SCCWRP # 1050

Seasonal patterns in aragonite saturation state on the southern California continental shelf

Karen McLaughlin[1], Nikolay P. Nezlin[1], Stephen B. Weisberg[1], Andrew G. Dickson[2], J. Ashley T. Booth[3], Curtis L. Cash[3], Adriano Feit[4], Joseph R. Gully[5], Meredith D.A. Howard[1], Scott Johnson[6], Ami Latker[4], Michael J. Mengel[7], George L. Robertson[7], Alex Steele[4], and Laura Terriquez[7]

[1] *Southern California Coastal Water Research Project Authority, Costa Mesa, CA, United States*

[2] *Scripps Institution of Oceanography, La Jolla, CA, United States*

[3] *City of Los Angeles Sanitation, Playa del Rey, CA, United States*

[4] *City of San Diego Public Utilities, San Diego, CA, United States*

[5] *Sanitation Districts of Los Angeles County, Carson, CA, United States*

[6] *Aquatic Bioassay Consulting Laboratories, Ventura, CA, United States*

[7] *Orange County Sanitation District, Fountain Valley, CA, United States*

ABSTRACT

Shoaling of the saturation horizon for aragonite in the California Current System has been well-documented; however, these reports are based primarily on surveys conducted in waters off the continental shelf. Here we characterize, for the first time, regional spatial and seasonal patterns in aragonite saturation state (Ω_{arag}) in the shallow, nearshore waters of the southern California continental shelf through a series of synoptic surveys. Spectrophotometric pH and total alkalinity samples were collected quarterly from 72 sites along the shelf for two years. Samples were collected using Niskin bottles deployed at 2–3 depths per station (surface, mixed layer, and near-bottom) to characterize site extremes in Ω_{arag} (highest values near the surface, lowest at depth). Ω_{arag} in bottle samples ranged between 3.0 and 0.54 and was strongly associated with density; average Ω_{arag} from samples collected in the top 10 m was 2.5 compared to an average of 1.1 in samples below 100 m. The average depth of corrosive waters ($\Omega_{arag} < 1$) was interpolated for the shelf from the bottle data and was estimated to be an average of 100 m regionally, though there were instances when the saturation horizon rose to less than 20 m depth, primarily in the northern part of the coast during the spring. Ω_{arag} was strongly correlated with dissolved inorganic carbon and dissolved oxygen indicating that patterns in Ω_{arag} were linked to biological processes. The seasonality and spatial patterns we observed on the continental shelf were comparable to those observed by the California Cooperative Fisheries Investigations (CalCOFI) and West Coast Ocean Acidification (WCOA) programs in offshore southern California waters, suggesting that oceanic forcing is a strong driver defining broad patterns in aragonite saturation state on the shelf.

Full Text

Due to distribution restrictions, the full-text version of this article is available by request only.

Please contact pubrequest@sccwrp.org to request a copy.