Contextualizing time-series data: Quantification of short-term regional variability in the San Pedro Channel using high-resolution *in situ* glider data

SUPPLEMENTAL INFORMATION

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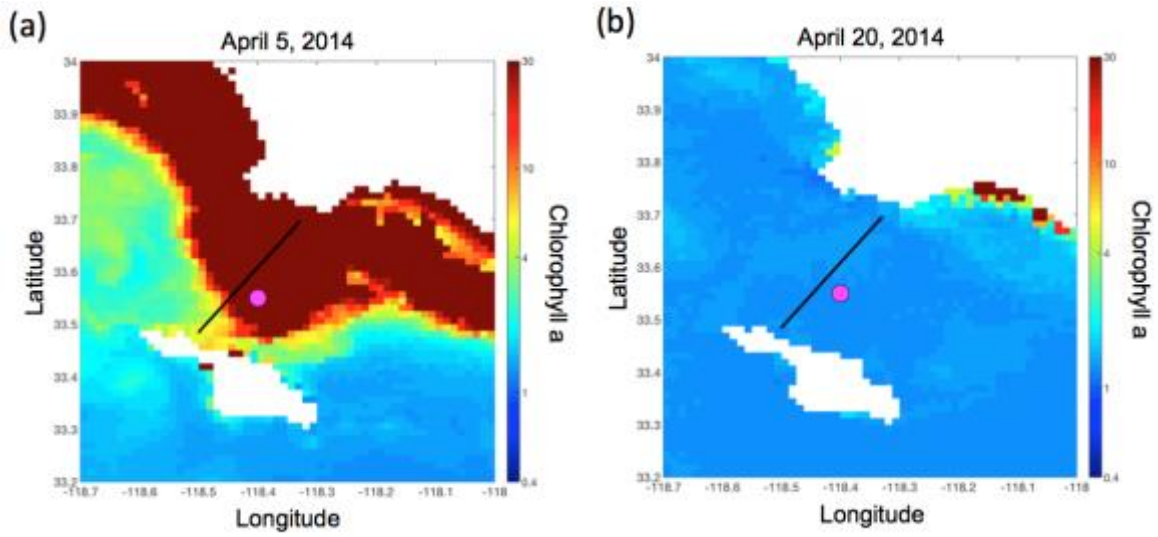
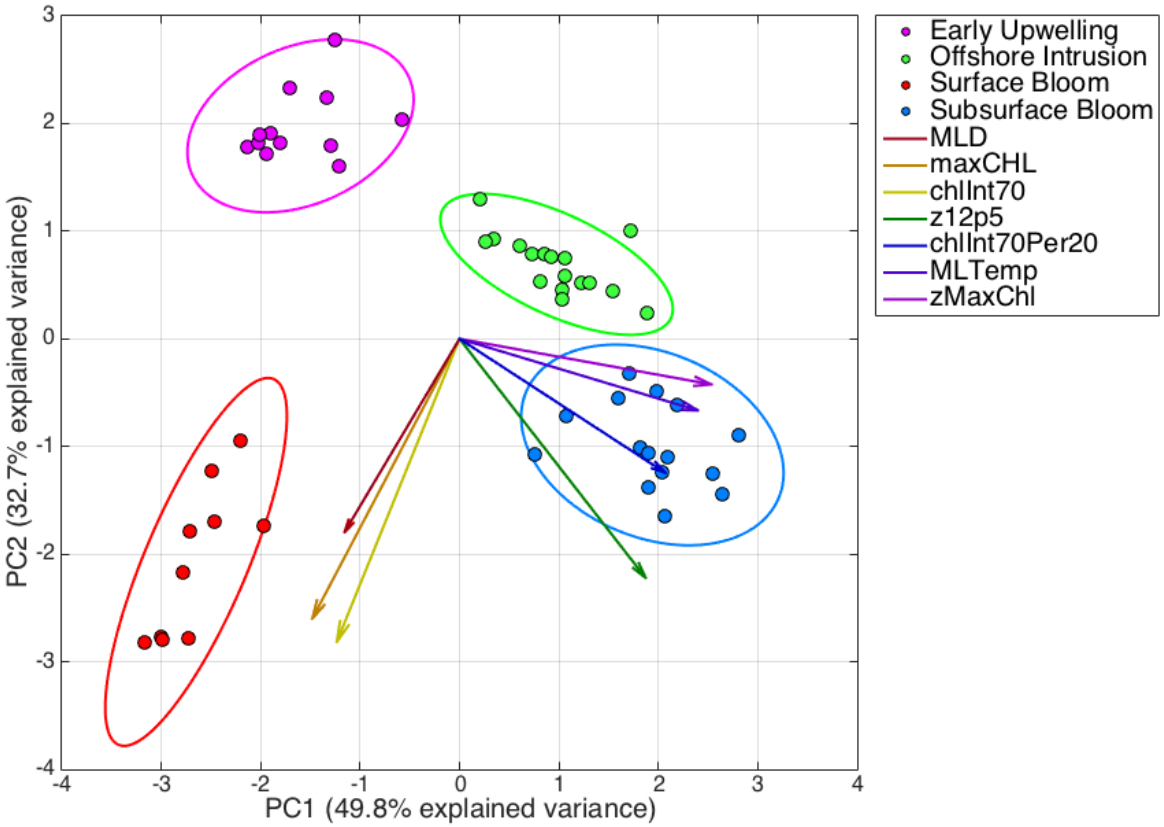
Supplemental Table S1: Ideal profile characteristics. End-member profile types, early upwelling, surface bloom, subsurface chlorophyll maximum, and offshore water intrusion, were selected numerically according to the following selection criteria. MLTemp refers to mixed layer temperature; MLD refers to the mixed layer depth; maxCHL is the maximum value of calibrated chlorophyll a fluorescence in micrograms per litre along a single profile; zMaxChl is the depth at which the maxCHL was observed; ChlInt70 is the value of integrated chlorophyll a over the top 70 meters of the water column; ChlInt70Per20 is a ratio of the amount of integrated chlorophyll in the top 20 meters of a profile compared with the integrated chlorophyll in the top 70 meters of the profile. And z12p5 is the shallowest depth at which the water temperature was below a value of 12.5˚C and is associated with sub-thermocline, nutrient-rich waters. For each water type, between 4 and 6 selection criteria (labelled #1-#6) were used to distinguish the water mass type.

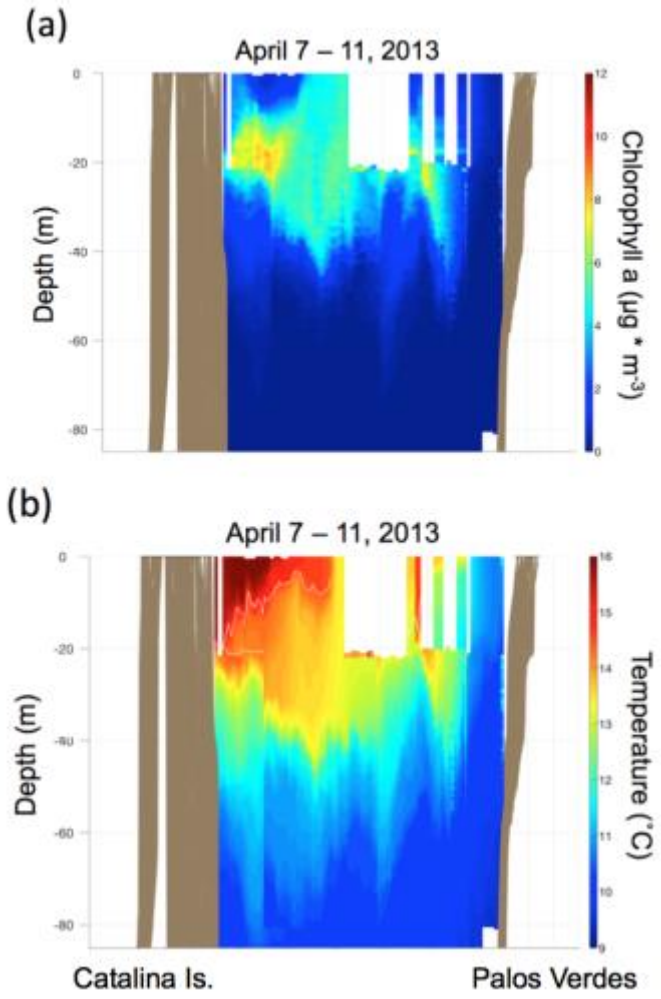
Water Type	MLTemp	MLD	maxCHL	zMaxChl	ChlInt70	ChlInt 70Per20	z12p5
Upwelling *n = 12*	**#1** <12.5		**#3** <20	**#4** <45	**#2** <85		
Surface Bloom *n = 10*	**#4** >12.9 & <17	**#5** >10	**#6** >10		**#2** >150 & <450	**#1** <2	**#3** >20
Subsurface Chl Max *n = 15*	**#1** > 17		**#5** >4		**#3** > 120	**#4** >20	**#2** > 35
Offshore influence *n = 17*	**#2** >18	**#3** <12			**#1** <80	**#5** >5 & <15	#4 <40



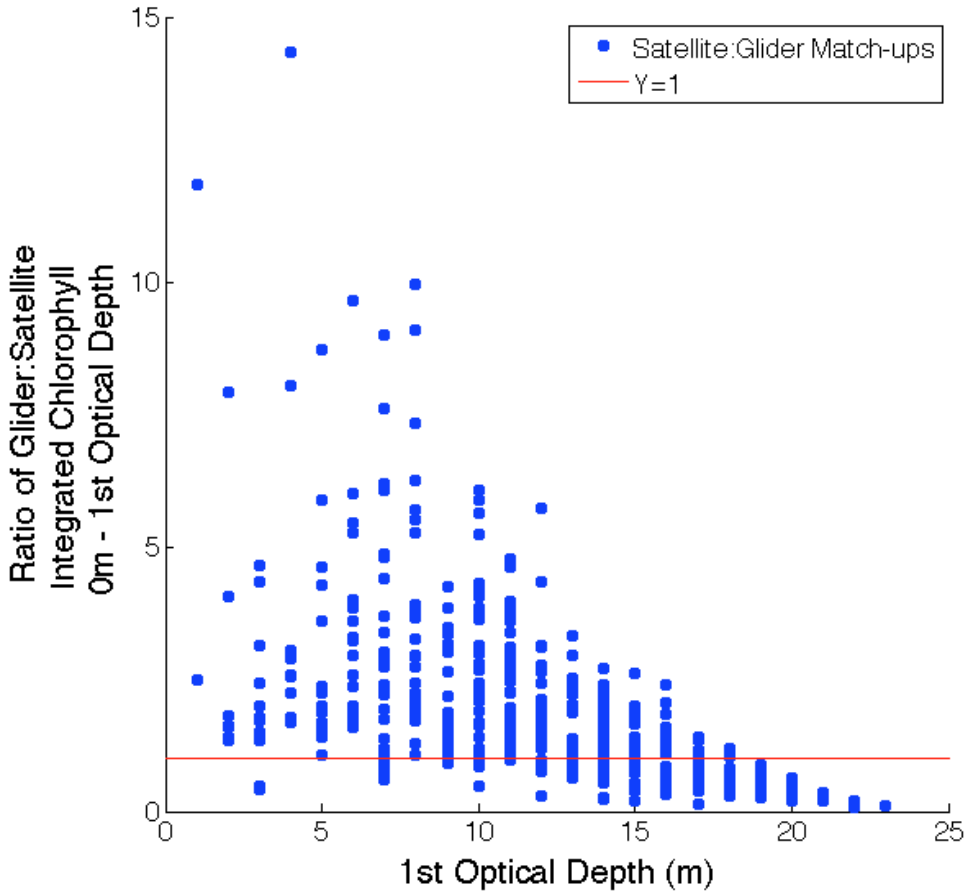
Supplemental Figure S1: Satellite chlorophyll variability within April 2014. MODIS Aqua daily 1 km chlorophyll a imagery was used to display two extreme oceanographic states within the San Pedro Channel (SPC) within a single month: (a) a strong surface phytoplankton bloom on April 5th and (b) a relatively oligotrophic surface signature on April 20th. The pink dot represents the location of SPOT. Black line shows the cross-channel mean glider transect used within this study. This strong intra-monthly variability within surface chlorophyll would most likely not have been detected with the monthly sampling scheme at the San Pedro Ocean Time Series (SPOT) site. Our findings also suggest that the satellite integrated chlorophyll and the satellite chlorophyll-derived primary production estimates may be underestimated in both of these oceanographic cases due to subsurface dynamics below the first optical depth.



Supplemental Figure S2: Principal Component Analysis of ideal profiles. The secondary profile characteristics that defined the majority of the variance in the end-member profiles were mixed layer depth (MLD), the maximum chlorophyll value for a profile (maxChl), the amount of integrated chlorophyll in the top 70 meters of the profile (ChlInt70), the depth of the 12.5˚C isotherm (z12p5), the mixed layer temperature (MLTemp), the depth of the chlorophyll maximum (zMaxChl), and the ratio of integrated chlorophyll in the top 20 meters of the profile relative to the integrated chlorophyll over the top 70 meters (chlInt70Per20). Using these variables, the axes PC1 and PC2 explained a combined 82.5% of the total variance observed between end-member profiles. Each end-member group, early upwelling, offshore influence, surface bloom, and subsurface chlorophyll maximum, is presented here with a 95% confidence interval ellipse to define similar profile types. These PCA axes were used for temporal and spatial analyses of all glider profiles collected within the SPC during 2013 and 2014.



Supplemental Figure S3: Glider curtain plots of active upwelling**.** Glider data for chlorophyll a (a) and temperature (b) from April 7th to 11th, 2013 is plotted along a transect between Catalina Island (left) and Palos Verdes Peninsula (right). Glider profiles showed strong coastal upwelling of colder subsurface water near Palos Verdes Peninsula during this time period. While tilted isotherms extended across the San Pedro Channel, the low-chlorophyll and low-temperature upwelled waters only reached the surface near Palos Verdes itself.



Supplemental Figure S4: Glider-satellite mismatch in integrated chlorophyll over the first optical depth. MODIS Aqua *chlorophyll a* data and calibrated glider *chlorophyll a* fluorescence were compared using integrated chlorophyll values between the surface and the first optical depth (OD1). Integrated chlorophyll over OD1 was generally 3-5x higher when estimated from the glider data as compared to the satellite estimate. This discrepancy was likely caused at least in part by deviation in fluorescence to chlorophyll ratios between phytoplankton in-situ and phytoplankton used for fluorometric calibrations. The glider chlorophyll fluorometer was calibrated with a mixture of locally relevant phytoplankton cultures to minimize this error, but the dominant phytoplankton species and related fluorescence to chlorophyll ratio almost certainly varied during the course of these deployments. More important, no correlation was observed between glider and satellite derived integrated chlorophyll. This disagreement was particularly pronounced during periods with extremely shallow optical depths such as those typically associated with surface blooms. This mismatch was likely exacerbated by temporal and spatial discrepancy between these datasets, since glider data were collected continuously with 500 m resolution while satellite data were collected once daily at 1km resolution. Due to these mismatches, further analyses were based solely on the glider-to-glider chlorophyll comparisons.