

### **Section S1:**

This section summarizes the descriptive statistics to represent the characteristics of the used dataset for prediction of ESL at three study sites. Table S1, S2, and S3 represents the descriptive statistics for all ESL events at Cox's Bazar, Charchanga, and Khepupara, respectively.

Table S1. Descriptive statistics for all ESL events at Cox's Bazar.

Descriptive statistics	SLA [m]	Pre [mm]	SLP [hPa]	U [m/s]	V [m/s]
Mean	0.27	47.81	1003.33	0.83	1.81
Median	0.23	48.65	1002.27	1.16	2.13
Mode	0.38	78.31	1000.15	1.32	1.84
Standard Deviation	0.35	30.05	4.14	1.42	1.35
Sample Variance	0.12	902.75	17.11	2.02	1.81
Minimum	-0.49	0.05	996.29	-4.02	-2.13
Maximum	1.49	124.49	1014.32	3.03	4.14
Sample size	483	483	483	483	483

Table S2. Descriptive statistics for all ESL events at Charchanga.

Descriptive statistics	SLA [m]	Pre [mm]	SLP [hPa]	U [m/s]	V [m/s]
Mean	0.23	40.75	1004.46	0.03	1.44
Median	0.16	40.93	1004.44	0.12	1.57
Mode	0.42	68.41	1001.14	-0.24	2.36
Standard Deviation	0.30	24.04	3.86	1.18	1.11
Sample Variance	0.09	577.91	14.87	1.40	1.23
Minimum	-0.37	0.05	995.56	-3.66	-2.13
Maximum	0.94	84.58	1014.03	2.64	4.29
Sample size	434	434	434	434	434

Table S3. Descriptive statistics for all ESL events at Khepupara.

Descriptive statistics	SLA [m]	Pre [mm]	SLP [hPa]	U [m/s]	V [m/s]
Mean	0.18	29.05	1005.25	-0.70	0.86
Median	0.14	28.42	1004.59	-0.78	1.12
Mode	0.05	18.84	1000.92	-0.73	1.52
Standard Deviation	0.25	20.28	5.21	1.12	1.50
Sample Variance	0.06	411.43	27.13	1.25	2.25
Minimum	-0.23	0.00	996.62	-3.66	-2.45
Maximum	1.01	86.60	1018.18	2.56	4.13
Sample size	259	259	259	259	259

## **Section S2:**

To ensure the independency of the explanatory variables in multivariate linear regression (MLR) analysis, a correlation analysis was performed among the variables for each ESL event at three stations. The significance of the correlation coefficients is tested at 90% confidence level. It reveals the nonsignificant correlation among the explanatory variables for many cases at three stations (Table S4). The nonsignificant correlation among the explanatory variables represents their independent role in MLR to predict ESL. However, some of the explanatory variables (i.e., Pre) show significant correlation with sea level anomaly, that may relate to the physical characteristics of the variables.

Station	SLA-Pre		SLA-SLP		SLA-U		SLA-V		Pre-SLP		Pre-U		Pre-V		SLP-U		SLP-V		U-V	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
Cox's Bazar	47	22	29	40	20	49	21	48	28	41	23	46	26	43	18	51	21	48	19	50
Charchanga	44	18	31	31	36	26	22	40	26	36	23	39	19	43	18	44	23	39	12	50
Khepupara	25	12	22	15	26	11	23	14	23	14	15	22	16	21	18	19	12	25	11	26

Table S4. Number of ESL events for significant (S) and non-significant (NS) correlation at 90% confidence level among the explanatory variables of sea level anomaly (SLA), precipitation (Pre), sea level pressure (SLP), zonal (U), and meridional (V) wind. The analysis was performed for each ESL event for three study stations of Cox's Bazar, Charchanga and Khepupara.

### Section S3:

To understand the causality of precipitation for predictions, we decompose the MLR equation for WP (with precipitation) setting into two parts, one is the term represents precipitation's effect (i.e.,  $d_1 \times \text{Pre}(t)$ ) and another representing the other effects (i.e.,  $a_1 \times \text{SLP}(t) + b_1 \times U(t) + c_1 \times V(t) + e_1$ ). Figure S1 shows the decomposition of predicted SLA with WP setting at Cox's Bazar. The predicted SLA without the term of precipitation shows large uncertainty although it shows a weak increase toward the ESL day (Figure S1b). This means SLA variations driven by meteorological elements (air pressure and wind) are strongly case dependent. The precipitation term also shows large uncertainty among cases but shows steady increase (Figure S1a). The negative SLAs in Figure S1a during the first half of the episode is because we use the normalized precipitation. This analysis confirms that the influence of terrestrial precipitation on sea level rise during the ESL event is larger than the influence of other atmospheric forcings.

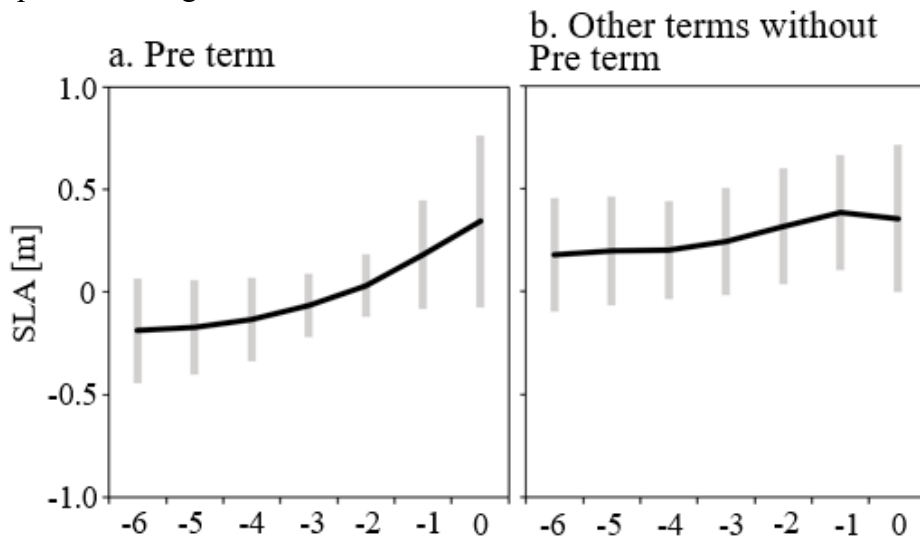


Figure S1. 7-day time series of predicted SLA by using multivariate linear regression with precipitation effect. (a) Decomposed SLA variations due to precipitation term (i.e.,  $d \times \text{Pre}$ ) and (b) other terms.