Acoustic Vessels-of-Opportunity
AVO

New methods *for larger spatial coverage,*
reduced assumptions and streamlined workflow

Midwater Assessment and Conservation Engineering
(MACE)

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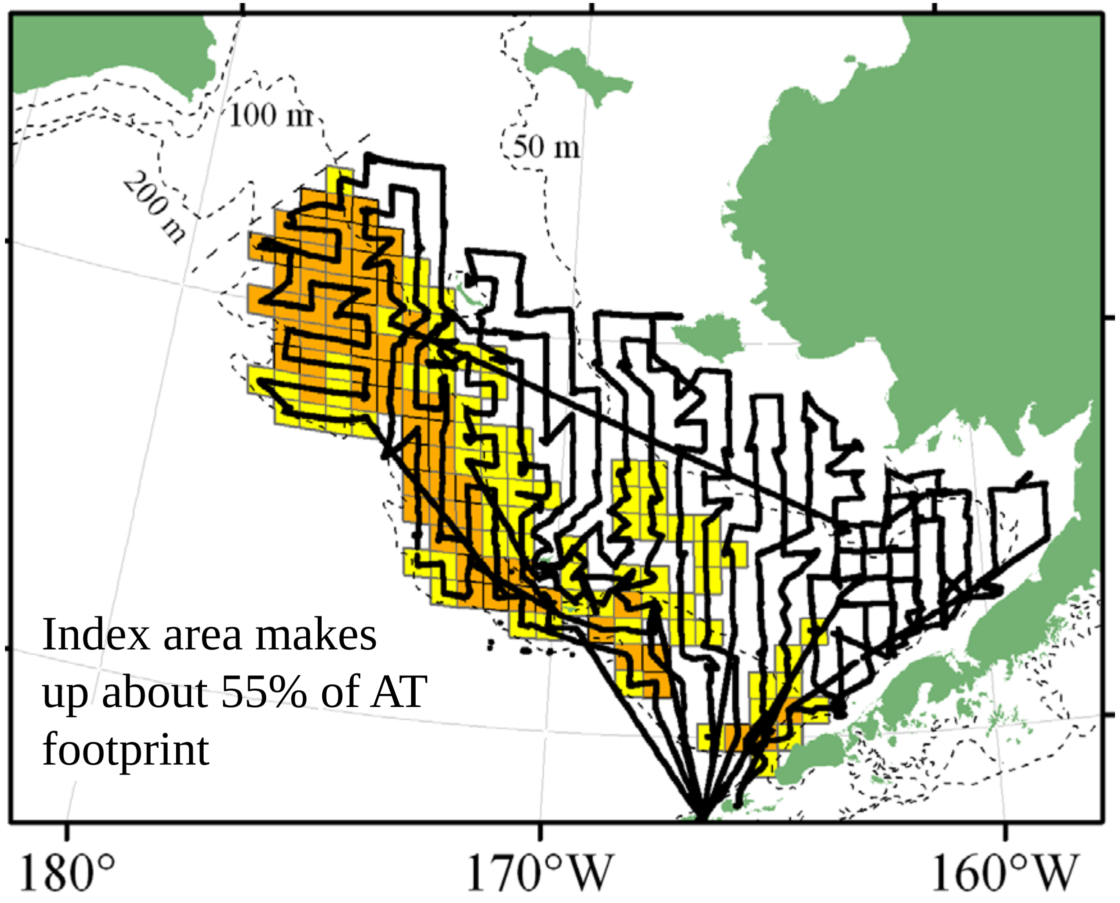
Acoustic Vessels-of-Opportunity
AVO

Use acoustic data collected aboard commercial fishing vessels during annual GAP bottom-trawl (BT) survey to produce an index for midwater pollock in the eastern Bering sea (EBS)

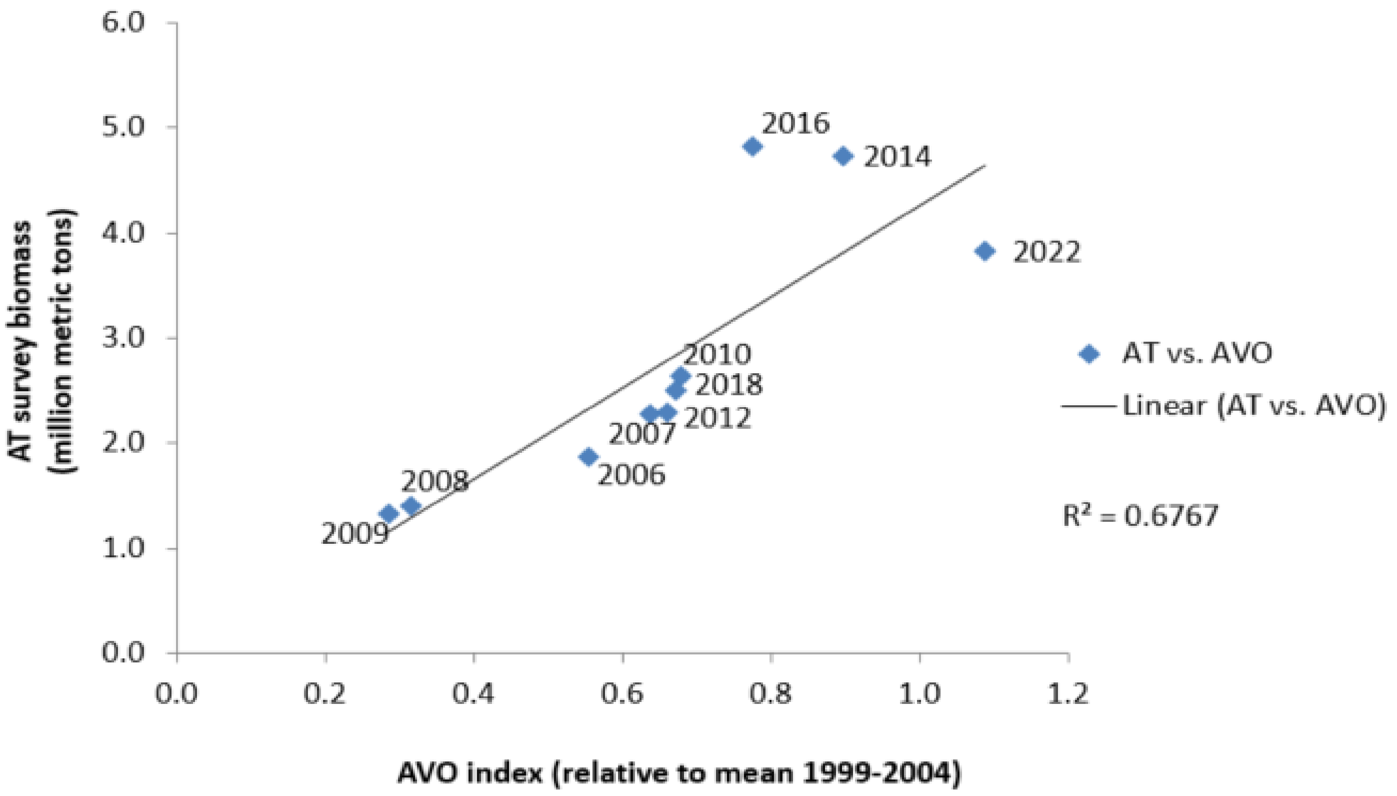
Previous methods:

- Backscatter in the orange and yellow grid cells was used as an index to estimate midwater pollock (Honkalehto et al., 2011)
- This works because there is mostly pollock in the midwater throughout the EBS
- Combination of manual and automatic acoustic backscatter identification
- Index is produced annually, whereas the MACE acoustic-trawl (AT) survey is biennial



Honkalehto, T., Ressler, P. H., Towler, R. H., Wilson C. D.. 2011. Using acoustic data from fishing vessels to estimate walleye pollock (*Theragra chalcogramma*) abundance in the eastern Bering Sea. *Canadian Journal of Fisheries and Aquatic Sciences*. **68**(7): 1231-1242. https://doi.org/10.1139/f2011-050

Acoustic Vessels-of-Opportunity AVO

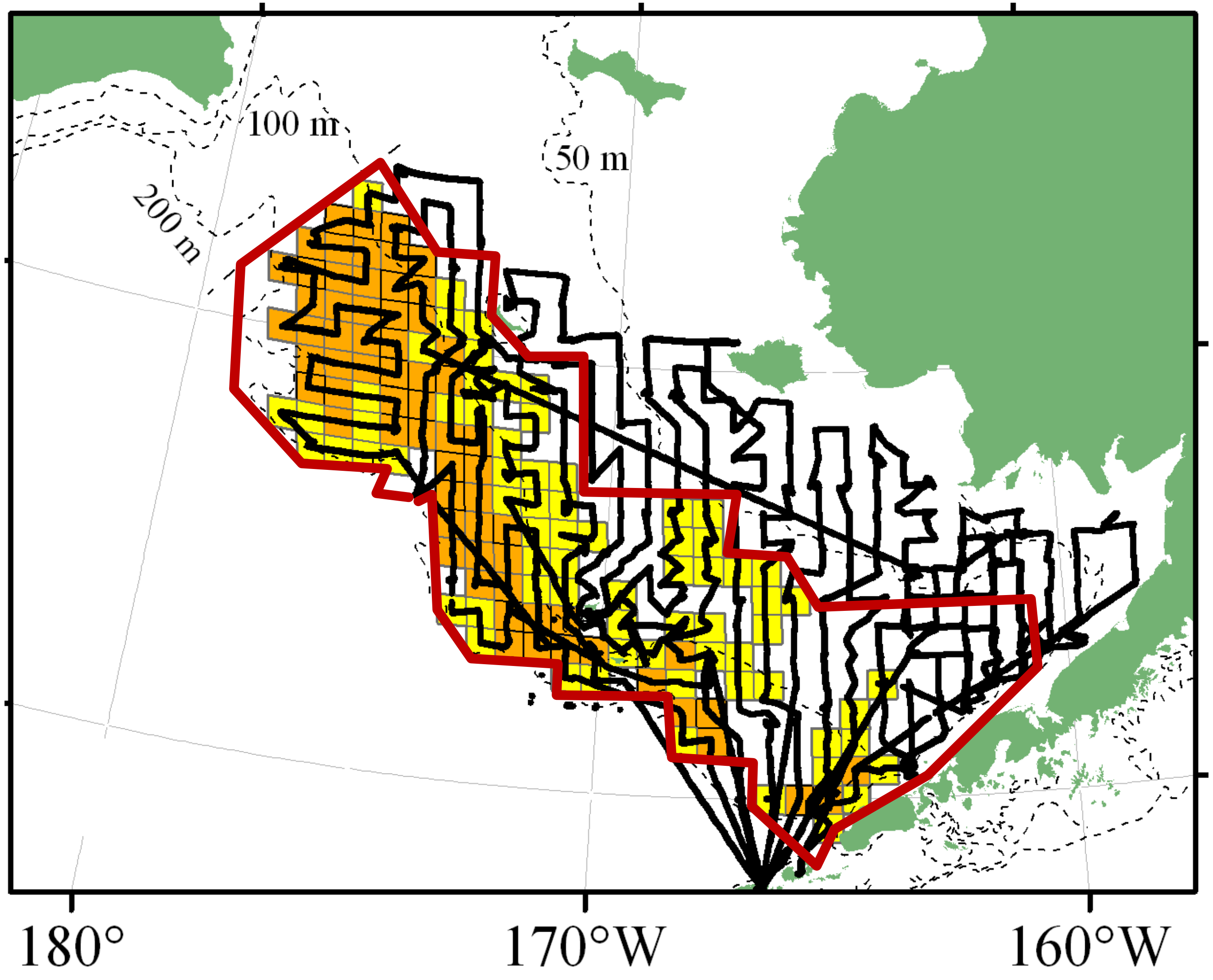


Recent trends in poorer correlation to the AT survey ($R^2 = 0.68$) is likely due to:

- Limited area of backscatter coverage
- Non-pollock backscatter contamination in automatically processed areas are changing, violating initial assumptions

AVO Nouveau

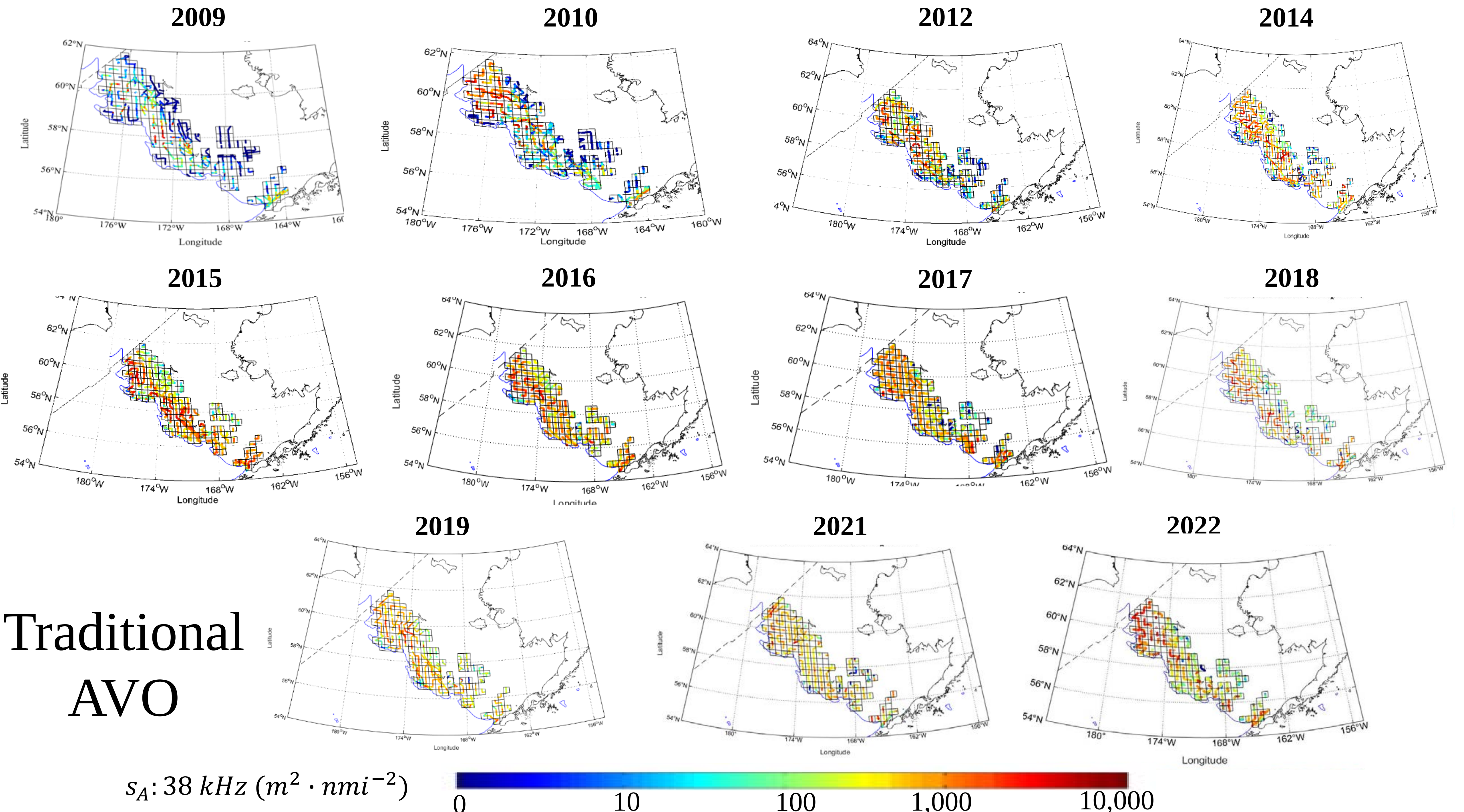
To address pollock migrating outside the index area, issues with assumptions in the automatic backscatter classification, and processing efficiencies, we revamped AVO methods and reprocessed most of the time series



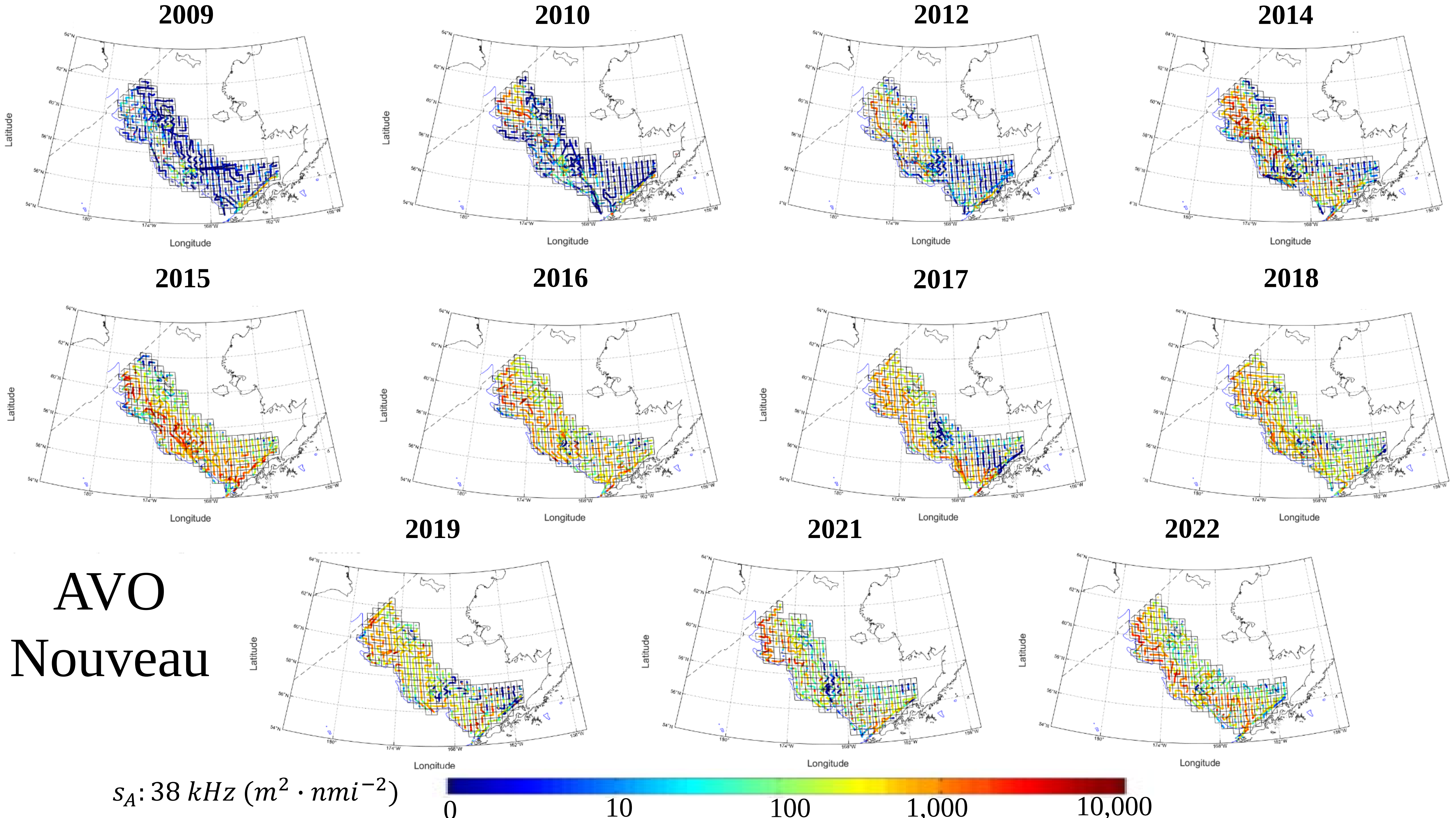
New methods:
- Full AT EBS footprint coverage (outlined in red):
  - ➢ Two 5% subsamples = 10% total
  - ➢ Systematic subsampling, 50 pings chunks every 500 pings throughout the region (Levine & De Robertis, 2019)
- Backscatter is manually identified:
  - ➢ No reliance on automatic backscatter assumptions
- More streamlined workflow

Retrospective analysis complete:
- 11 years (back to 2009)
- 7 years overlapping with the EBS AT survey for comparison

Levine, M., and De Robertis, A.. "Don’t work too hard: subsampling leads to efficient analysis of large acoustic datasets." *Fisheries Research* 219 (2019): 105323.


2009
2010
2012
2014
2015
2016
2017
2018
2019
2021
2022
Latitude
Longitude
Traditional AVO
s_A: 38 kHz $(m^2 \cdot nmi^{-2})$
0
10
100
1,000
10,000

AVO Nouveau


2009
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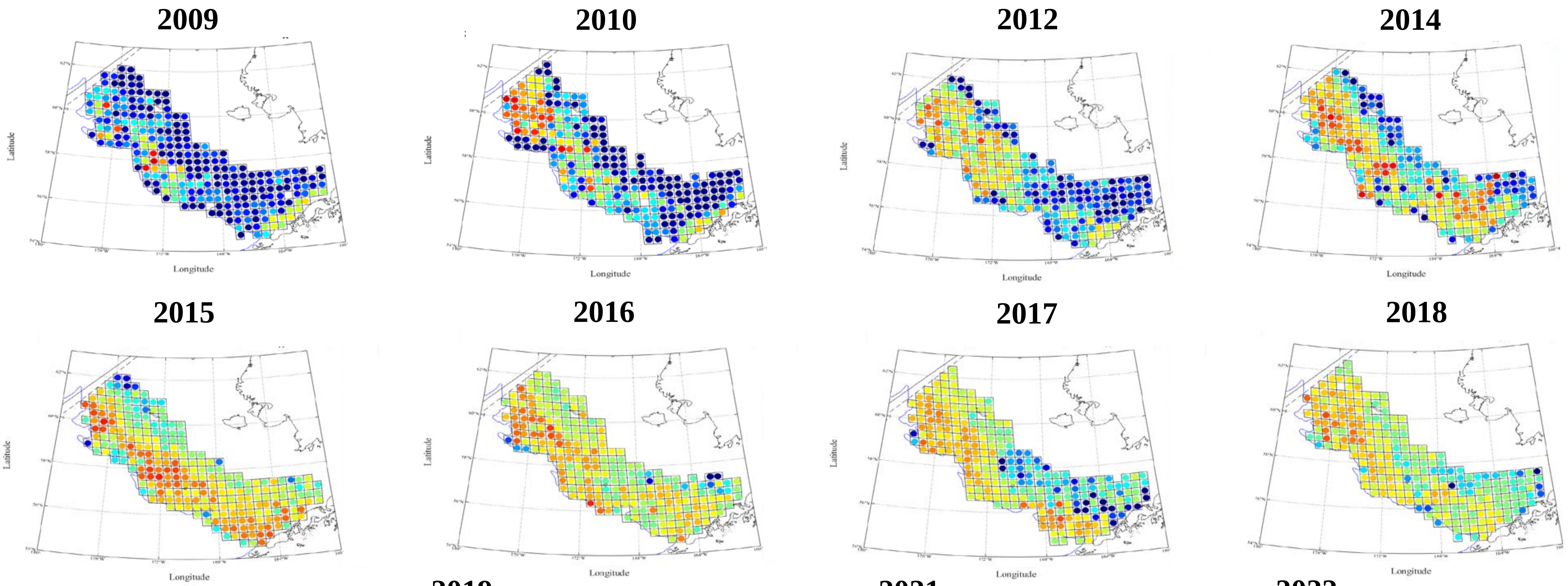
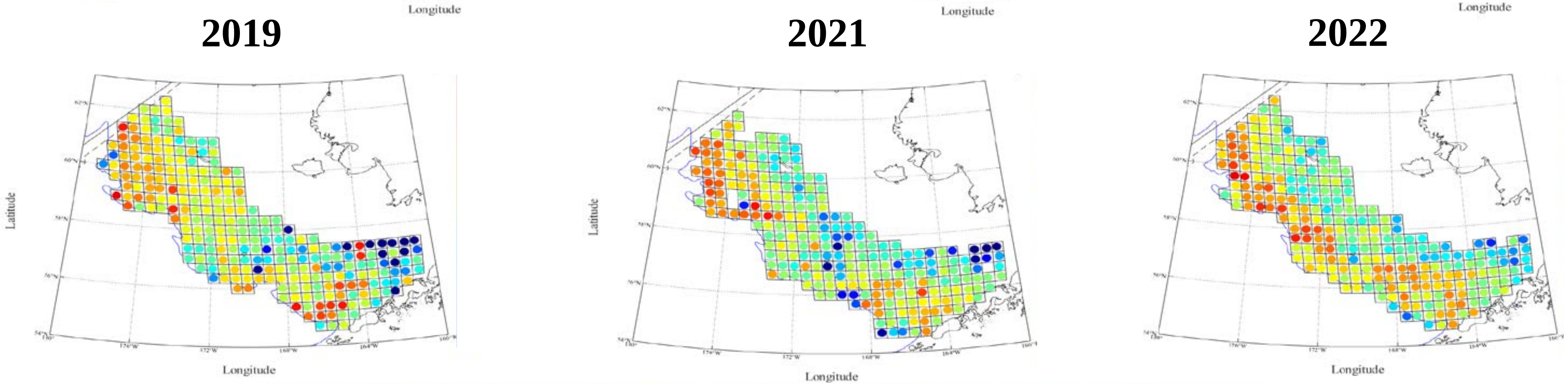
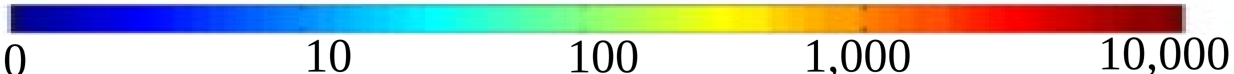
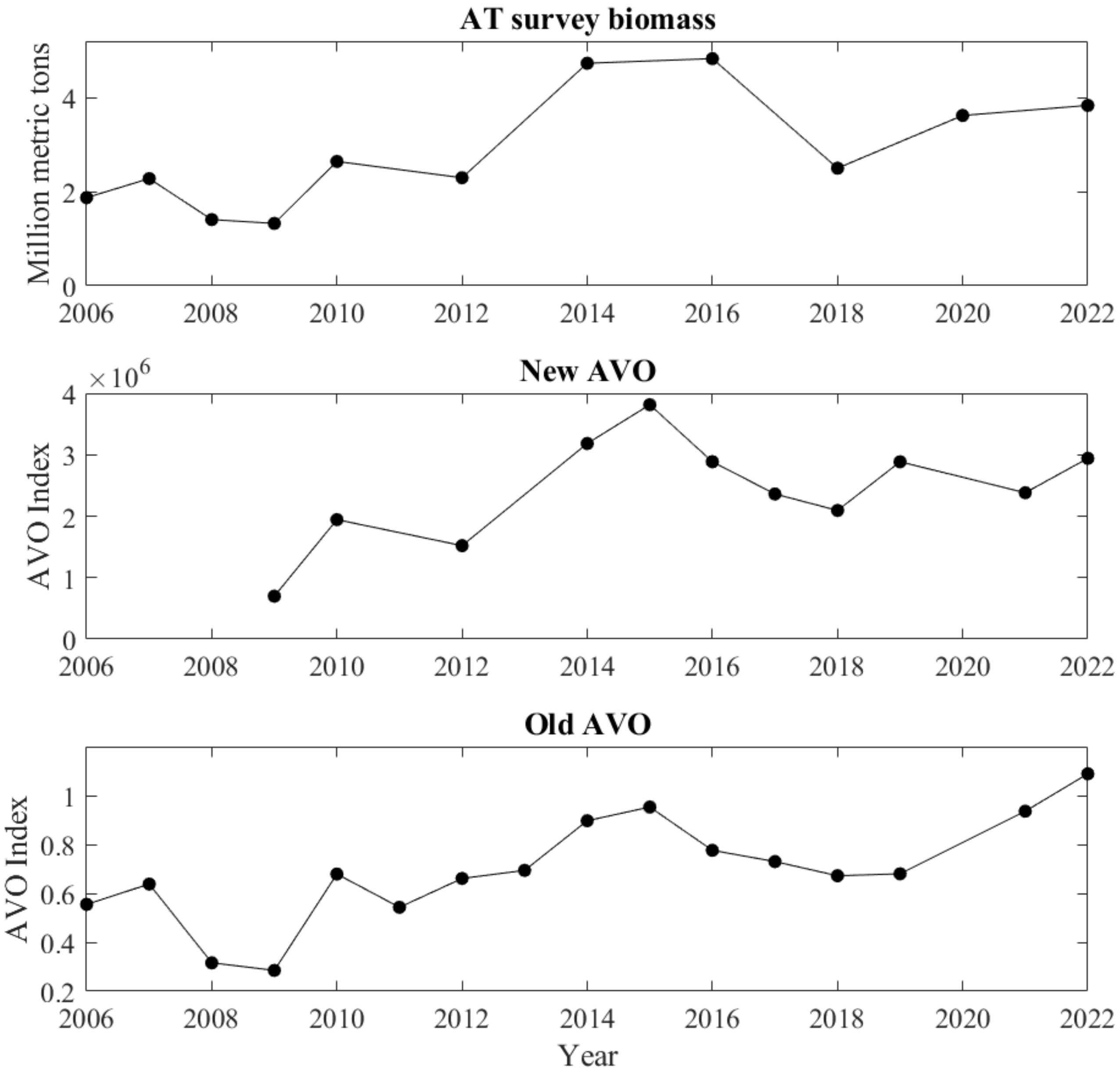


AVO
Nouveau

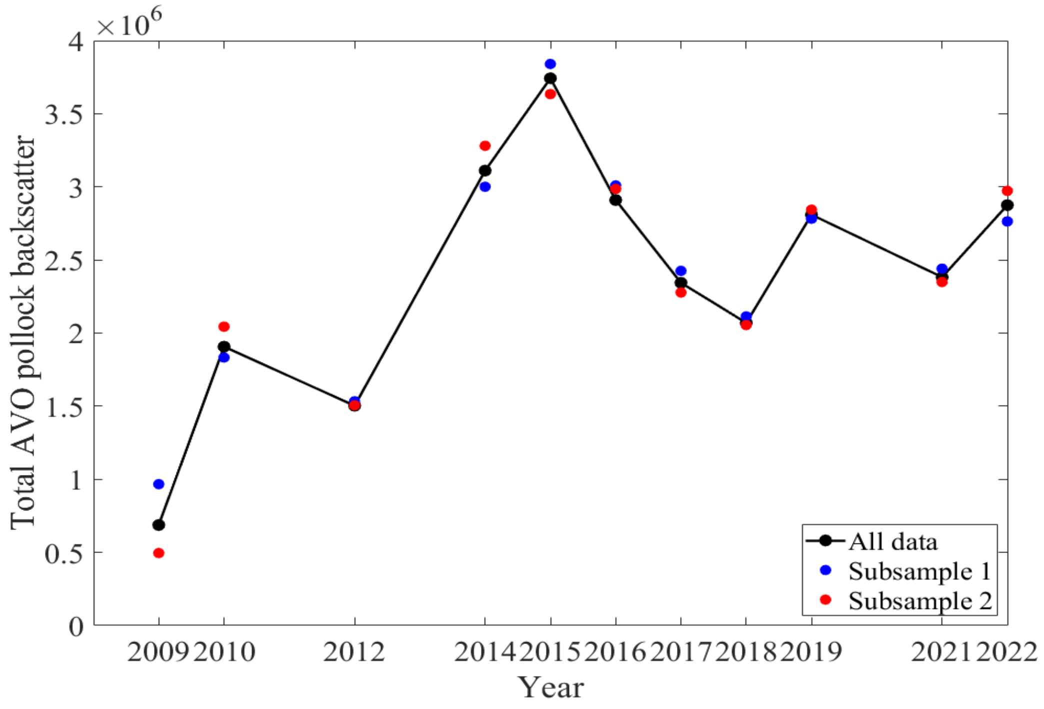


s_A: $38\ kHz\ (m^2 \cdot nmi^{-2})$

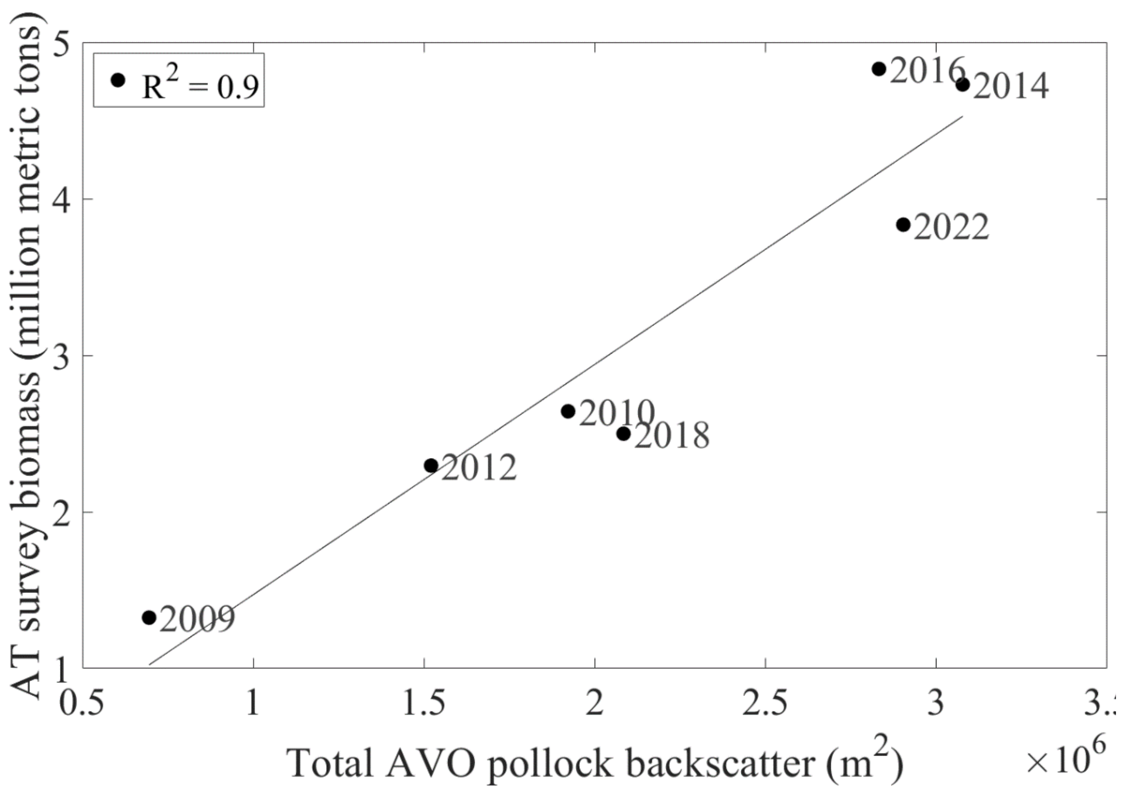




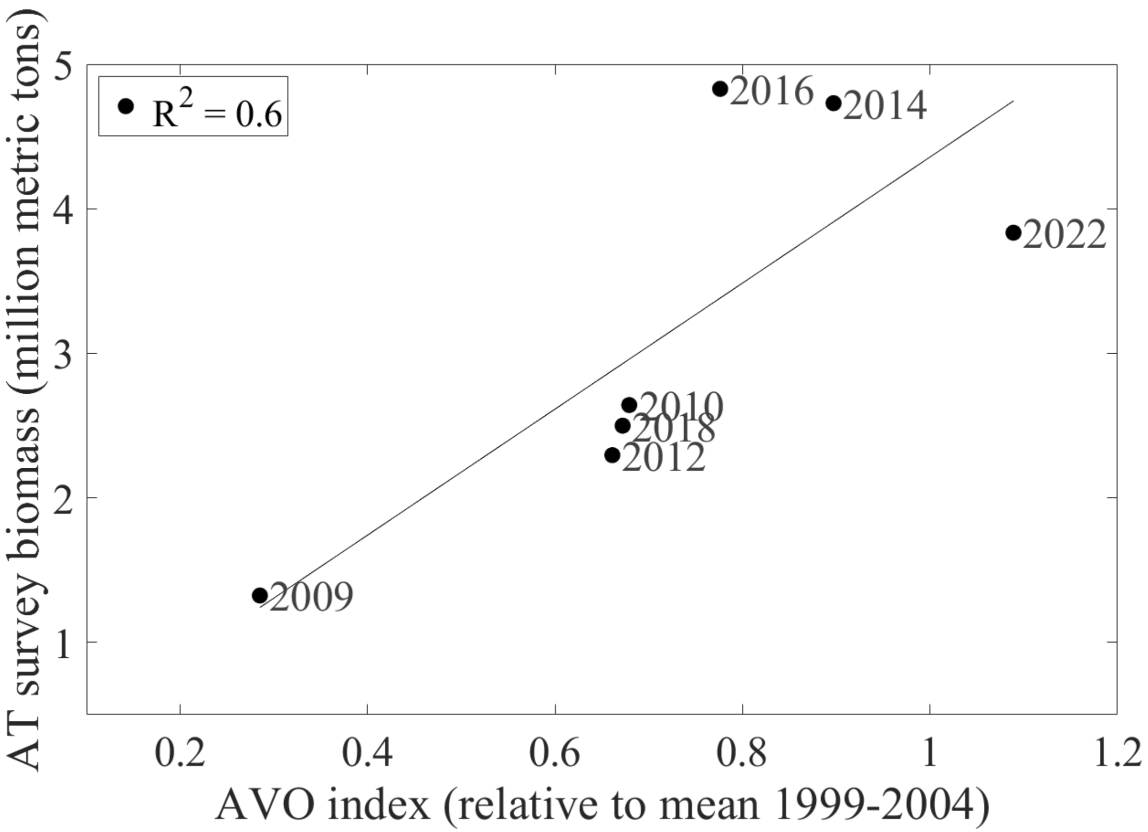
Comparison between two 5% subsamples



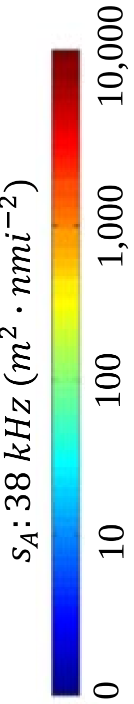
NEW

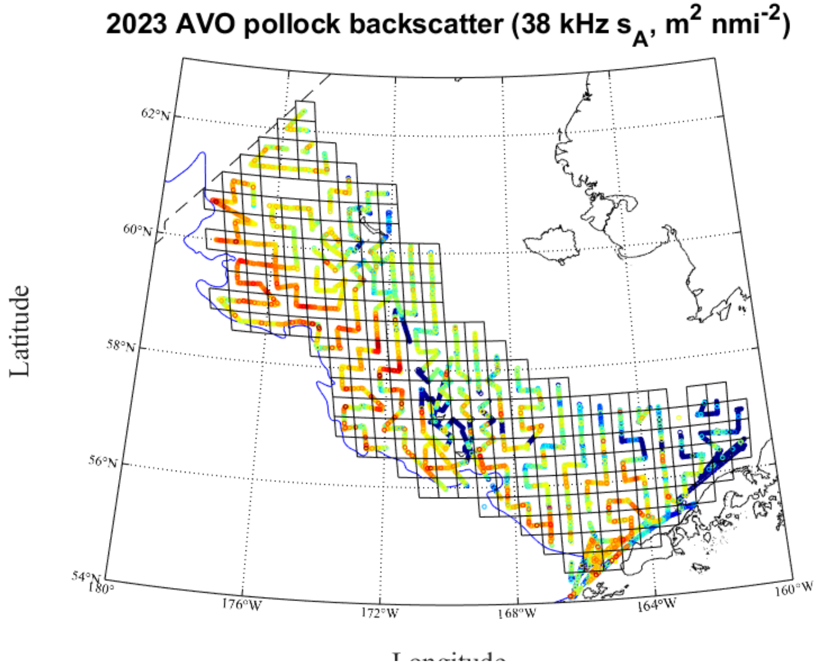


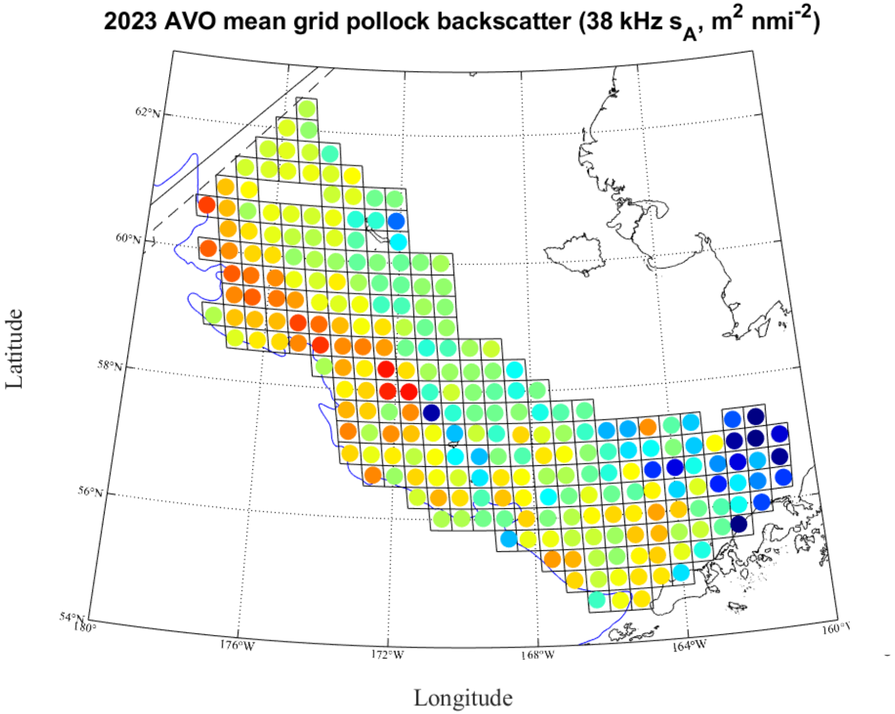
OLD (same years)

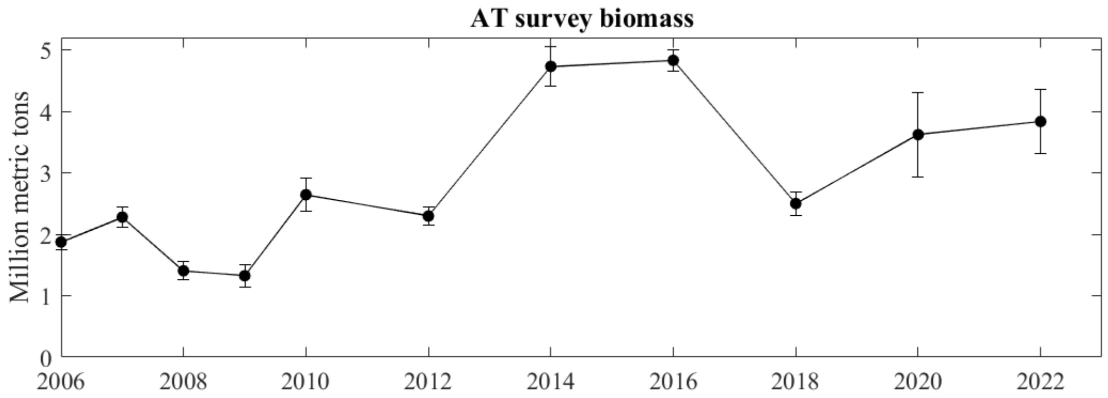


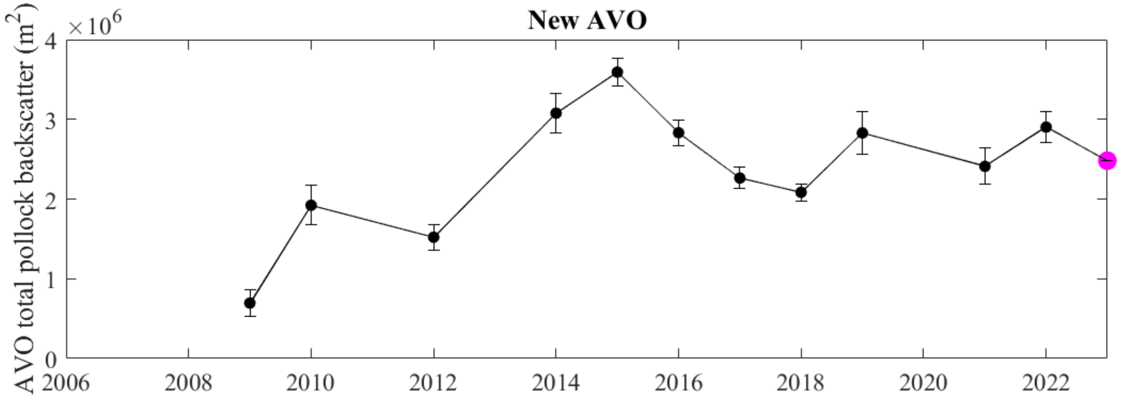
Preliminary 2023 estimate











~ 15% decrease from 2022