Autonomous observations of carbon dynamics in the southern California Current System

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Autonomous chemical sensors have been used recently to study dynamic variability in biogeochemical ratios [1] and formulate mixed layer chemical budgets [2]. Building on these studies, concurrent autonomous pH, pCO_2, and Oxygen data covering eight months at two sites in the southern California Current System are used in this work to examine and compare the surface mixed layer budgets for dissolved inorganic carbon (DIC) and dissolved oxygen. It is shown that upwelling and advection often dominate the DIC budget, whereas air-sea gas exchange is the dominant term in the O_2 budget. The effects of digital filtering, sensor error and other input errors are discussed in the context of a sensitivity analysis of the chemical budgets. Uncertainty in the budget inputs and/or assumptions inherent in the formulation of a surface mixed layer budget lead to significant accumulated errors over 8 months. However, restricting the calculations to event-scale phenomena reveals that, in many cases, a mixed layer chemical budget can be constrained for prolonged periods during important transient processes such as upwelling and relaxation events occuring on the weekly to monthly timescale.

[1] Martz, T., U. Send, M. D. Ohman, Y. Takeshita, P. Bresnahan, H.-J. Kim, and S. Nam (2014), Dynamic variability of biogeochemical ratios in the Southern California Current System, *Geophys. Res. Lett.*, 2014GL059332. [2] Emerson, S., and C. Stump (2010), Net biological oxygen production in the ocean—II: Remote in situ measurements of O_2 and N_2 in subarctic pacific surface waters, Deep Sea Research Part I: *Oceanographic Research Papers*, **57**(10), 1255-1265.