EXPORTS: using high resolution studies of Thorium-234 at Ocean Station PAPA to elucidate spatial and temporal variability in particle export and attenuation

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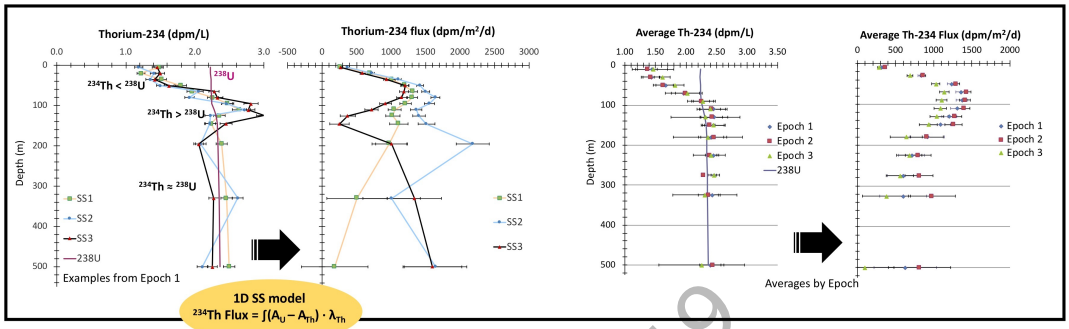
GOAL

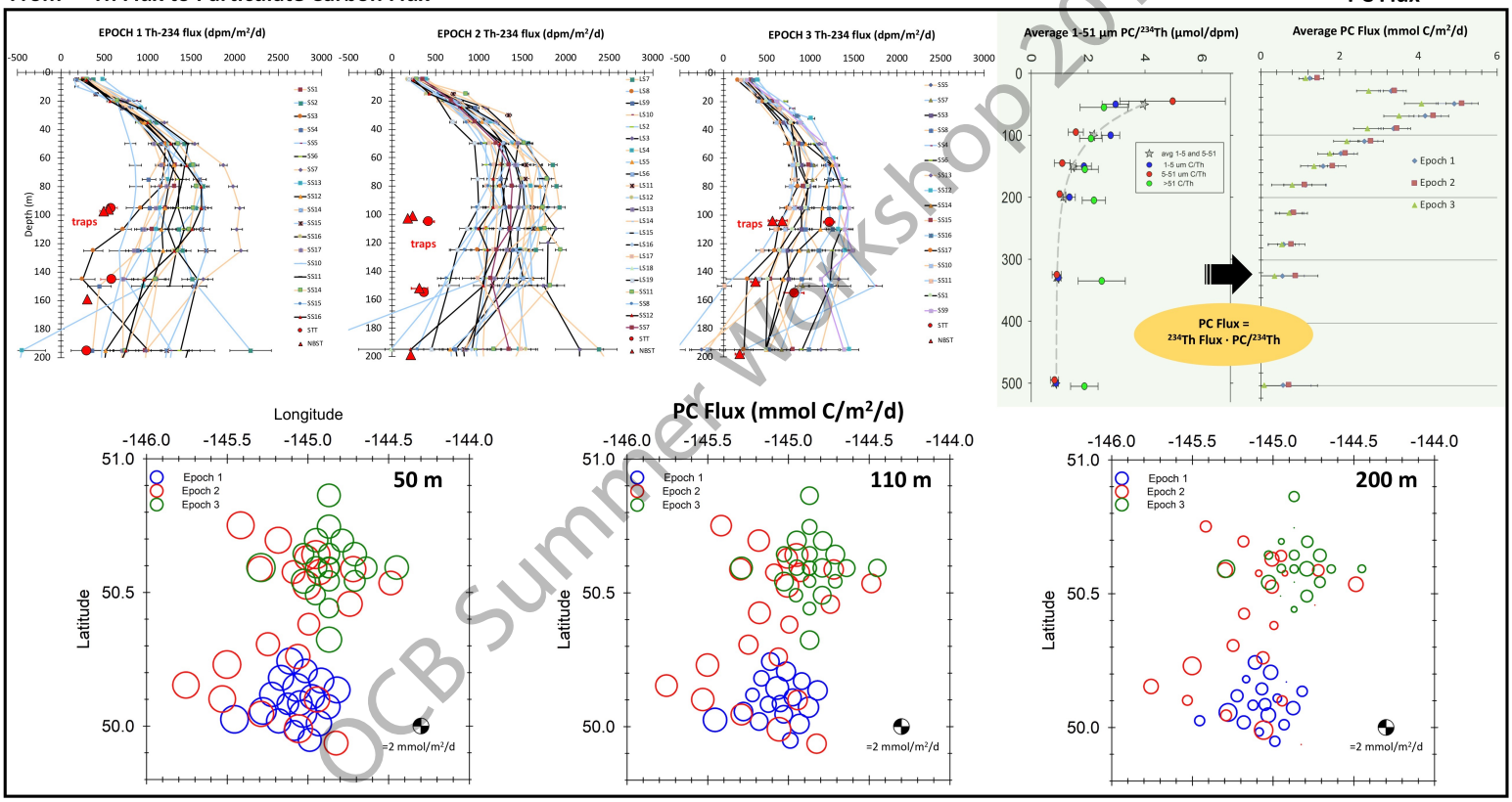
Provide quantitative estimates of sinking particle fluxes and attenuation with depth at scales that are key to understand physical and biological processes that influence the biological pump

- Temporal scales of days-weeks
- Horizontal spatial scales: 2-10 km
- Vertical spatial scales: every 10-20 m over the upper 500 m

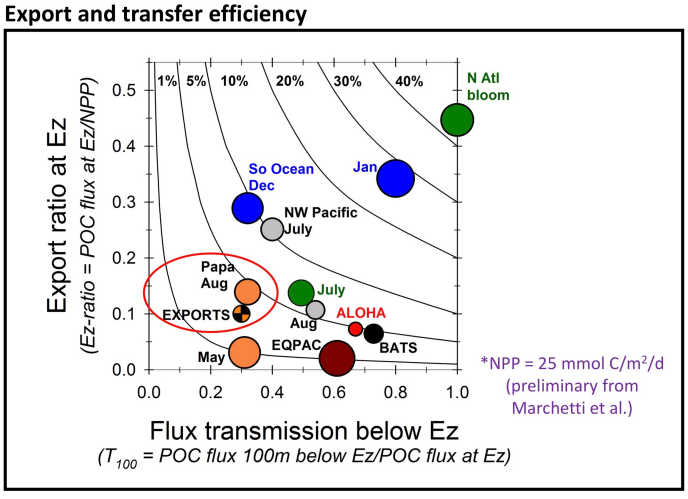
How to go from ^{234}Th data to ^{234}Th flux on sinking particles?



From ^{234}Th Flux to Particulate Carbon Flux



Export and transfer efficiency



CONCLUSIONS

- Low temporal variability in ^{234}Th although ^{234}Th fluxes in Epoch 1&2 > Epoch 3
- Maximum PC Flux ≈ 5 mmol C/m²/d → LOW fluxes (2x ALOHA)
- Rapid PC flux attenuation just below the euphotic zone (110 m = 0.1% PAR)
- Minimal spatial variability at ≈ 50 m increasing with depth
- ^{234}Th fluxes from the water column are higher than those measured in traps

  Active diel vertical migration flux? Removal of attached particles to swimmers? Trap source funnel?

  Non-steady state/physical mixing not included in ^{234}Th model (yet)
- EXPORTS 2018 cruise: Overall low efficiency of the biological carbon pump

Acknowledgements

This research is funded by the NASA Ocean Biology & Biogeochemistry program (80NSSC17K0555)

We thank the whole EXPORTS team and the crew and scientific party aboard the R/V Sally Ride and R/V Roger Revelle