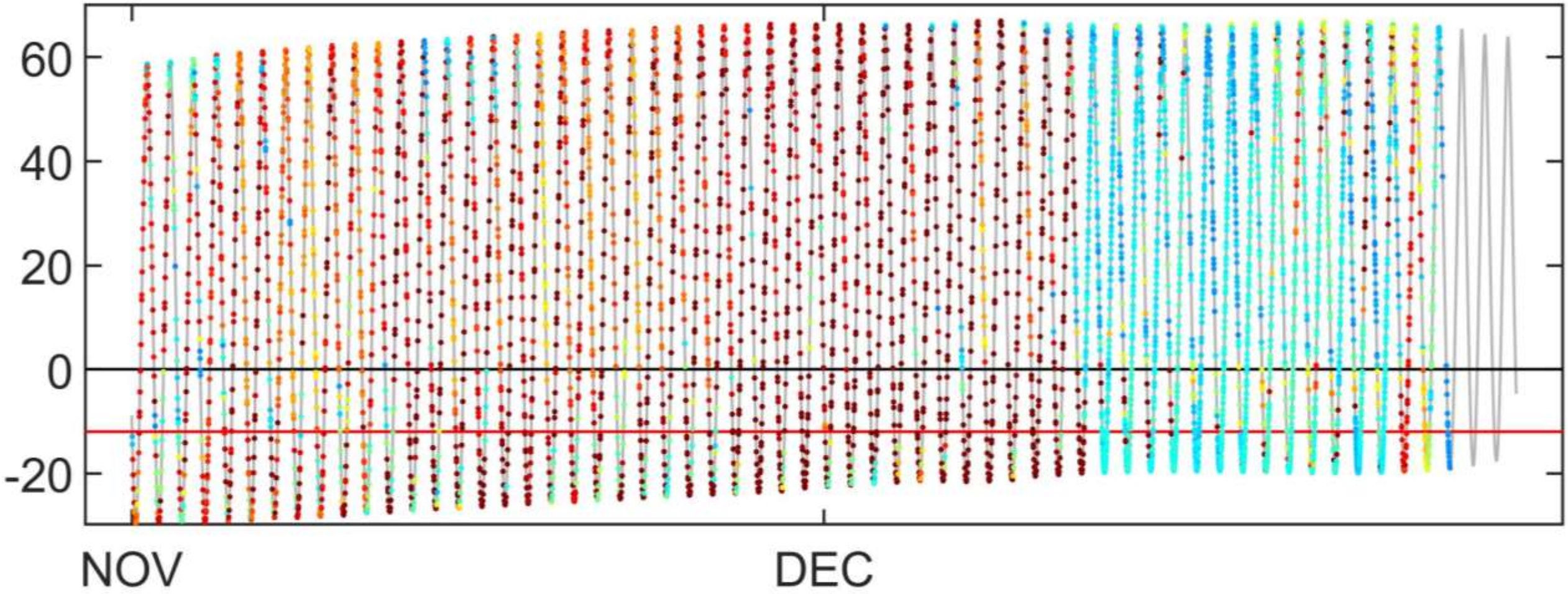
潜水的频次

潜水的深度



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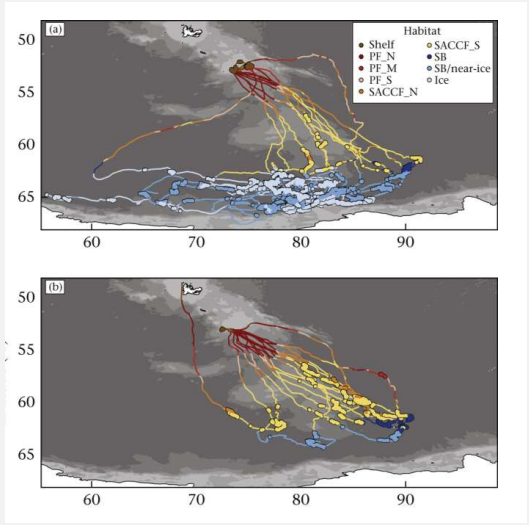
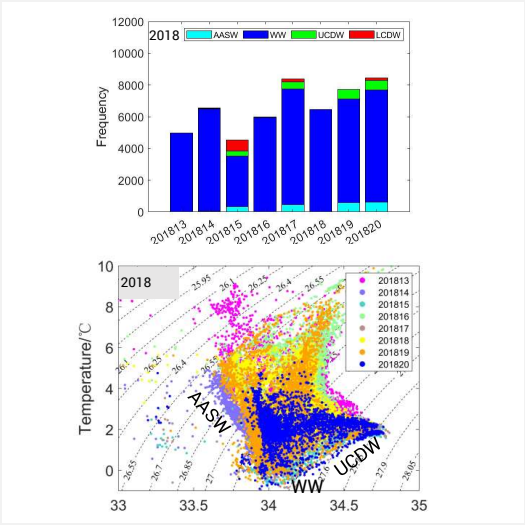
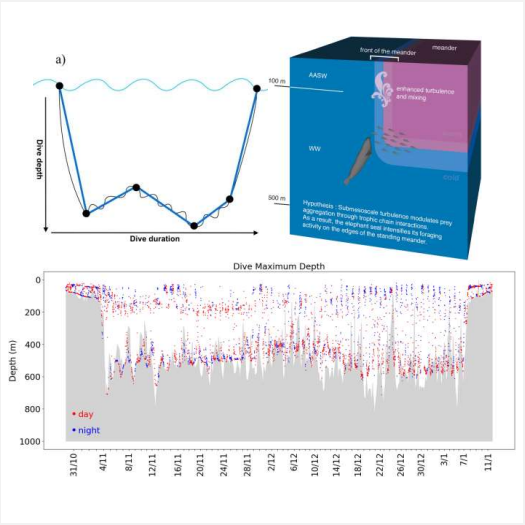
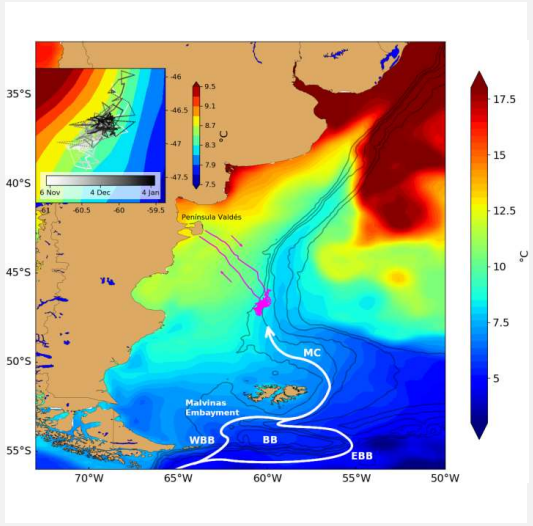
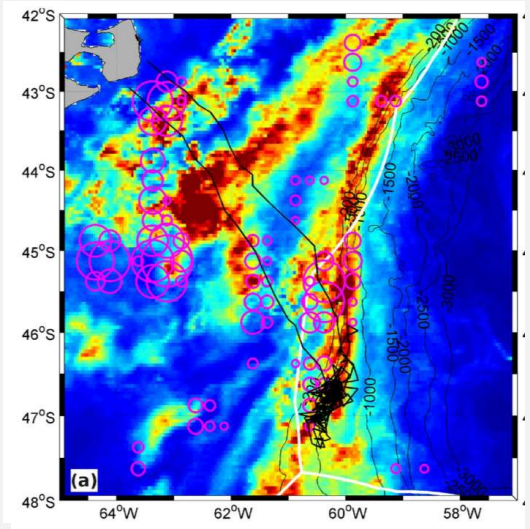
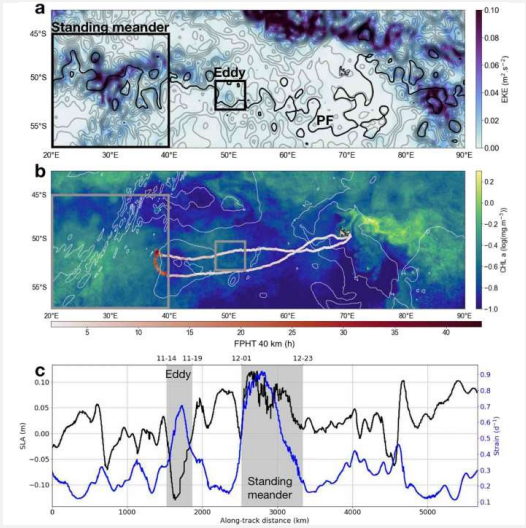

(a)
Habitat
Shelf
PF_N
PF_M
PF_S
SACCF_N
SACCF_S
SB
SB/near-ice
Ice
(b)

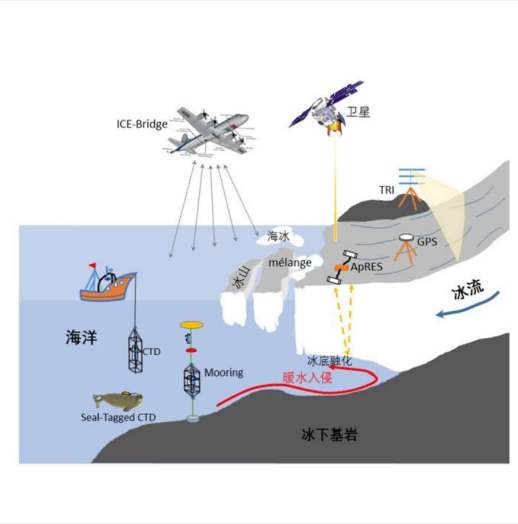

2018
AASW
WW
UCDW
LCDW
Frequency
Temperature/°C
AASW
WW
UCDW


a)
Dive depth
Dive duration
AASW
WW
Dive Maximum Depth
Depth (m)
day
night

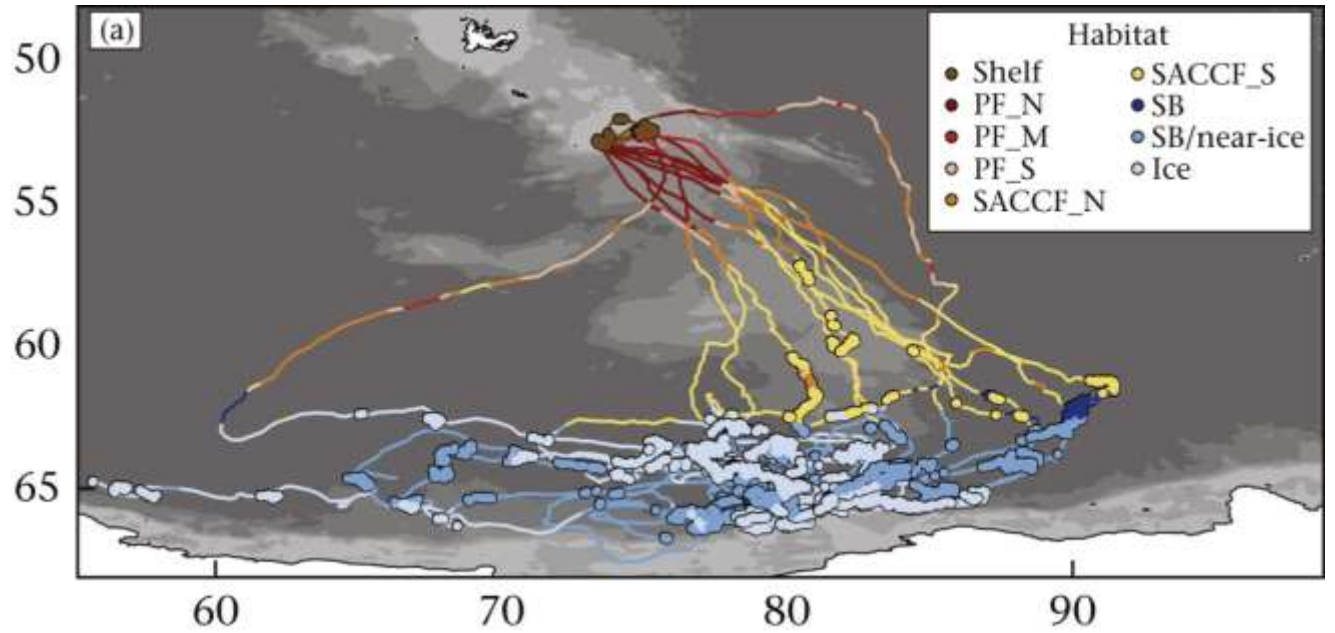

Peninsula Valdés
MC
Malvinas Embayment
WBB
BB
EBB
°C

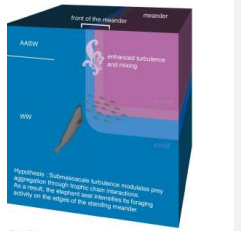

(a)

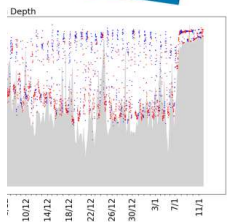

a
Standing meander
Eddy
PF
b
FPHT 40 km (h)
c
Eddy
Standing meander
Along-track distance (km)

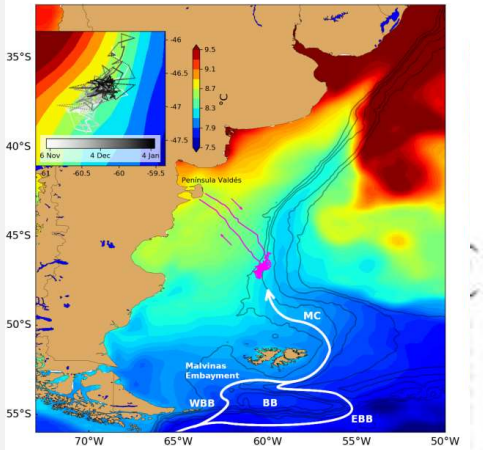

ICE-Bridge
卫星
TRI
海冰
mélange
GPS
ApRES
冰山
冰流
海洋
CTD
Mooring
冰底融化
暖水入侵
Seal-Tagged CTD
冰下基岩

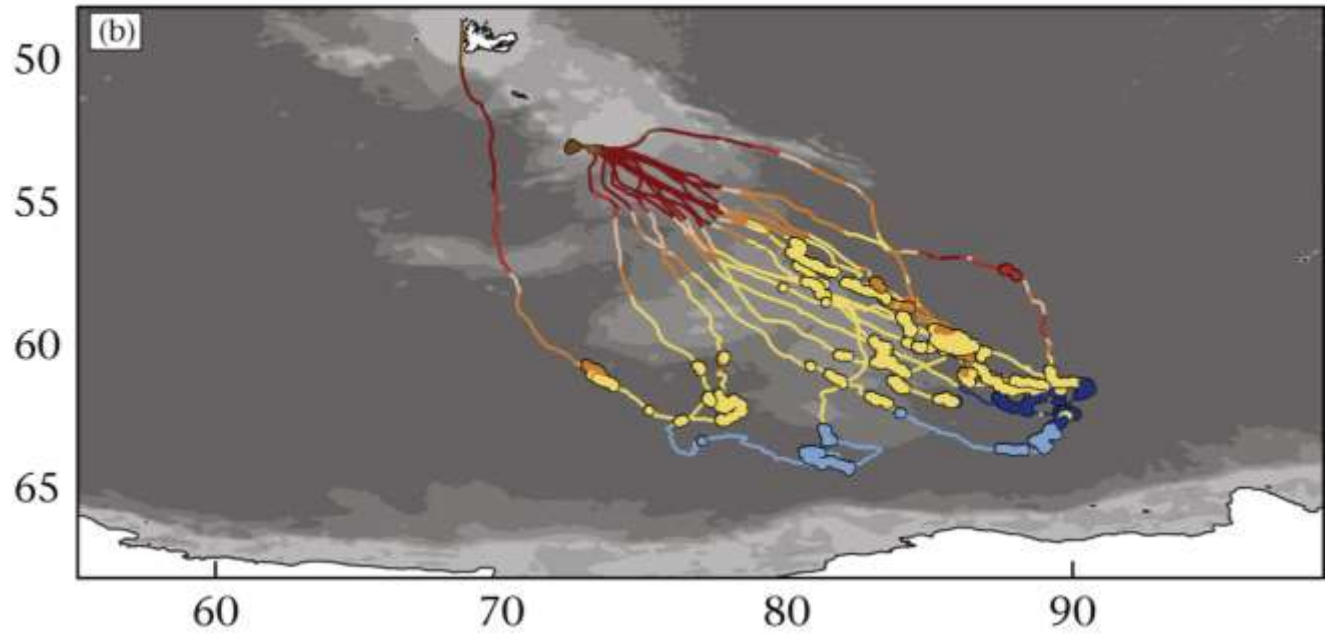
海上栖息地研究











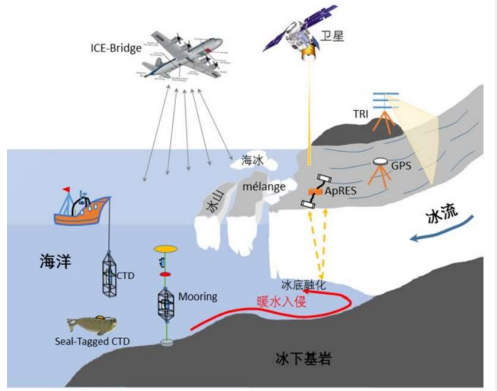
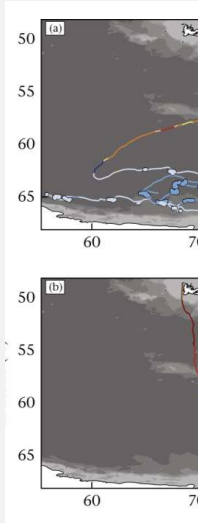
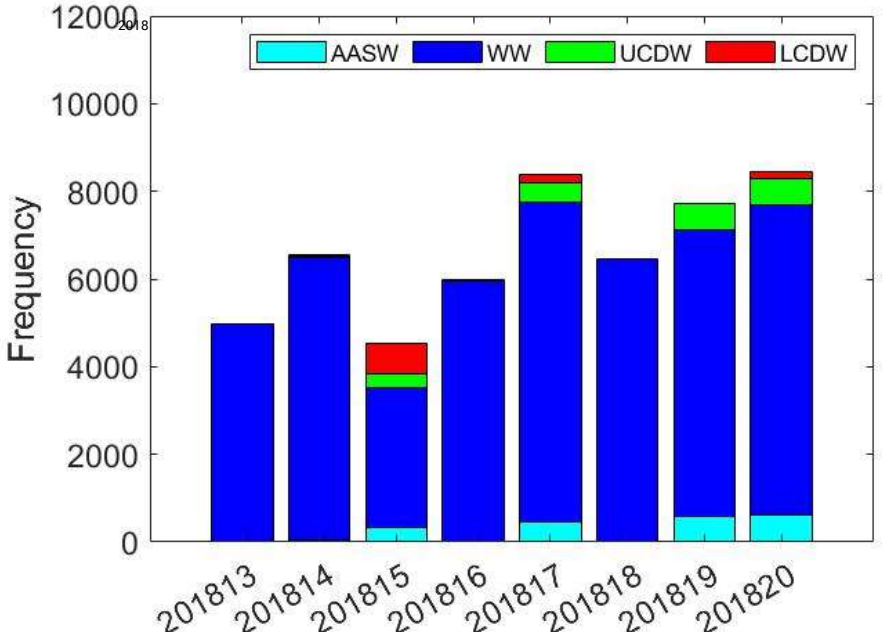
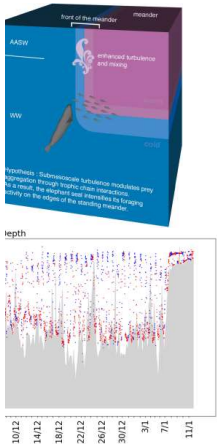
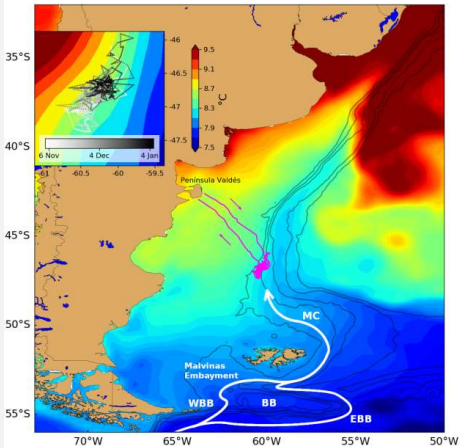


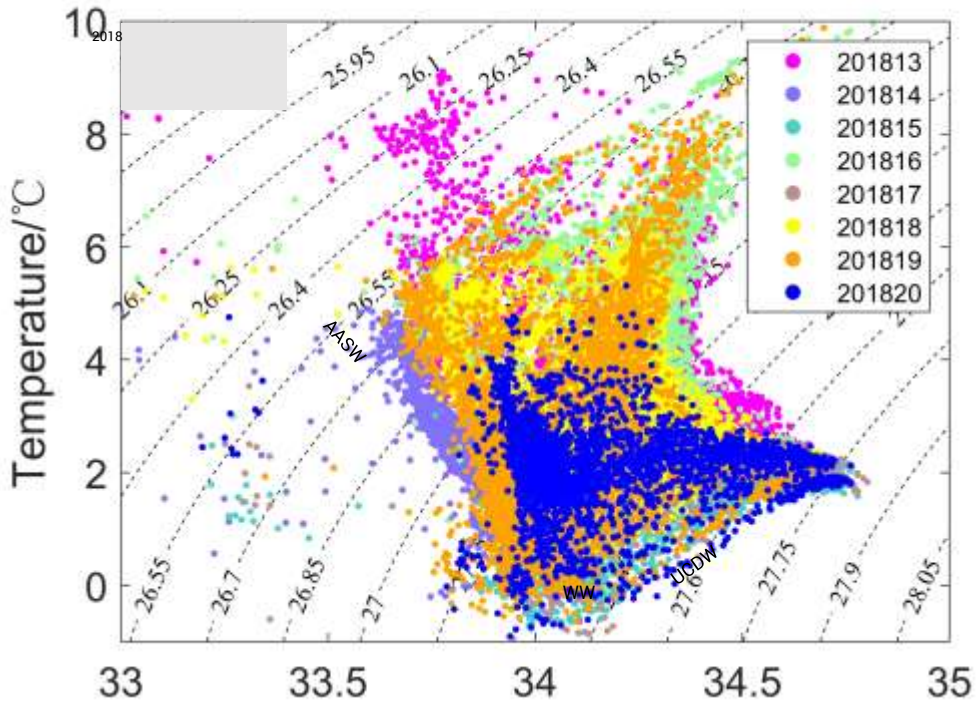
Photo credit: MarcusSalton











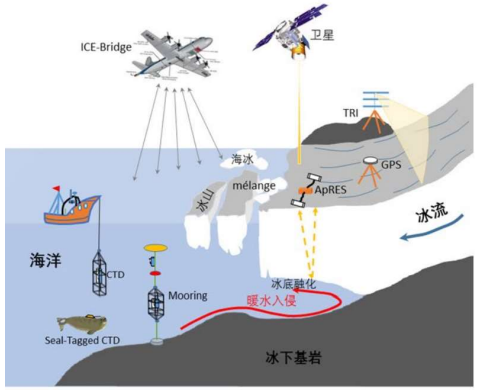
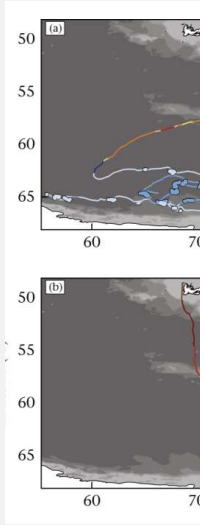
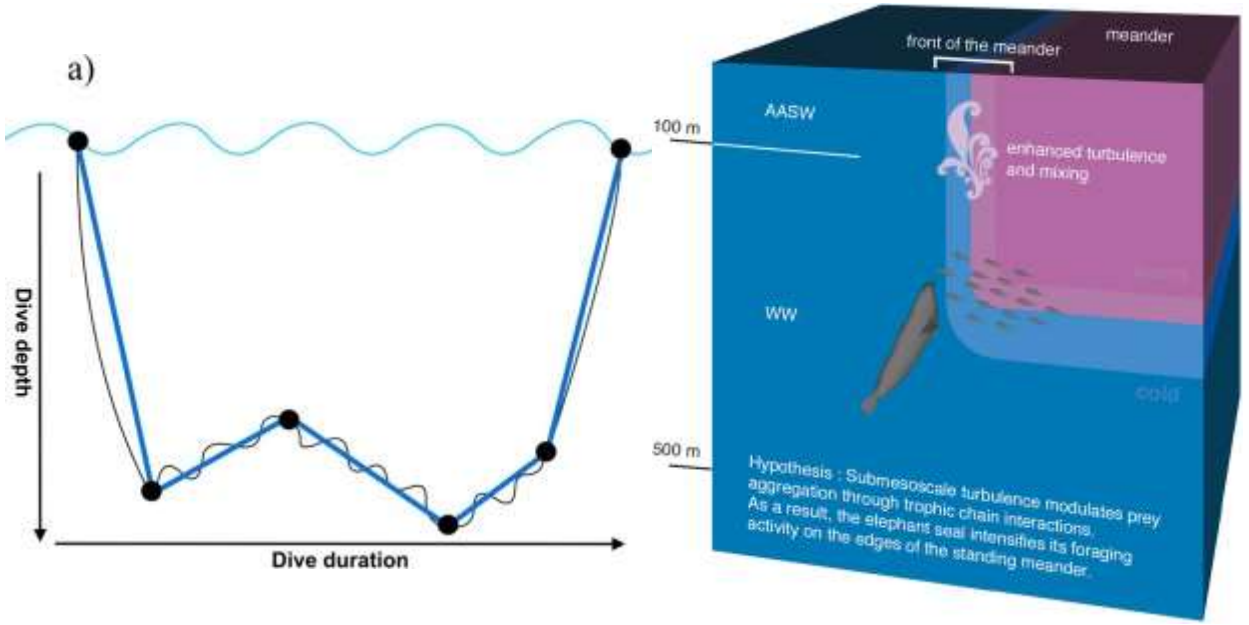
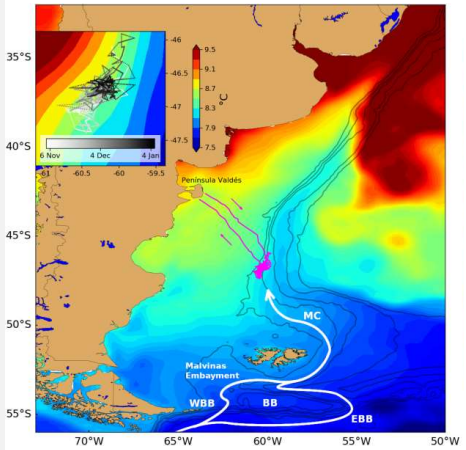
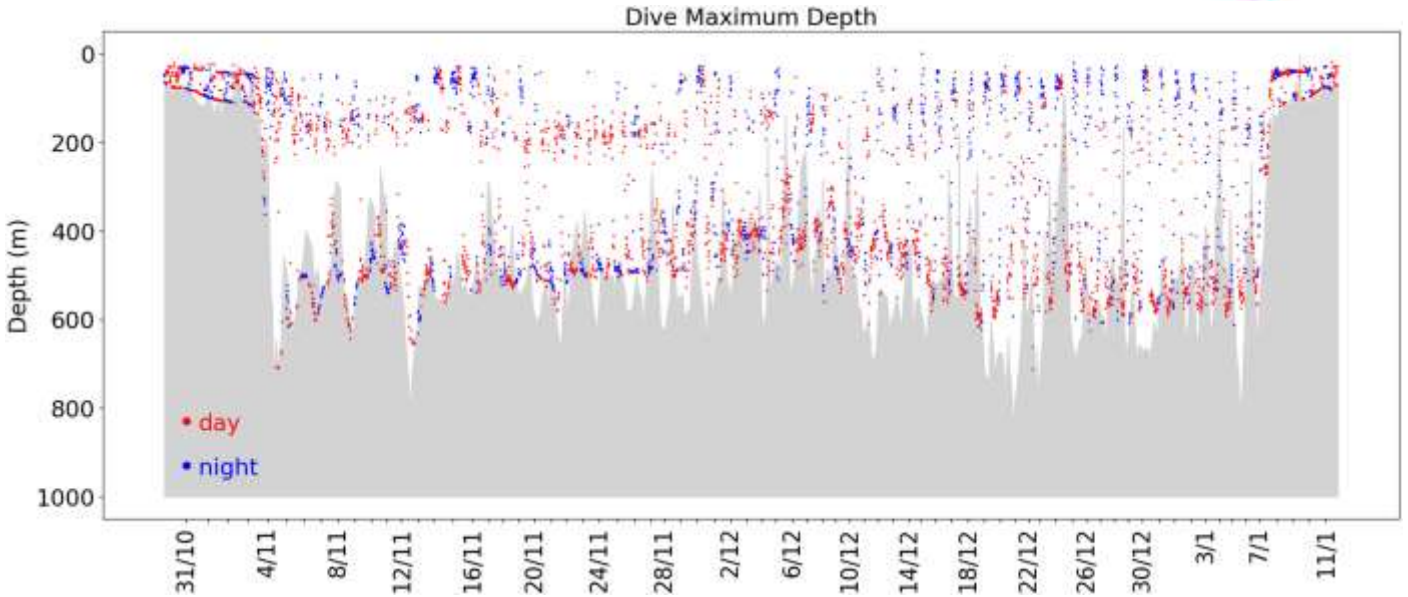


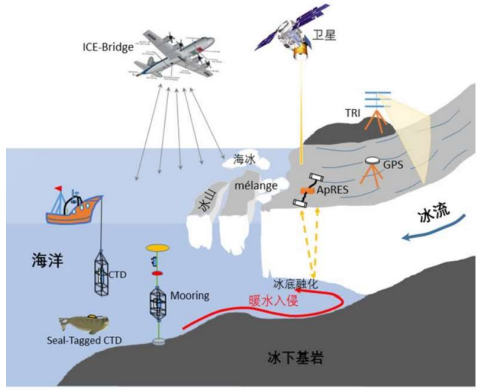
Photo credit: MENG











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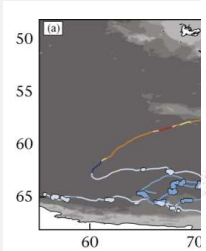

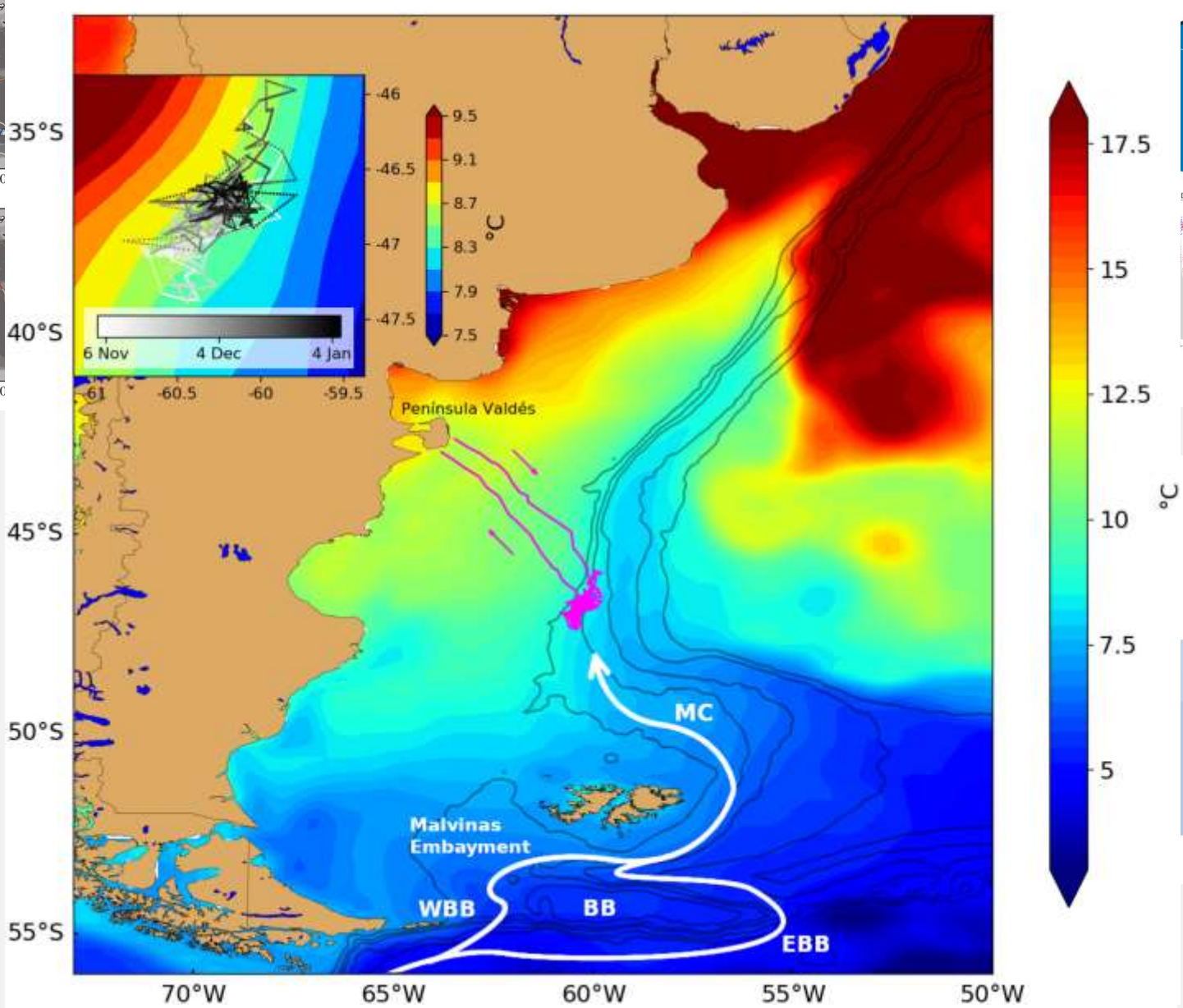

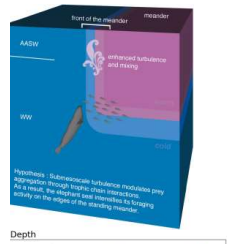

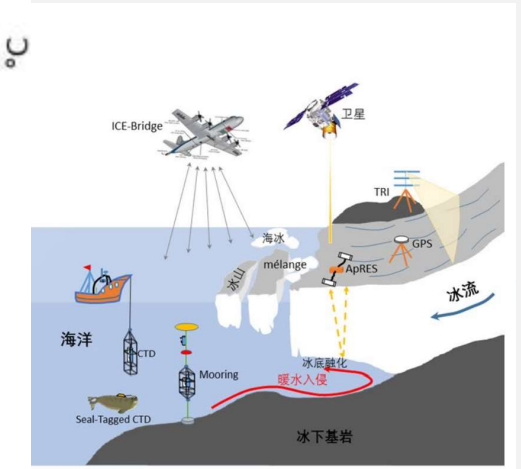

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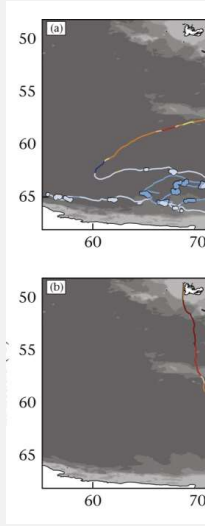

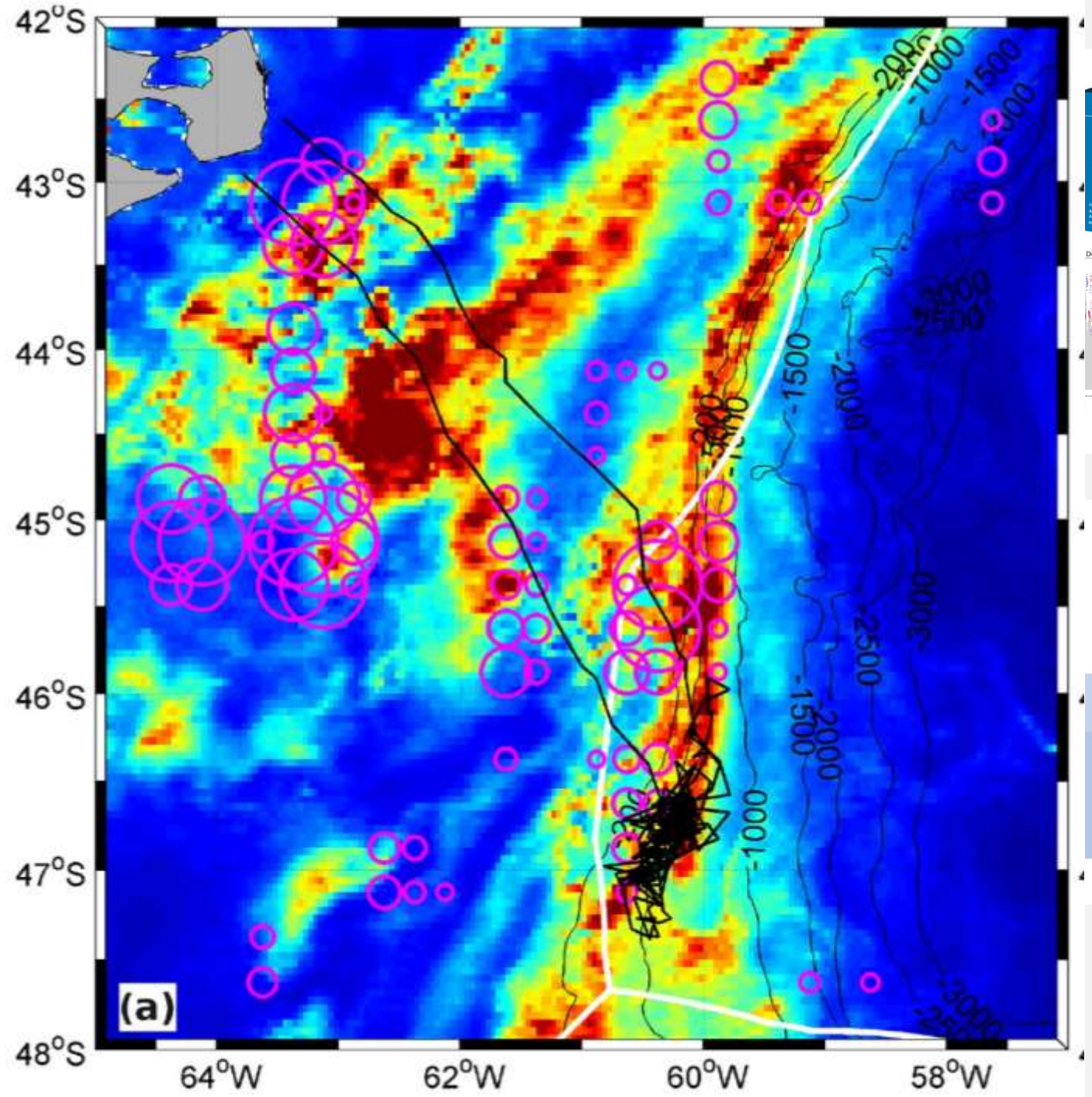

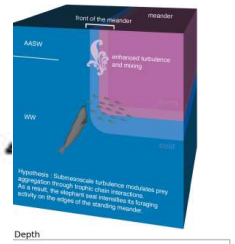

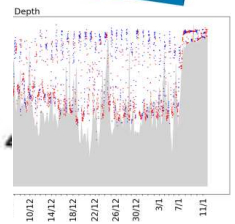

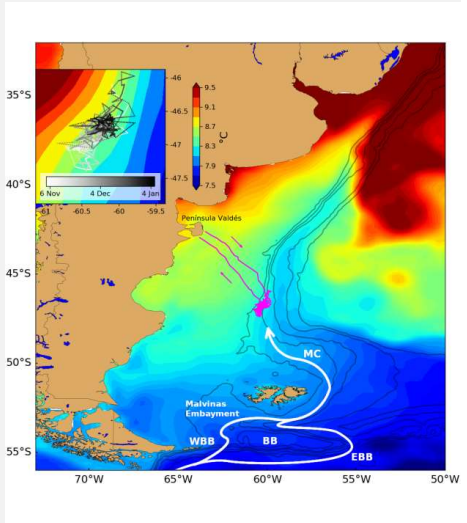

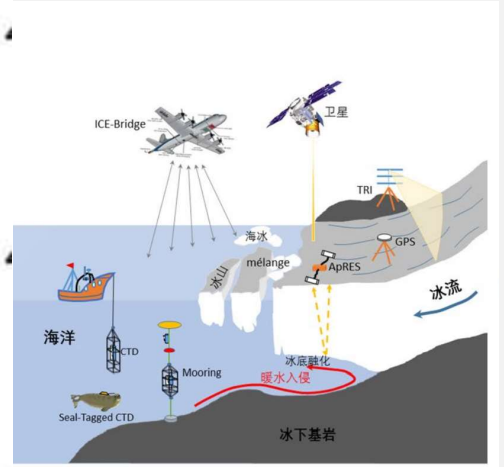

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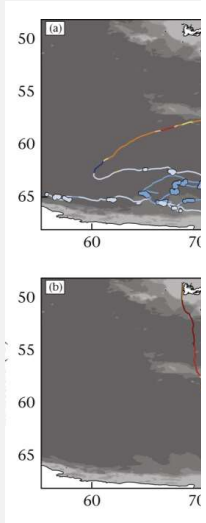

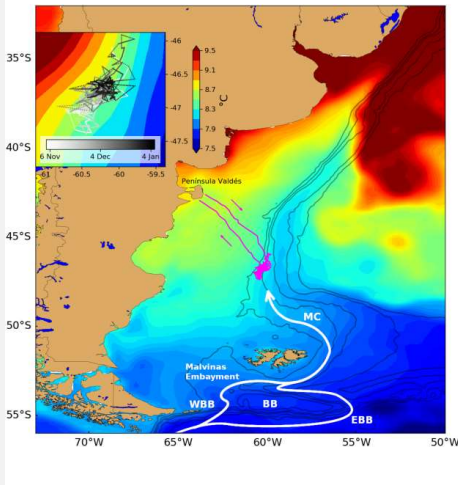

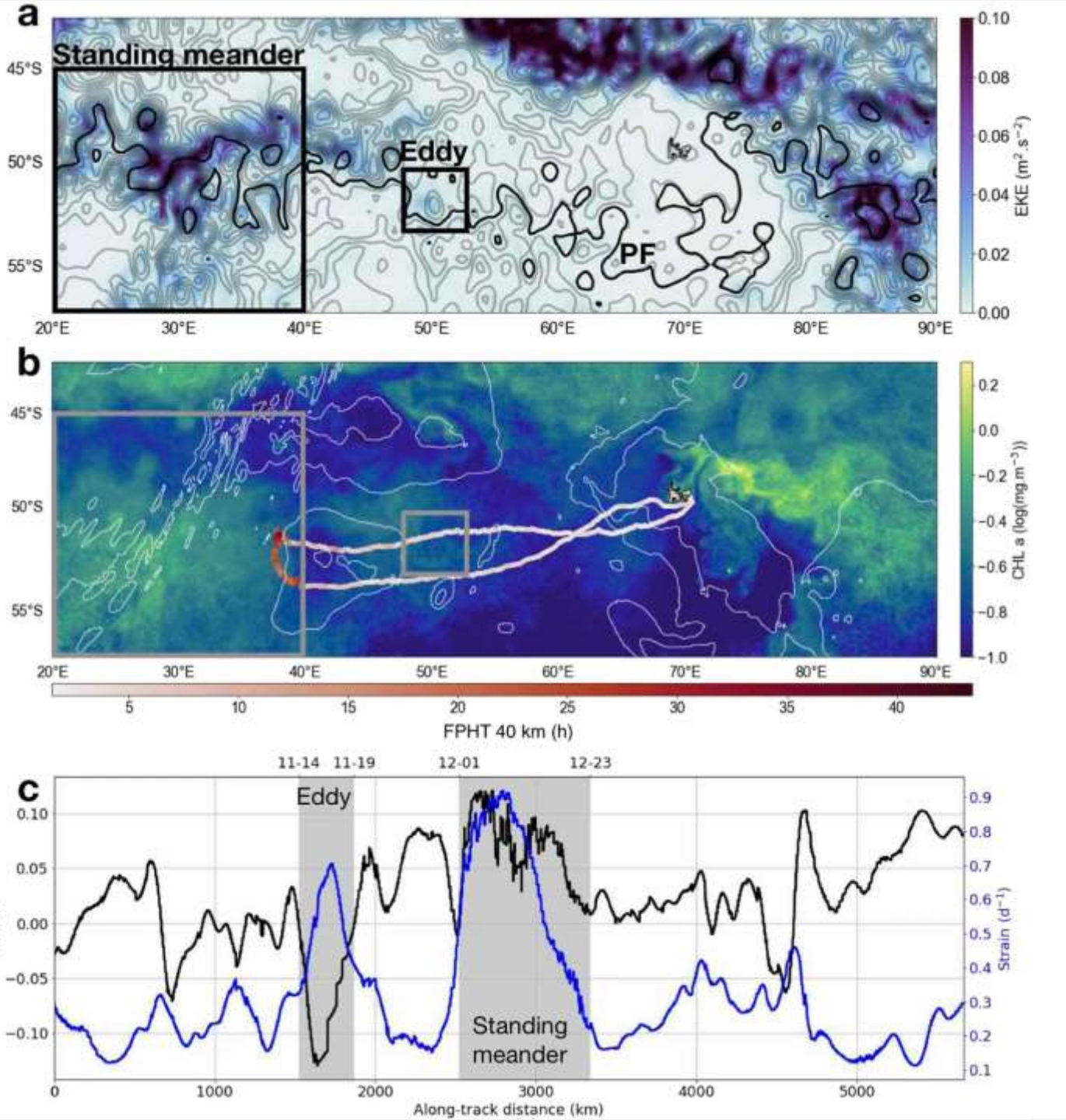

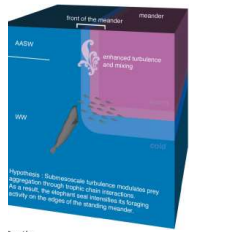

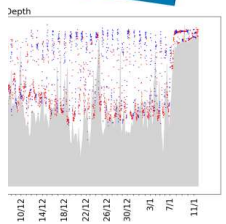

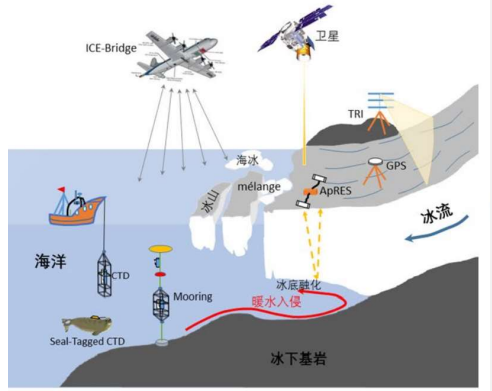

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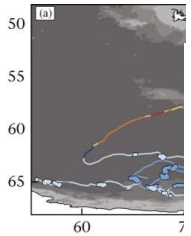

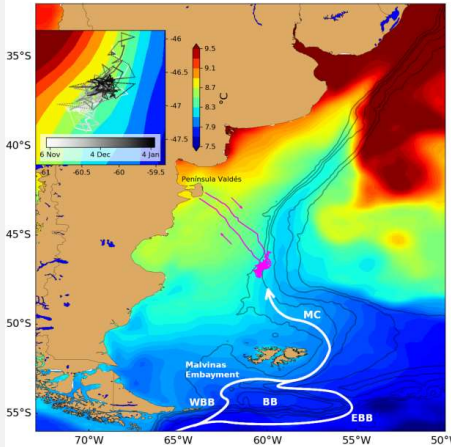

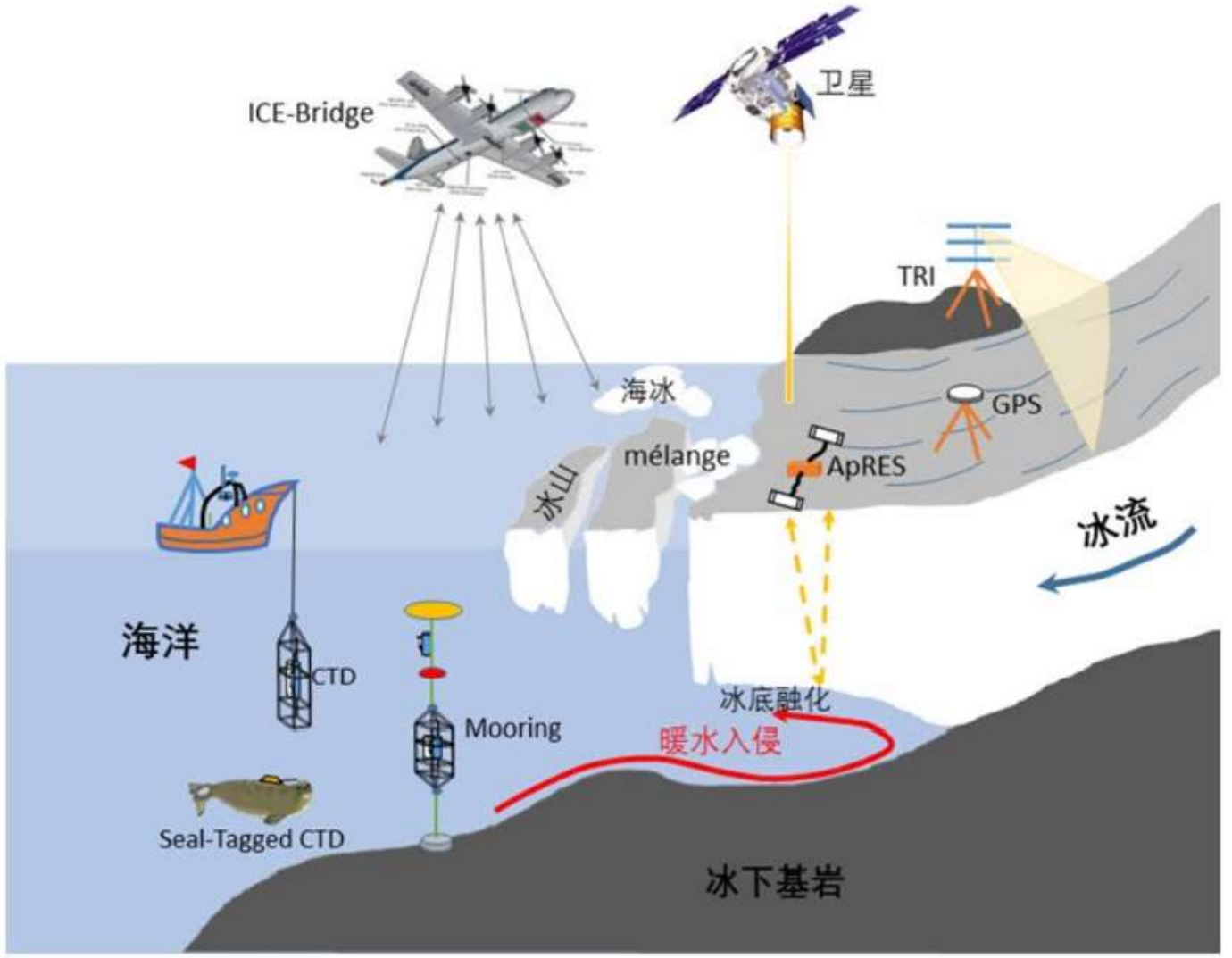

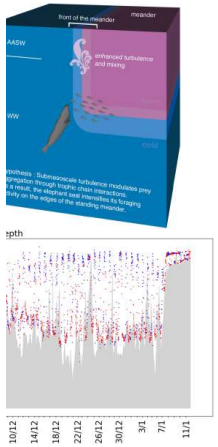

Photo credit: WANG

The study has been widely disseminated.

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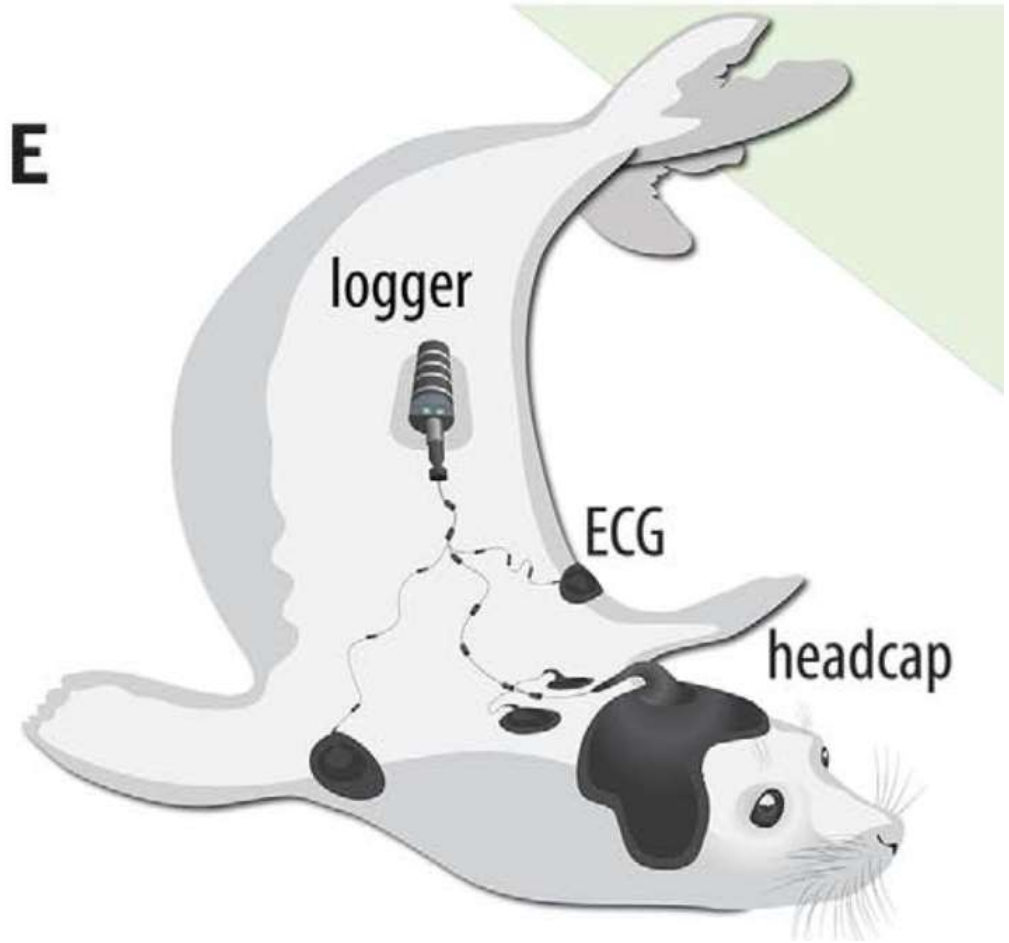
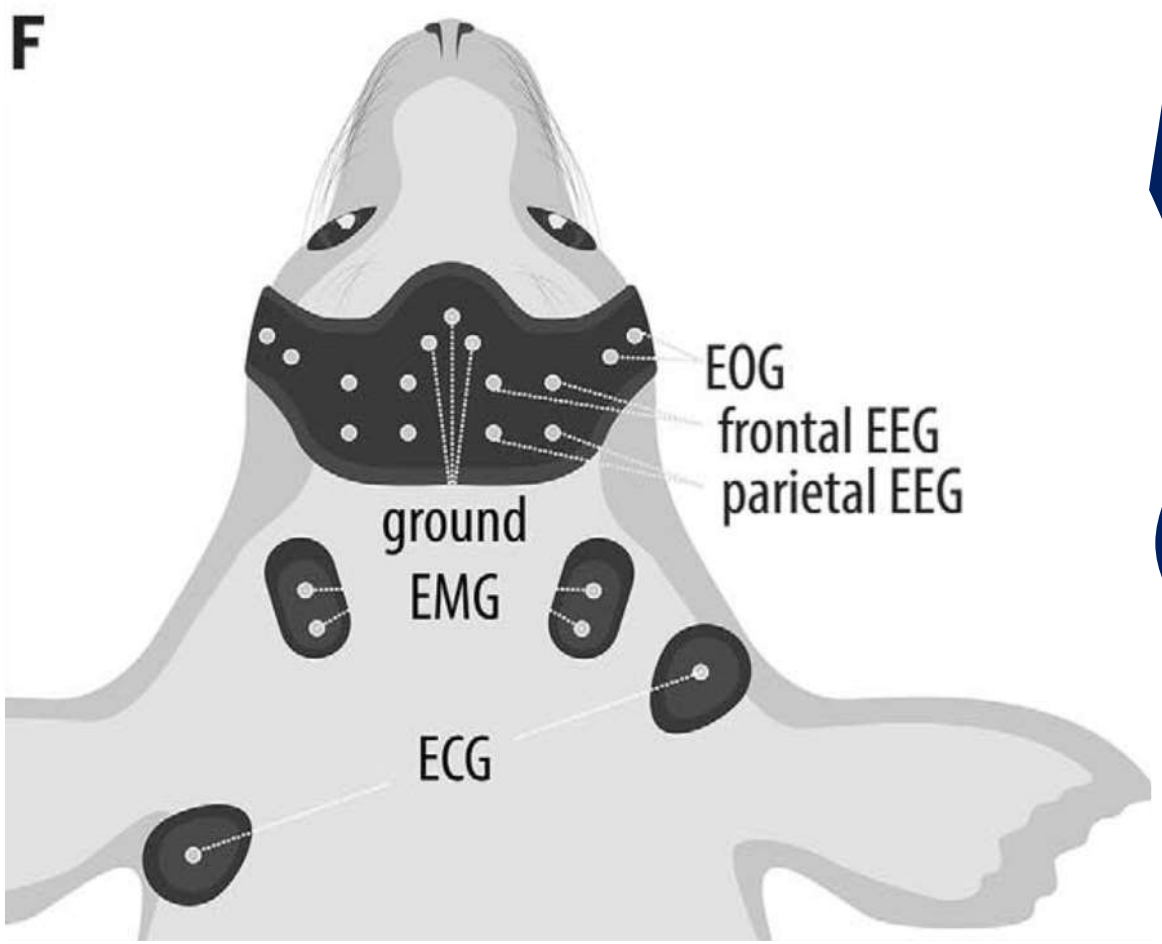
CNN

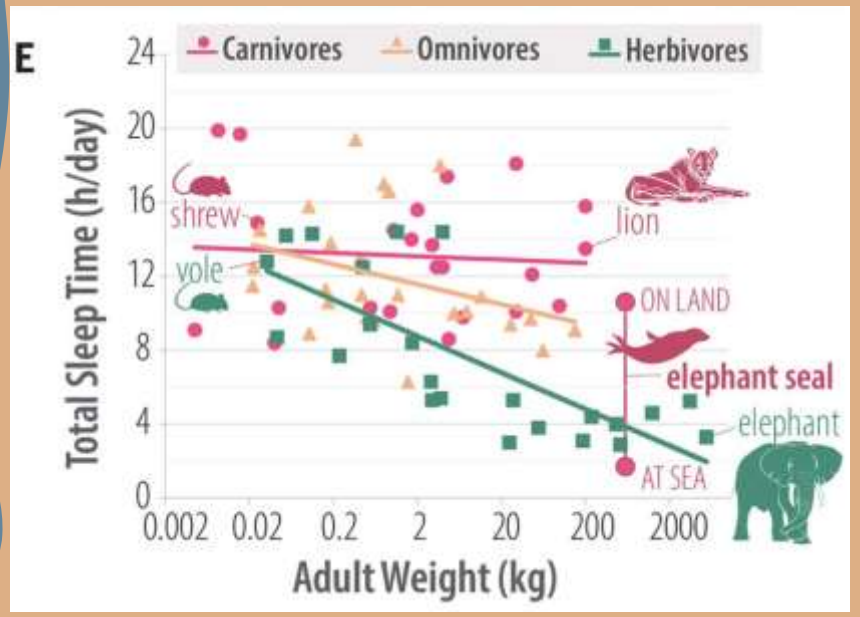
BBC NEWS

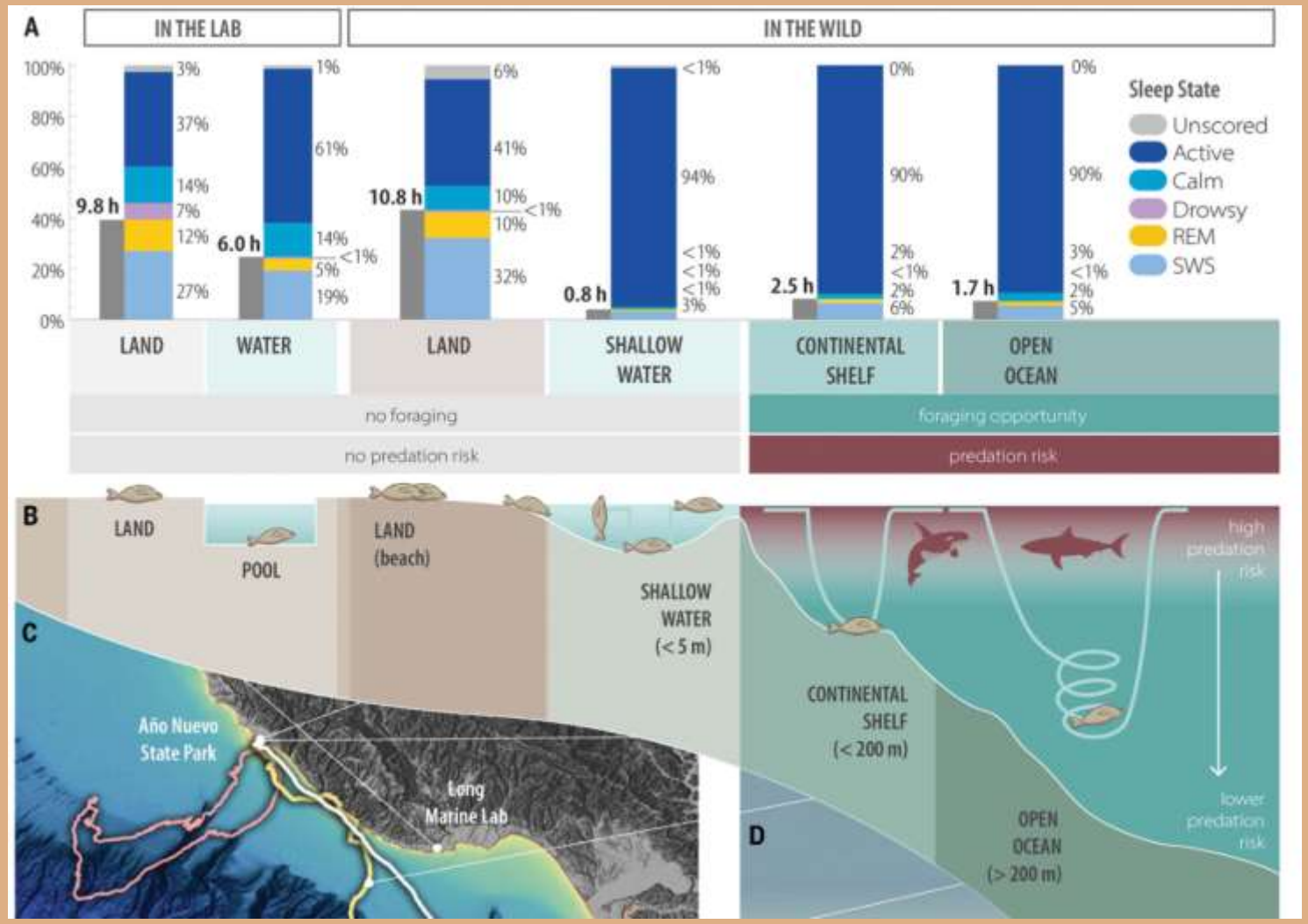
Research methodology.

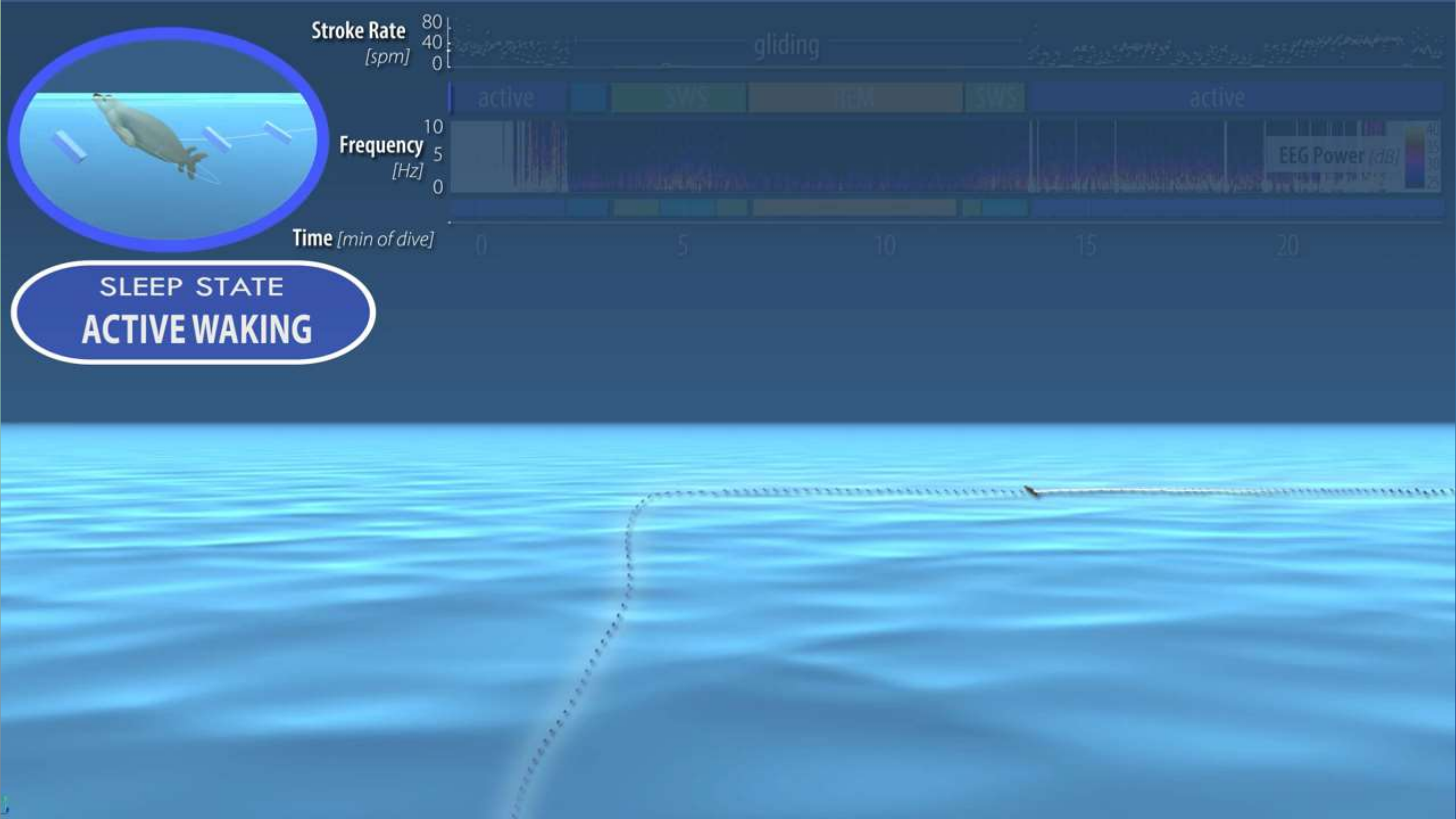




Results

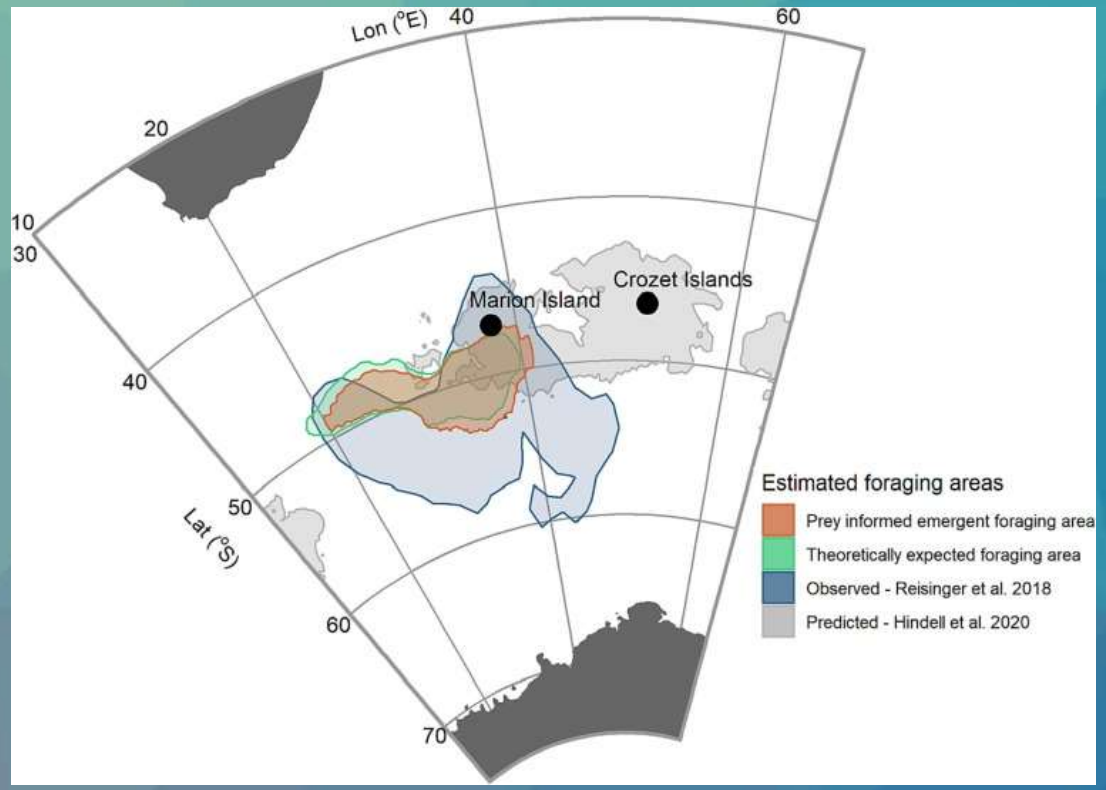

E
Carnivores
Omnivores
Herbivores
Total Sleep Time (h/day)
24
20
16
12
8
4
0
shrew
vole
lion
ON LAND
elephant seal
elephant
AT SEA
0.002
0.02
0.2
2
20
200
2000
Adult Weight (kg)

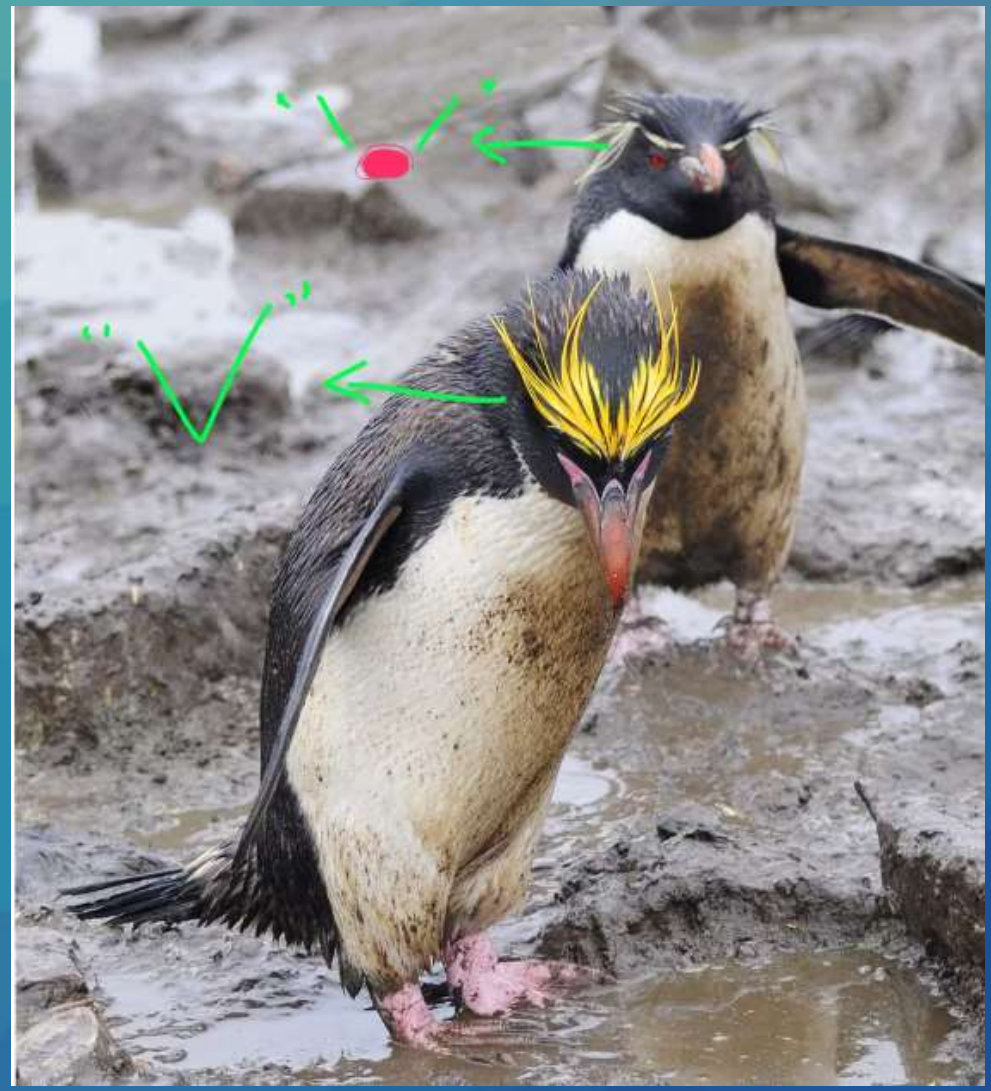

A
IN THE LAB
IN THE WILD
100%
80%
60%
40%
20%
0%
9.8 h
6.0 h
10.8 h
0.8 h
2.5 h
1.7 h
Sleep State
Unscored
Active
Calm
Drowsy
REM
SWS
LAND
WATER
LAND
SHALLOW WATER
CONTINENTAL SHELF
OPEN OCEAN
no foraging
no predation risk
foraging opportunity
predation risk
B
LAND
POOL
LAND (beach)
SHALLOW WATER (< 5 m)
C
Año Nuevo State Park
Long Marine Lab
D
CONTINENTAL SHELF (< 200 m)
OPEN OCEAN (> 200 m)
high predation risk
lower predation risk


Stroke Rate
[spm]
80
40
0
gliding
active
SWS
REM
SWS
active
Frequency
[Hz]
10
5
0
EEG Power [dB]
Time [min of dive]
0
5
10
15
20
SLEEP STATE
ACTIVE WAKING

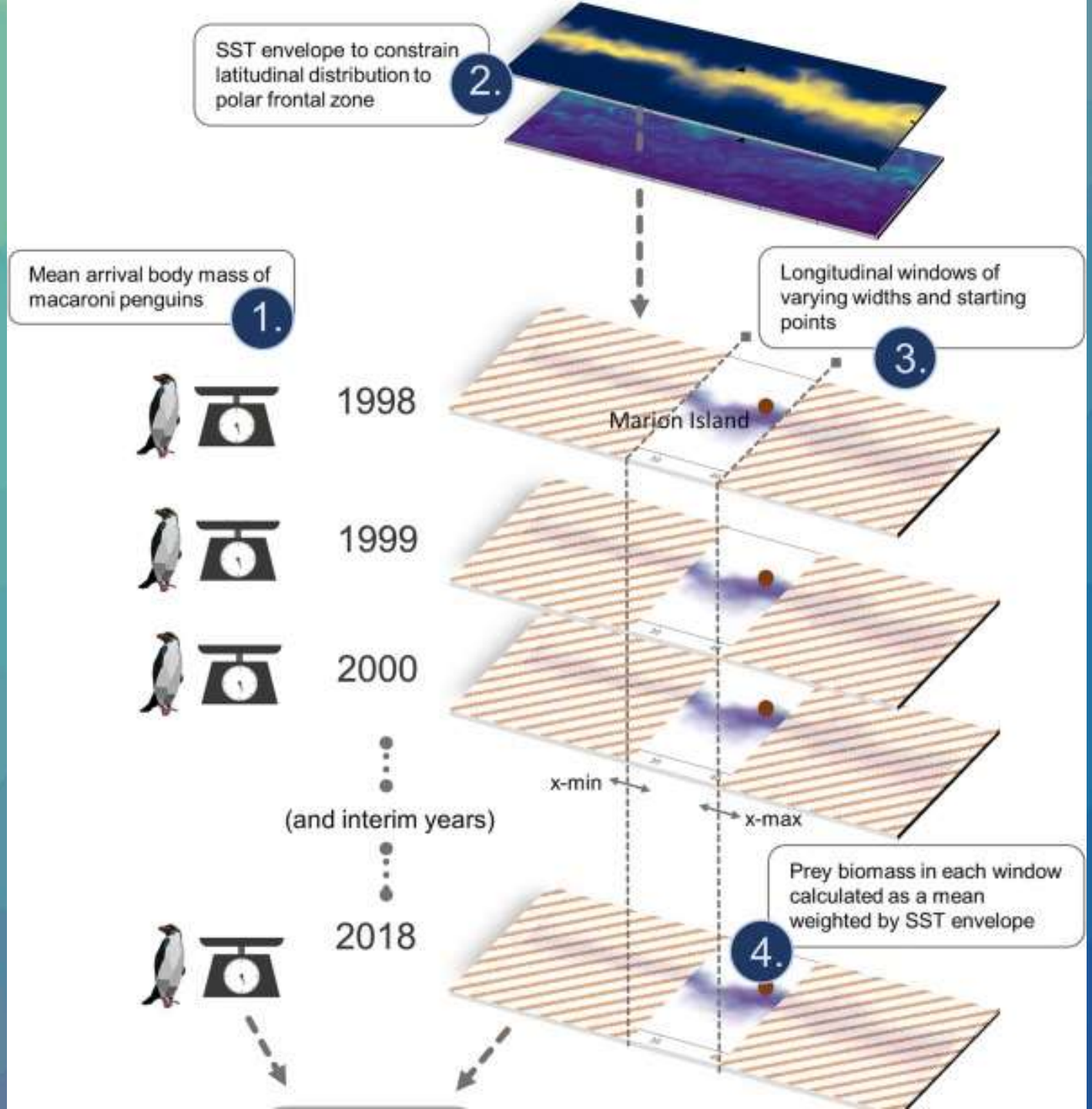
科学目的、实验数据

在没有追踪数据的情况下，正确估计长眉企鹅的觅食栖息地。





分析方法


SST envelope to constrain latitudinal distribution to polar frontal zone
2.
Mean arrival body mass of macaroni penguins
1.
Longitudinal windows of varying widths and starting points
3.
1998
1999
2000
(and interim years)
2018
Marion Island
x-min
x-max
Prey biomass in each window calculated as a mean weighted by SST envelope
4.

分析方法

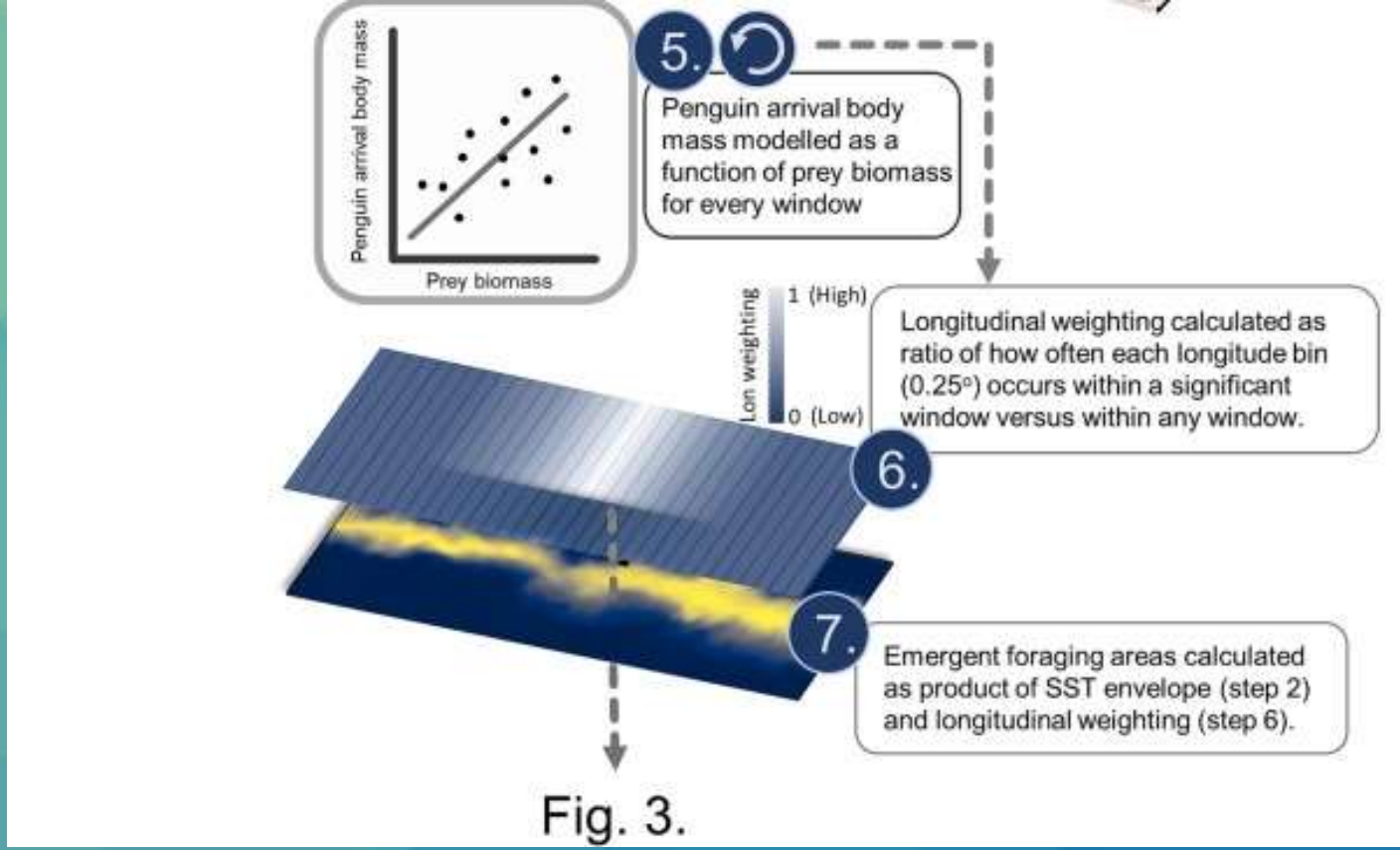
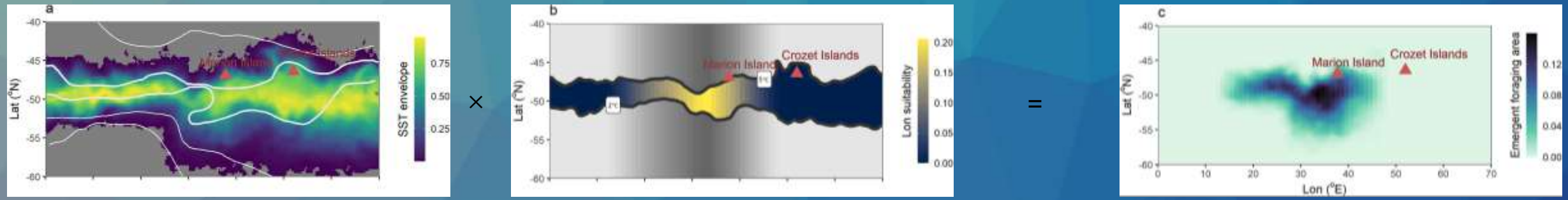
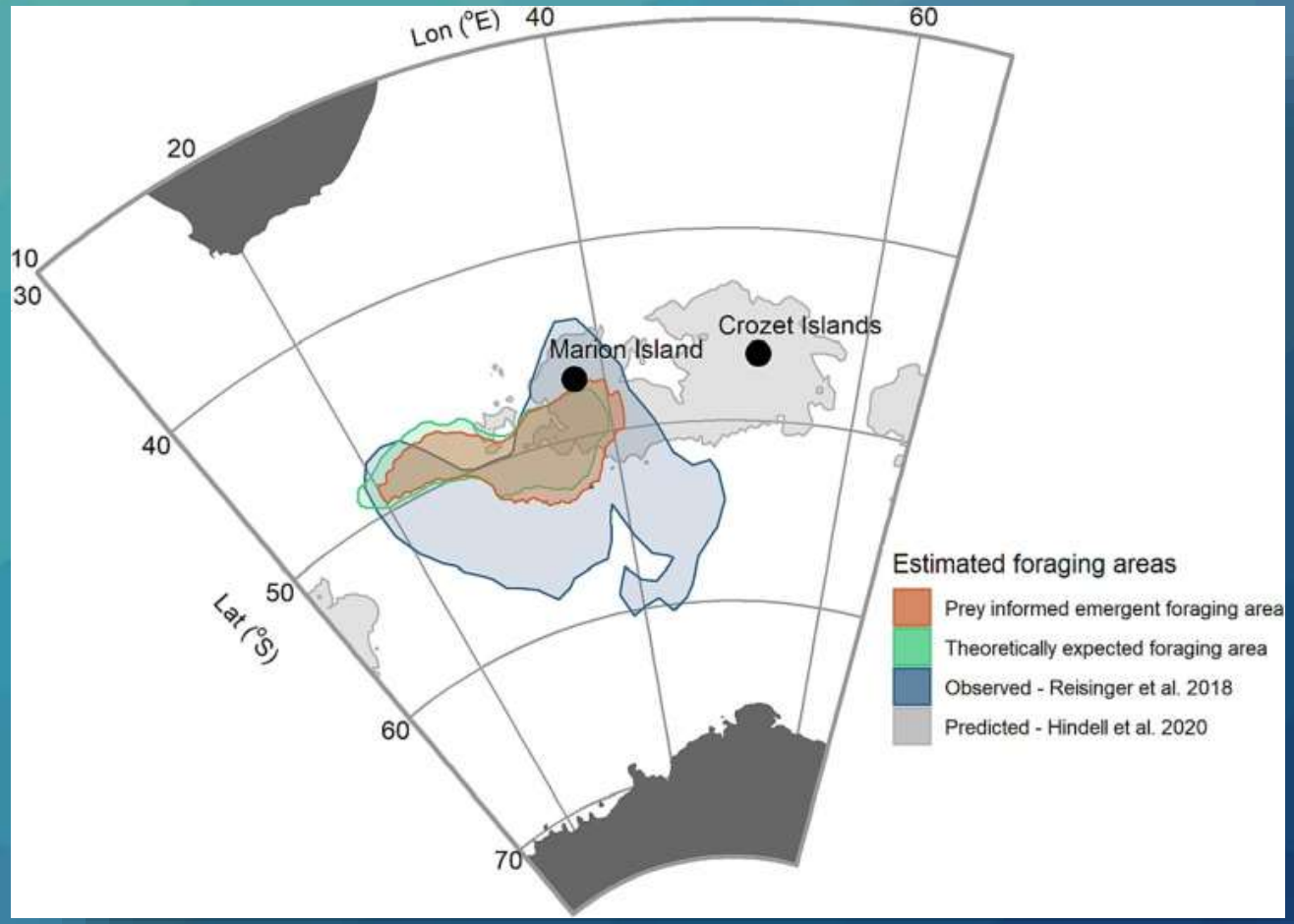

Penguin arrival body mass
Prey biomass
5.
Penguin arrival body mass modelled as a function of prey biomass for every window
Lon weighting
1 (High)
0 (Low)
Longitudinal weighting calculated as ratio of how often each longitude bin (0.25°) occurs within a significant window versus within any window.
6.
7.
Emergent foraging areas calculated as product of SST envelope (step 2) and longitudinal weighting (step 6).

Fig. 3.


a
b
c
Lat (°N)
SST envelope
Lon suitability
Marion Island
Crozet Islands
Lon (°E)
Emergent foraging area
×
=

研究结论

- 实现目标
- 新的生态指标
- 顶级捕食者觅食与竞争行为研究
- SEABODYM模型拓展性



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