Pteropod population-level responses to acidification across different time-scales in the California Current System

Other Conference Item

Author(s):
Hofmann Elizondo, Urs

Publication date:
2022-04

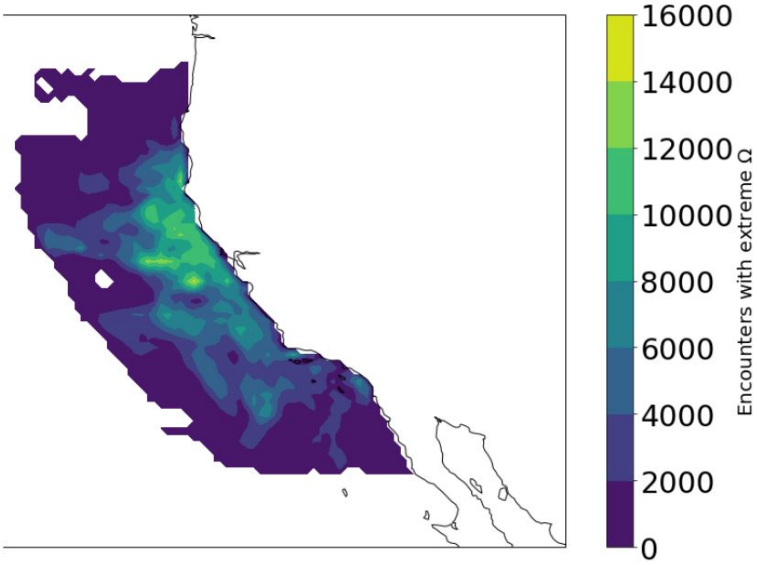
Permanent link:
https://doi.org/10.3929/ethz-b-000594898

Funding acknowledgement:
175787 - X-EBUS: Extreme Ocean Weather Events and their Role for Ocean Biogeochemistry and Ecosystems in Eastern Boundary Upwelling Systems (SNF)

A14 Urs Elizondo Hofmann
Environmental Physics, ETH

Pteropod population-level responses to acidification across different time-scales in the California Current System

Climate change will increase the frequency, magnitude and duration of acidification extremes in the California Current System (CalCS). Observational evidence suggests that extremes superimposed on the long-term ocean acidification trend and seasonal variations have resulted in widespread dissolution, lack of accretion, and developmental delays in calcifying pteropods. However, a comprehensive attribution of ecosystem impacts to carbonate chemistry perturbations at different time scales is limited. Here, we quantify the effects of ocean acidification at different time-scales on the population-level across several generations of pteropods. We use an individual-based model with life stage specific responses to environmental conditions in a regional hindcast simulation (1984-2019) of the CalCS to compare the effects of long-term ocean acidification with the seasonal variation and short-lived acidification extremes. We find that the timing of extremes and life-stage composition of the pteropod community determine the life-stage specific impact relative to the long term trend and the seasonal variation. Extremes during periods of rapid growth significantly increase the mortality of the juvenile life-stages. The life-stage dependent responses to extremes suggest that life cycle dynamics need to be investigated in future impact and attribution studies to accurately characterize and quantify the effects of ocean acidification extremes.



Cumulative number of encounters with extreme aragonite saturation states (Ω) throughout a simulation year in the California Current System.