The following supplement accompanies the article

Synchronous settlement of barnacle larvae at small spatial scales correlates with both internal waves and onshore surface winds

J. A. Valencia-Gasti, L. B. Ladah*

*Corresponding author: lladah@cicese.mx)

Marine Ecology Progress Series 552: 195–210 (2015)

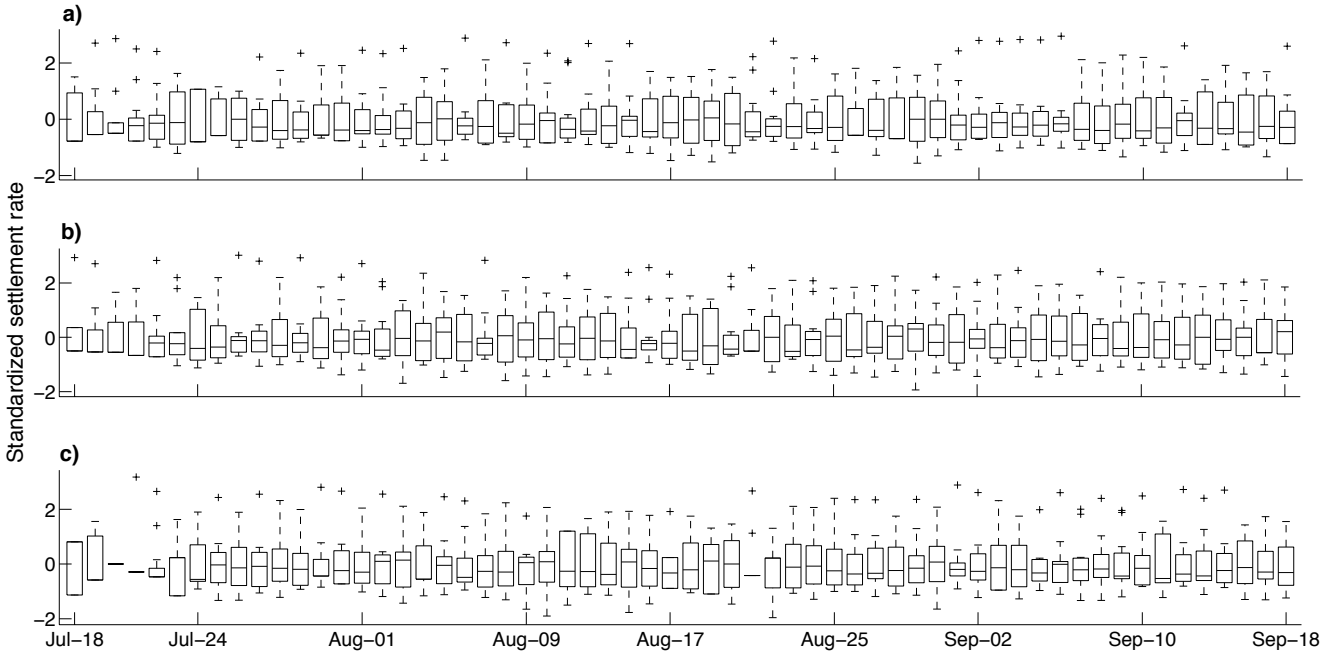

Figure S1. The differences between settlement plates per day were used to test variability between plates during sampling day in each site (a) The Exposed site, (b) Inside bay and (c) Reef site, with 12 plates were deployed per sampling day. The settlement counts were standardized and are shown as the standard normal settlement rate. The y-axis is displayed in standard units from the mean (0). On each box, the central mark is the median, with the 25th and 75th percentiles encompassing the box, the whiskers extend to the most extreme data not considered outliers, and the outliers are plotted individually as the plus signs. A total of 720 plates were deployed per site for the 60 sampling days, however a few plates were lost due to surf (plates counted per site were: exposed site=644, inside bay site=710 and reef site=706.

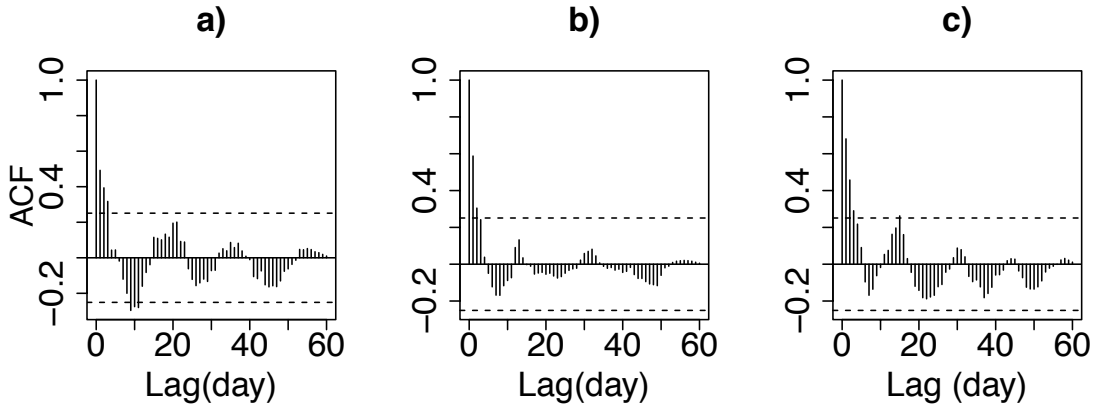

Figure S2. Autocorrelation function (ACF) for the daily settlement data for the three study sites, a) the Exposed site, b) Inside bay, c) Reef site. The ACF plots showed fortnightly periodicity in our data, with significant positive autocorrelation out to lags of 3 or 2 days (in the case of the Inside bay site), but all other autocorrelations decrease in magnitude and do not exceed the 95% significance bounds (black lines). Although the exposed site correlations for lags 9 to 11 exceed the significance bounds, the partial correlation function (pacf) "cuts off" after lag 1 for all the time series (not shown here), suggesting that only the most recent value may be useful in building the ARIMA models.

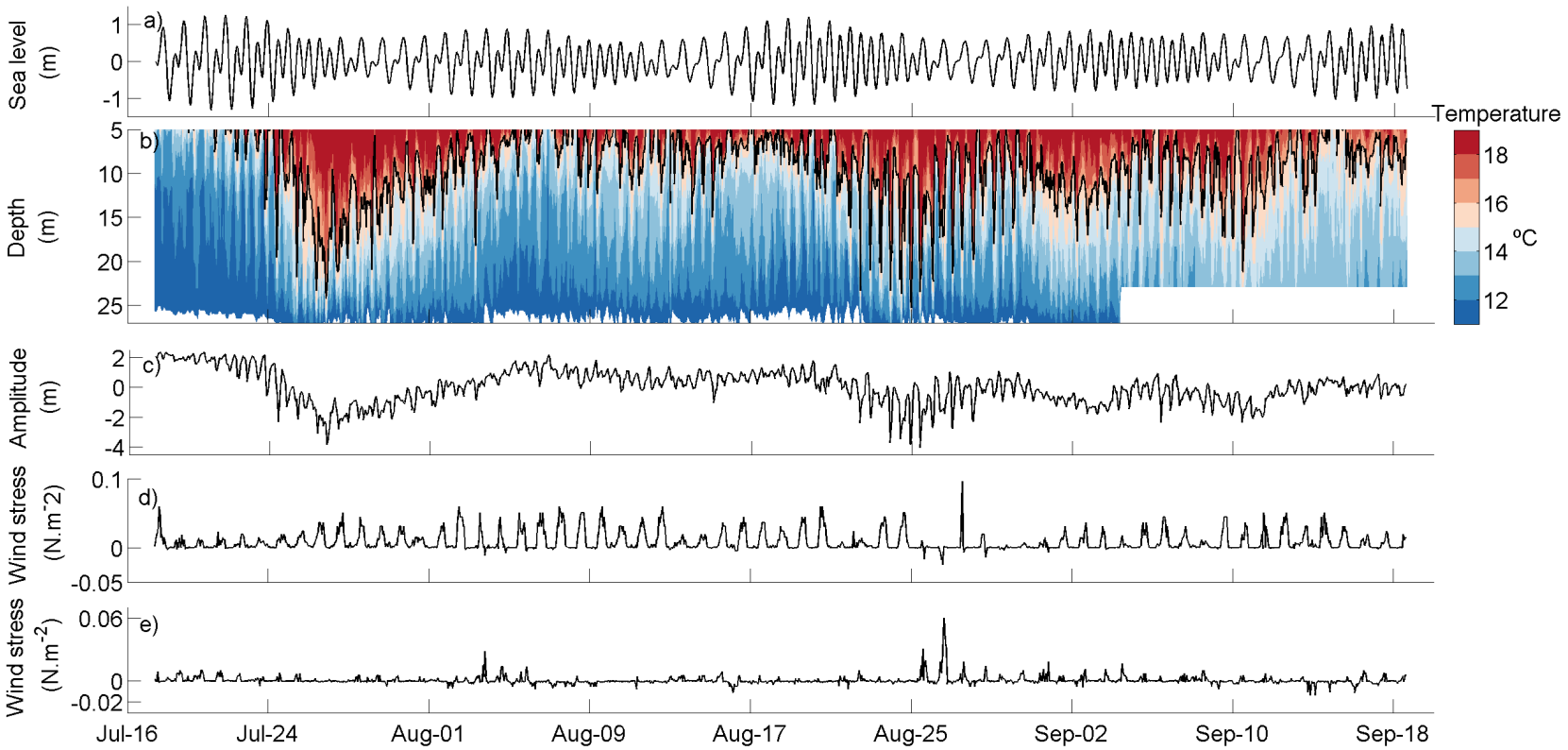

Figure S3. Variables obtained during the sampling settlement time from July to September 2009. (a) Sea level, (b) the vertical profile of temperature and (c) the average vertical isotherm displacements occurred at the mooring L05 deployed at 1600 m from the coast. The negative vertical displacements were related to surface isotherms depressed to the bottom, which often occurred at a semidiurnal frequency during days of strong internal tidal forcing. The isotherm of 16ºC is indicated with black line. Wind velocity vectors were rotated into a common coordinate system using the angle of the principal axis (1.359º relative to East), which was roughly orthogonal to the coastline in the settlement sites. Because of the north–south orientation of the Obs. El Sauzal, for all analyses we adopt this north coast coordinate system, where the cross-shelf direction (Panel d) was positive towards the East (onshore) and the along-shelf direction was positive poleward (Panel e).

Table S1. The variance removed by fitting the series to non-seasonal ARIMA models. Values in parentheses show the ARIMA model parameters fit to the time series. The first component is the order of autoregressive model used to explain the longer-term dependencies between successive observations. The second component is the order of differencing used until obtaining a stationary time series, when we start with a time series which varies in mean and variance. And the last component is the order of the moving average used to explain the short-term dependencies between successive observations. In the settlement series (N = 61), we see that more than a quarter of the variance is due to persistence or autocorrelation ($R_p^2 > 24$), but in the physical data, this is increased ($R_p^2 > 40$). The fractional variance is estimated using the quotient between variances of residuals and the interpolated series $R_p^2 = \left(1 - \frac{\mathrm{var}(r)}{\mathrm{var}(y)}\right) \times 100$. The model parameters fitted are specified by the follow terms: auto-regressive (AR), difference (drift), and moving-average (MA).

Time series	**ARIMA model**	**AR**	**drift**	**MA**	**Intercept**	R_p^2
Exposed site settlement rate anomalies	ARIMA(1,0,0)	0.5	0	0	8.9	24.7
Inside bay settlement rate anomalies	ARIMA(0,0,1)	0	0	0.7	10.4	35.2
Reef site settlement rate anomalies	ARIMA(0,1,0)	0	0.04	0		38.5
Percent of moon illumination	ARIMA(5,0,0)	ar1= 1.3 ar2=-0.3 ar3=0.2 ar4=-0.03 ar5=-0.3	0	0	52.6	99.4
Isopycnal vertical displacements	ARIMA(1,0,2)	0.8	0	ma1=0.5 ma2=0.5	0	86.8
Maximum tidal range	ARIMA(1,0,0)	0.8	0	0	16.1	63.1
Thermal stratification in water column	ARIMA(1,0,1)	0.7	0	0.5	5.6	73.7
Integrated onshore winds	ARIMA(0,0,1)	0	0	0.8	2.5	43.9
Integrated alonshore winds	ARIMA(1,0,0)	0.7	0	0	0	40.2