**Negative sea level anomalies with extreme low tides in the south-west Indian Ocean shape Reunion Island’s fringing coral reef flats**

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**Electronic Supplementary Material (ESM)**

**Table S1**: Mean Depth and coral cover (%) ± Standard Deviations (±SD) before and after the 2015 nSLA event at ten shallow coral reef sites.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Study site |  Mean depth (m ±SD) | Coral cover before nSLA (% ± SD) | Coral cover after nSLA (% ± SD) | Absolute coral cover variation ACCV (% ± SD) | Relative coral cover variation RCCV ((% ± SD) |
| PAP | -0.36 ± 0.2 | 69.2 ± 1.01 | 36.3 ± 16.6 | -32.8 ± 9.61 | -47.5 ± 9.33 |
| 3CP | -0.40 ± 0.16 | 48.1 ± 15.3 | 18.8 ± 2.27 | -29.3 ± 8.91 | -60.9 ± 13.3 |
| LCP | -0.64 ± 0.15 | 35.6 ± 17.4 | 30.2 ± 9.21 | -5.4 ± 11.4 | -15.2 ± 10.6 |
| LVP | -0.58 ± 0.10 | 48.8 ± 12.4 | 35.3 ± 4.78 | -13.5 ± 7.69 | -27.7 ± 7.02 |
| *ESP* | *-1.05 ± 0.20\** | *50.0 ± 7.28* | *23.9 ± 3.39* | *-26.1 ± 4.64* | *-52.2 ± 4.38* |
| RBP | 0.01 ± 0.14 | 71.5 ± 8.5 | 20.3 ± 13.2 | -51.3 ± 9.05 | -71.6 ± 6.85 |
| APP | -0.16 ± 0.34 | 58.1 ± 4.9 | 26.7 ± 13.1 | -31.4 ± 8.09 | -54.0 ± 5.69 |
| Tr1 | -0.27 ± 0.10 | 40.0 ± 17.3 | 16.2 ± 14.3 | -23.8 ± 7.8 | -62.9 ± 21.3 |
| Tr2 | -0.73 ± 0.18 | 51.1 ± 24.6 | 46.5 ± 29.5 | -4.6 ± 29.1 | -3.4 ± 54.5 |
| Tr3 | -0.28 ± 0.07 | 52.0 ± 7.7 | 2.5 ±5.0 | -49.5 ± 9.9 | -95.0 ± 10.0 |

\* Bathymetry calculated from Lidar and hyperspectral data at site ESP should be considered with caution because of its low accuracy due to the presence of dark sand material disturbing the estimation methodology.

**Fig. S1**: Assessment of live coral cover changes at Saint-Gilles reef flat of Reunion Island. **A.** before and **B.** after the peak of nSLA (15 June and 25 September 2015 respectively). Transects were positioned over areas of homogenous and dense coral thickets at different bathymetry: Tr1 (-0.32m ± 0.21) and Tr3 (-0.28m ± 0.09) are shallower than Tr2 (-0.75m ± 0.26). Adapted from Bajjouk et al. (2019).

**Fig. S2**: Boxplots of the estimated Relative Coral Cover Variation (RCCV) of validation points, depending on whether Recent Dead Corals are observed on the reef flat (RDC) or not (NO RDC).

**Fig. S3**: Emersion times according to date and bathymetry. **A.** Daily values computed from tide gauge high frequency sea levels. The color bar represents the bathymetry gradient, and the black line indicates the historic mean sea level. **B.** Curves of the cumulative emersion times for the year 2015, by bathymetry increments of 0.05 m. Time length on vertical axis is logarithmic for better representation of critical short deeper emersion times.

**Table S2**: Mean sea levels (MSL) and tidal ranges (MTR) in meters ± standard deviations for three configurations of daily sea levels (dMSL): negative (nSLA), positive (pSLA) and neutral (MSL), and three configurations of tidal ranges (TR): average, spring and neap tides.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| dMSL | Tide | Beginning | End | N | MSL ± SD | MTR ± SD |
| nSLA | Average | 2015-07-13 | 2015-07-28 | 16 | -0.20 ± 0.016 | 0.46 ± 0.10 |
| Spring | 2015-07-15 | 2015-07-18 | 4 | -0.20 ± 0.01 | 0.57 ± 0.04 |
| Neap | 2015-07-23 | 2015-07-26 | 4 | -0.21 ± 0.00 | 0.33 ± 0.03 |
| pSLA | Average | 2015-11-16 | 2015-11-30 | 15 | 0.18 ± 0.02 | 0.53 ± 0.15 |
| Spring | 2015-11-24 | 2015-11-27 | 4 | 0.20 ± 0.01 | 0.72 ± 0.04 |
| Neap | 2015-11-18 | 2015-11-20 | 3 | 0.17 ± 0.01 | 0.35 ± 0.00 |
| MSL | Average | 2015-01-05 | 2015-12-30 | 222 | 0.00 ± 0.13 | 0.51 ± 0.08 |
| Spring | 2015-01-05 | 2015-12-30 | 66 | 0.03 ± 0.13 | 0.71 ± 0.05 |
| Neap | 2015-01-05 | 2015-12-30 | 65 | 0.03 ± 0.13 | 0.28 ± 0.05 |

**Fig. S4**: Pearson correlations and associated p values significance between trimestrial means of Coral Cover (CC), Coral Cover derivative (CCd), Seal Level Anomaly (SLA), Multivariate ENSO Index (MEI), Indian Ocean Dipole (IOD) and Degree Heating Week (DHW).

**Fig. S5**: Daily Sea Level Anomalies in Reunion Island for the 1993-2015 period. This 2D representation shows no particular monthly or seasonal patterns. The 2015 SLA is illustrated by the large deep blue patch at the top center of the figure.