

Supplementary Information

Tropical cyclone-induced downwelling:

observational evidence for an overlooked mechanism

Yang *et al.*

Institute of Oceanography, National Taiwan University, No. 1, Sec. 4, Roosevelt

Rd., Taipei, Taiwan

Correspondence to: Y. J. Yang, Email: yjyang67@ntu.edu.tw

Table S1 provides additional information on the 17 TCs mentioned in Table

1. Figures S1-S32 show depth-time contours of ΔT in the upper 200 m during approximately two IPs (66 h) before and after the TCPA. Please refer to the Methods section for data analysis details. The temperature data of a single TC passing the adjacent regions of the buoy were interpreted as “TC buoy”. For instance, TC Nepartak approaching buoy NTU1 was abbreviated as “Nepartak 1”. Figures S33-S34 show the model experiment results.

Table S1: Additional information of the 17 TCs.

No.	Name	Buoy	SSHS ¹	Speed ² (m s ⁻¹)
1601	Nepartak	1	C5	5.7
		2		
1614	Meranti	1	C5	6.7
		2		
1616	Malakas	1	C3	5.9
		2	C4	
1617	Megi	1	C3	5.6
		2	C4	
1709	Nesat	1	C1	4.8
1713	Hato	1	TS	6.5
		2		
1822	Mangkhut	1	C5	7.7
		2		
1824	Trami	1	C4	4.2
		2		
1825	Kong-rey	1	C3	6.4
		2		
1905	Danas	1	TS	8.7
		2		
1909	Lekima	1	C4	4.8
		2		
1911	Bailu	1	TS	7.1
		2		
1913	Lingling	1	C1	3.2
		2		
1916	Mitag	2	C1	6.7
2020	Atsani	1	TS	5.8
		2		
2114	Chanthu	1	C5	4.9
		2	C4	
2118	Kompasu	1	TS	6.6
		2		

¹ The Saffir-Simpson Hurricane Scale (SSHS) provides the intensity at the TCPA, not the lifetime maximum intensity.

² Average TC translation speed between the two buoys.

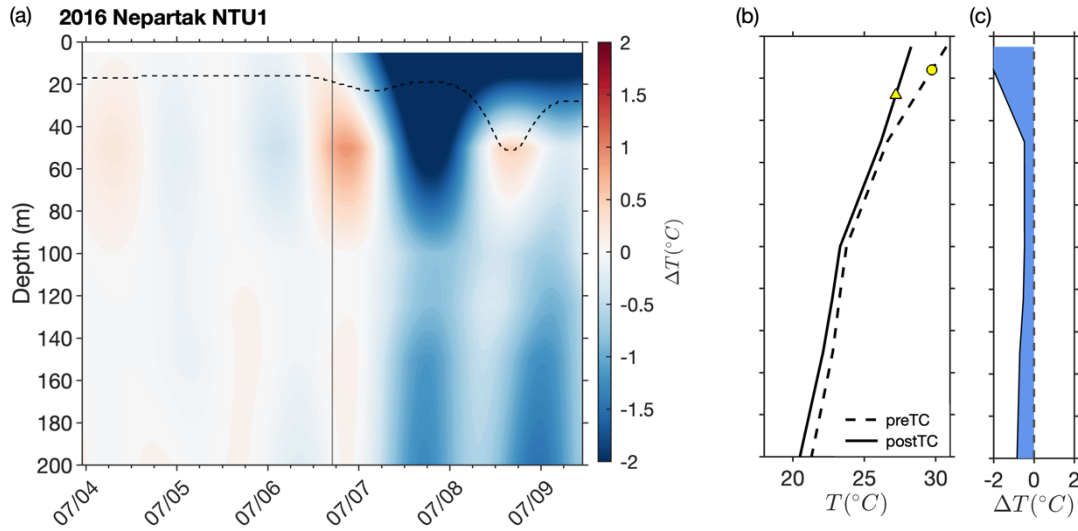


Figure S1: Temperature data of Nepartak 1. (a) Depth-time contours of ΔT in the upper 200 m during approximately two IPs (66 h) before and after the TCPA. The vertical black solid line indicates the TCPA. The black dashed line denotes the MLD. (b) Pre-TC (dashed line) and post-TC (solid line) temperature profiles in the upper 200 m are shown, with the circle (pre) and the triangle (post) denoting the MLD. The pre- and post-TC profiles are the mean temperatures over two IPs before and after the TCPA, respectively. (c) The difference between the pre- and post-TC profiles is presented. The blue shading represents a temperature decrease, and the red shading denotes a temperature increase.

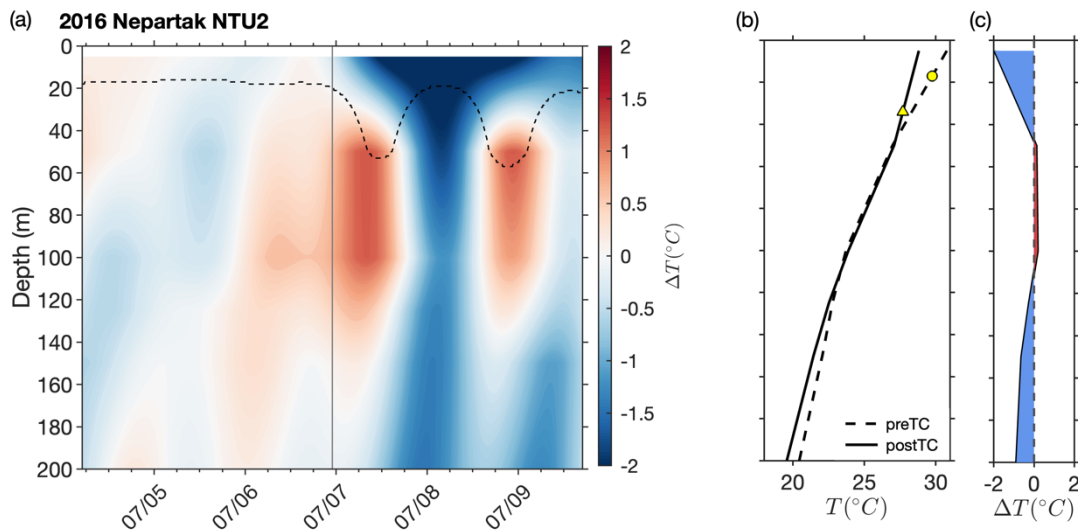


Figure S2: Temperature data of Nepartak 2. The details are the same as those in Fig. S1.

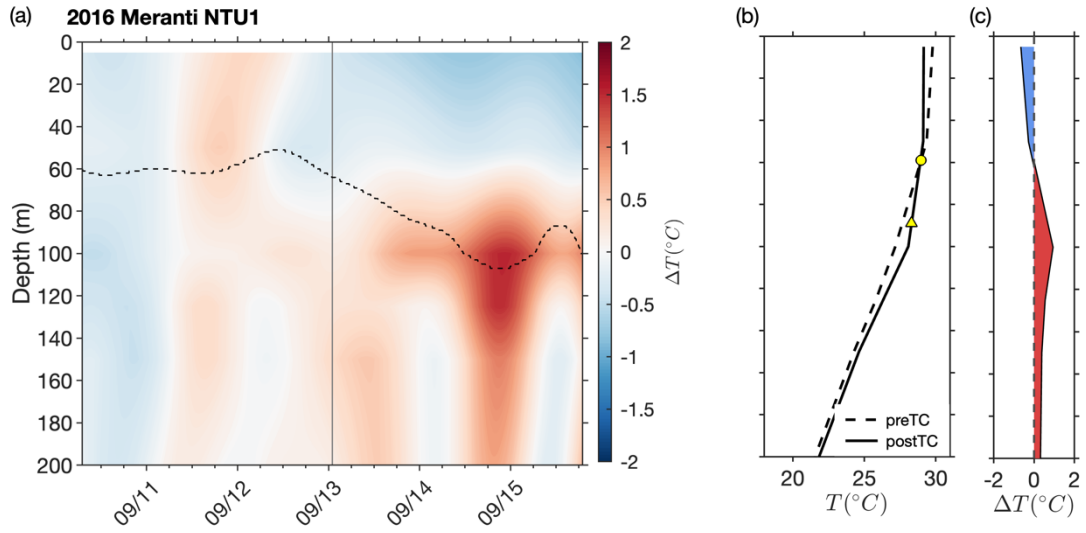


Figure S3: Temperature data of Meranti 1. The details are the same as those in Fig. S1.

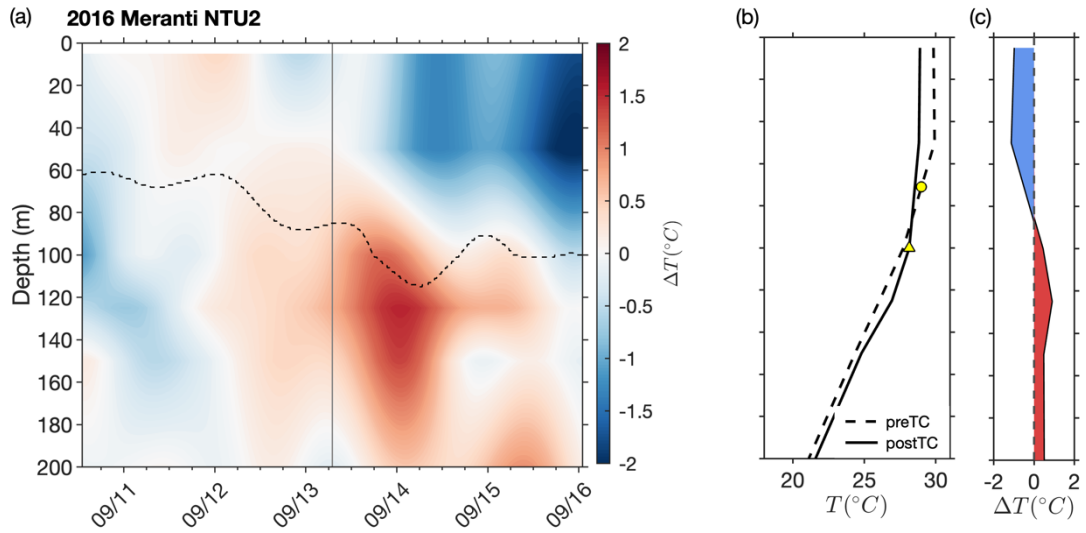


Figure S4: Temperature data of Meranti 2. The details are the same as those in Fig. S1.

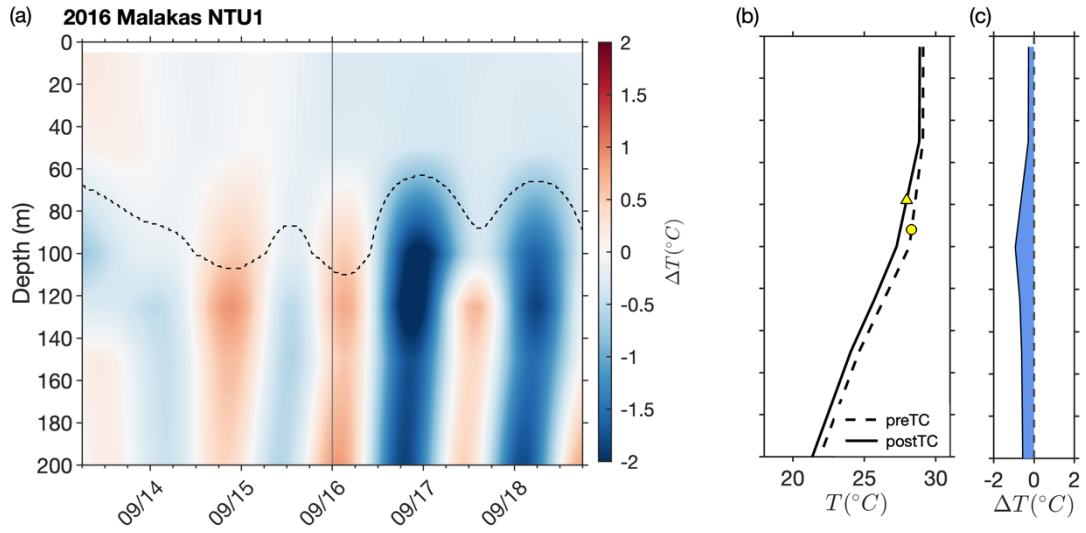


Figure S5: Temperature data of Malakas 1. The details are the same as those in Fig. S1.

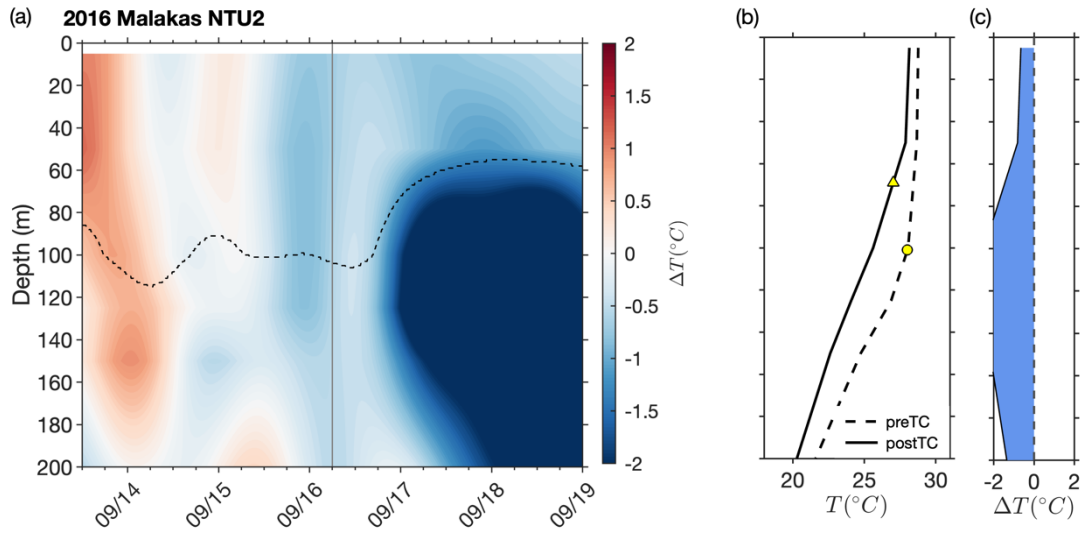


Figure S6: Temperature data of Malakas 2. The details are the same as those in Fig. S1.

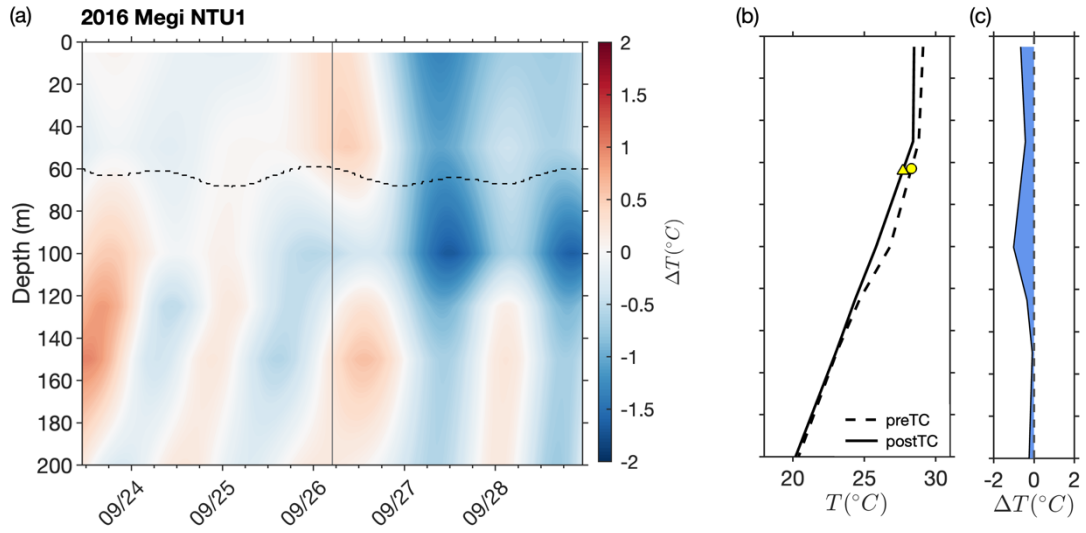


Figure S7: Temperature data of Megi 1. The details are the same as those in Fig. S1.

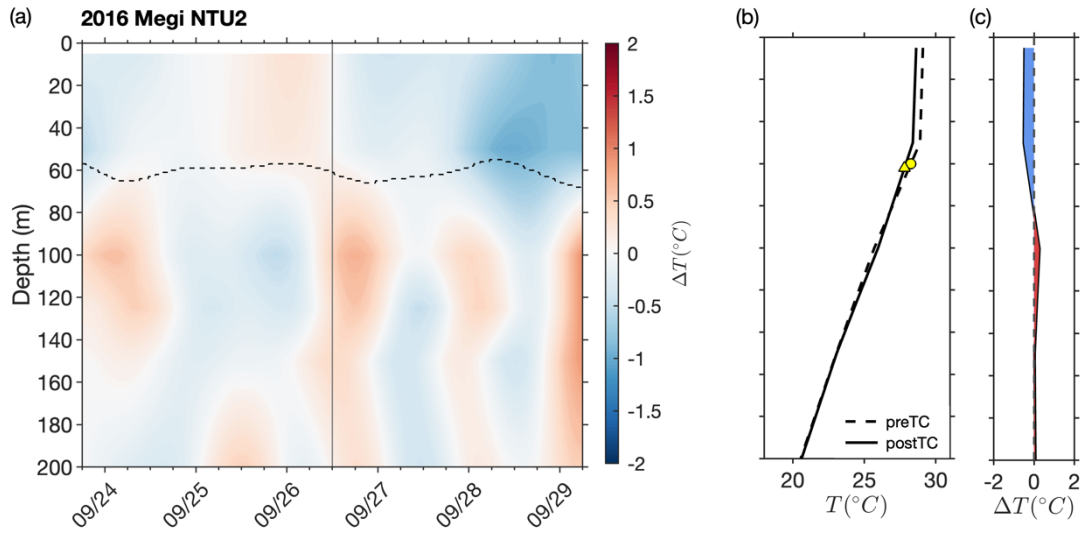


Figure S8: Temperature data of Megi 2. The details are the same as those in Fig. S1.

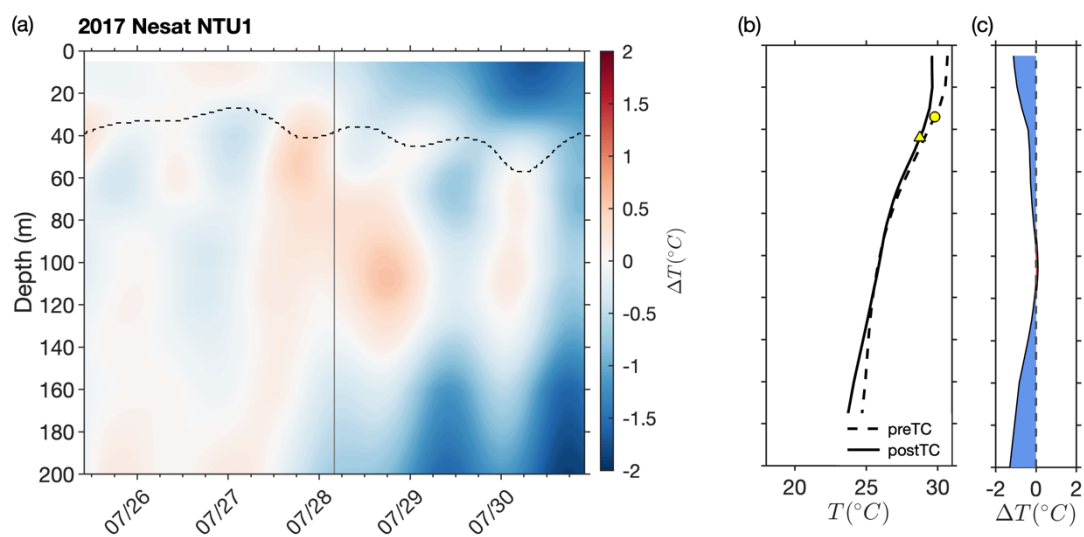


Figure S9: Temperature data of Nesat 1. The details are the same as those in Fig. S1.

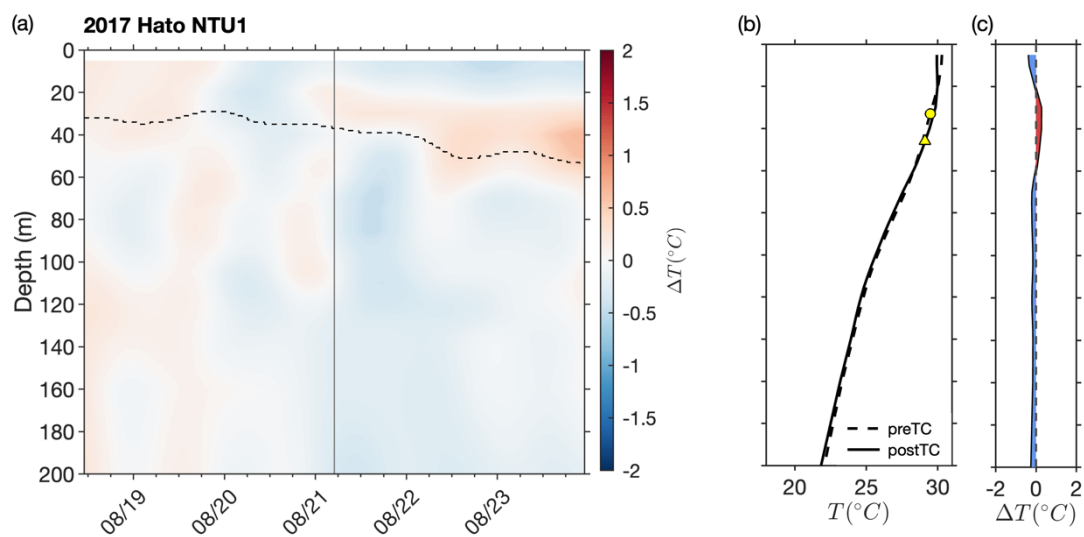


Figure S10: Temperature data of Hato 1. The details are the same as those in Fig. S1.

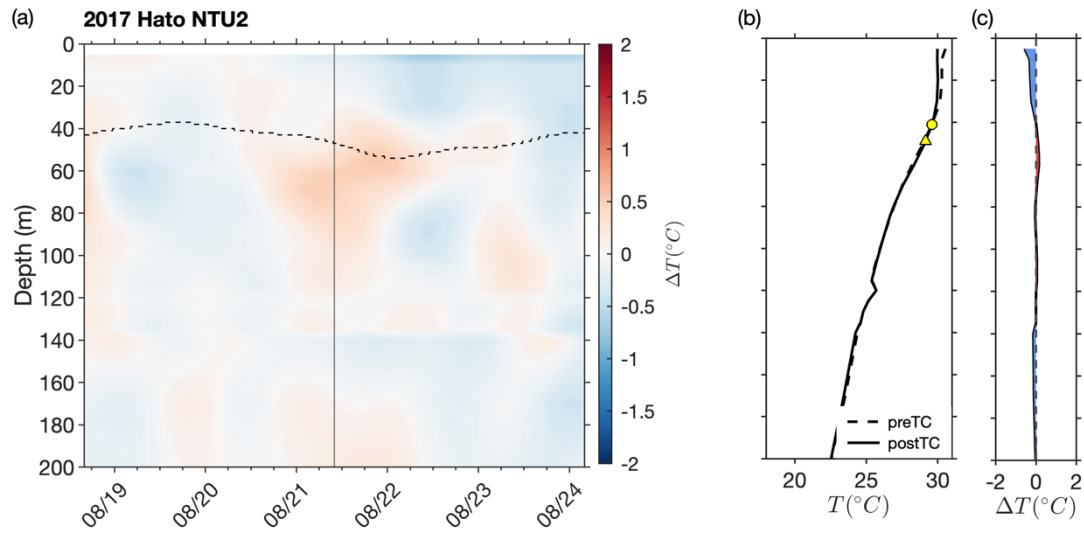


Figure S11: Temperature data of Hato 2. The details are the same as those in Fig. S1.

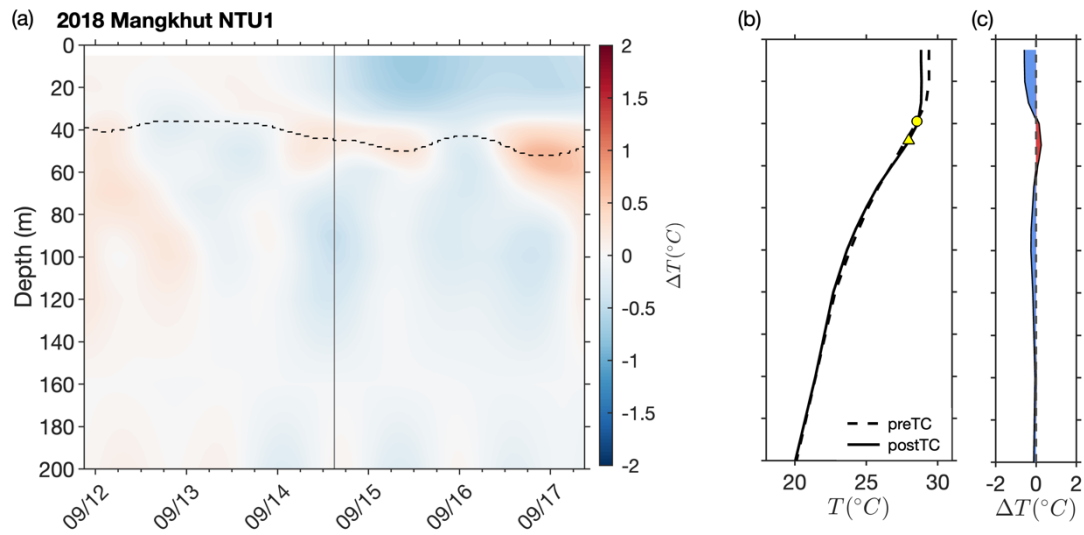


Figure S12: Temperature data of Mangkhut 1. The details are the same as those in Fig. S1.

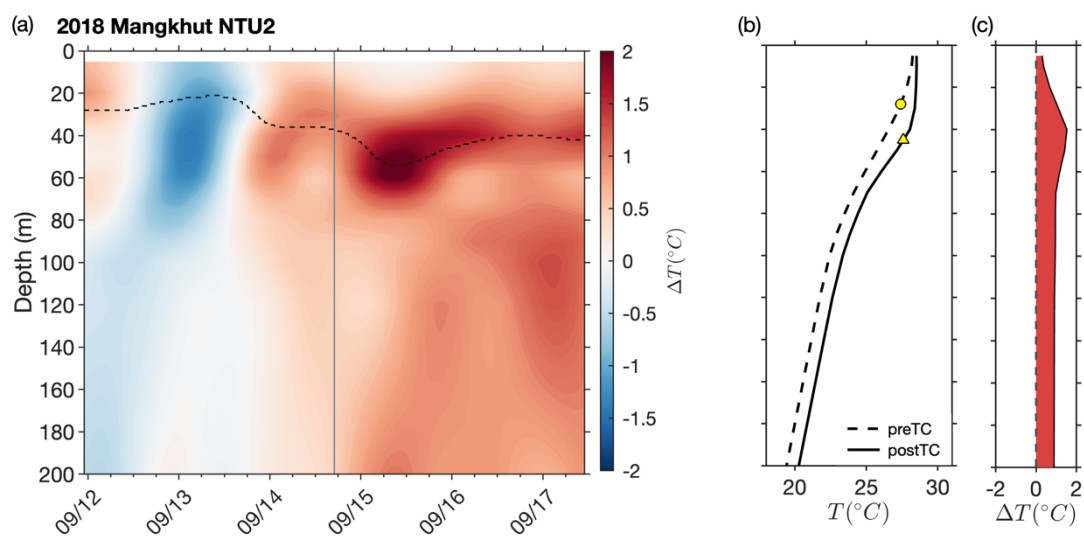


Figure S13: Temperature data of Mangkhut 2. The details are the same as those in Fig. S1.

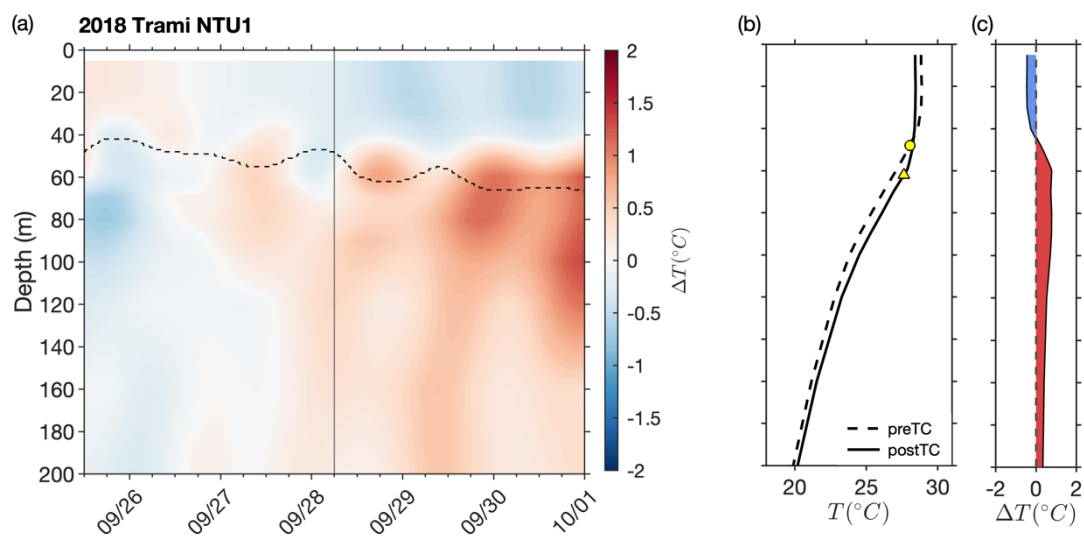


Figure S14: Temperature data of Trami 1. The details are the same as those in Fig. S1.

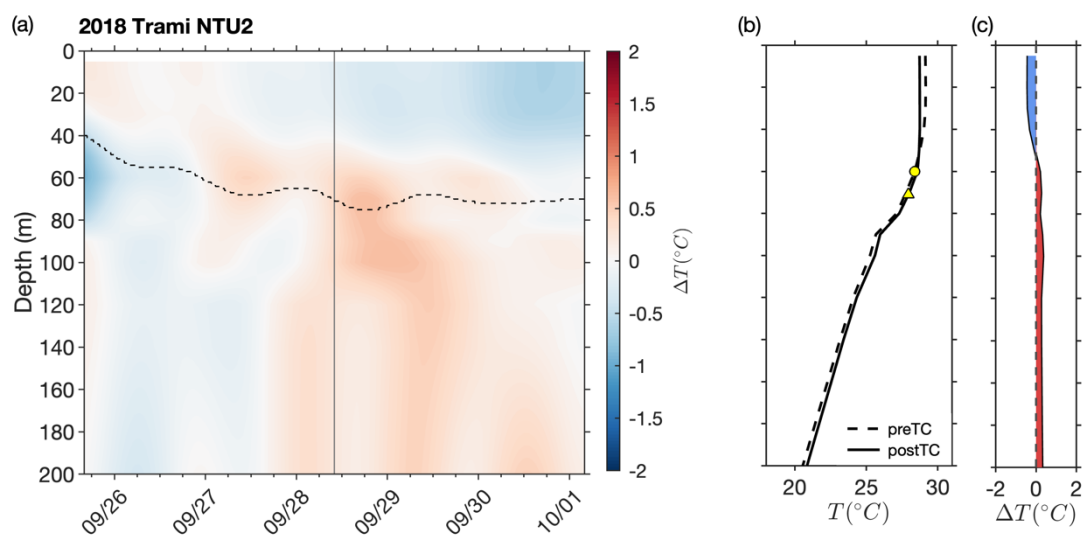


Figure S15: Temperature data of Trami 2. The details are the same as those in Fig. S1.

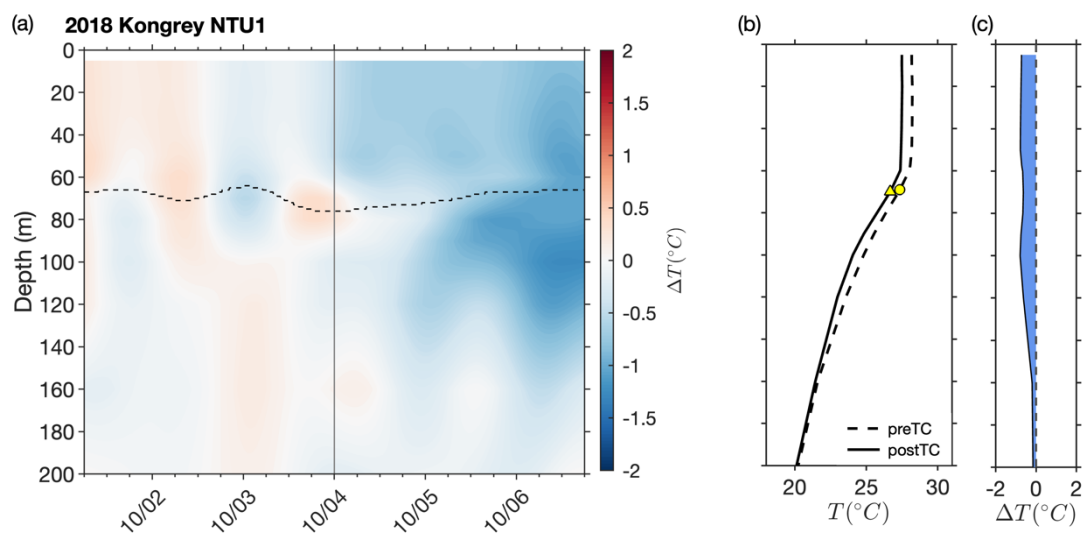


Figure S16: Temperature data of Kongrey 1. The details are the same as those in Fig. S1.

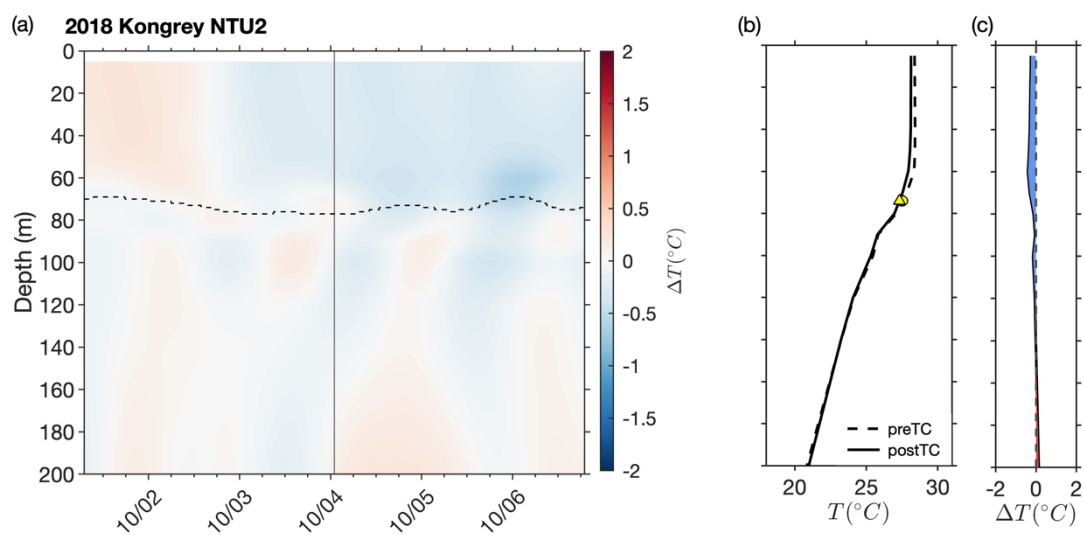


Figure S17: Temperature data of Kongrey 2. The details are the same as those in Fig. S1.

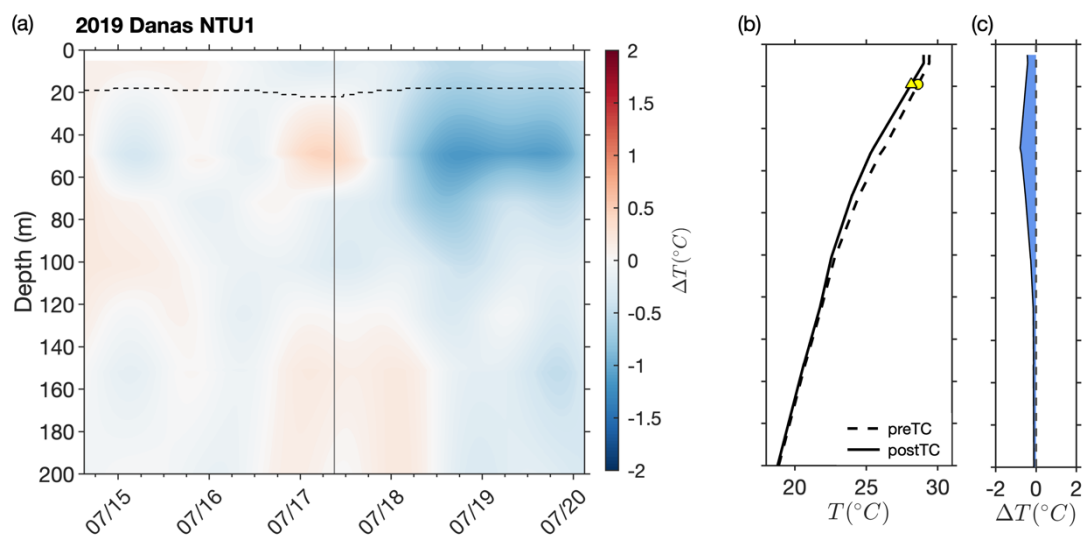


Figure S18: Temperature data of Danas 1. The details are the same as those in Fig. S1.

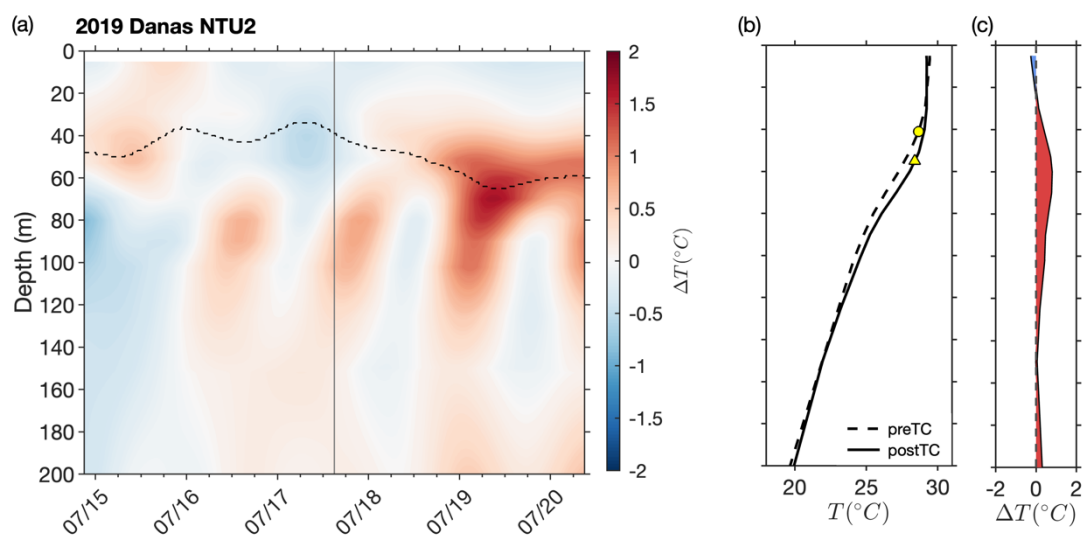


Figure S19: Temperature data of Danas 2. The details are the same as those in Fig. S1.

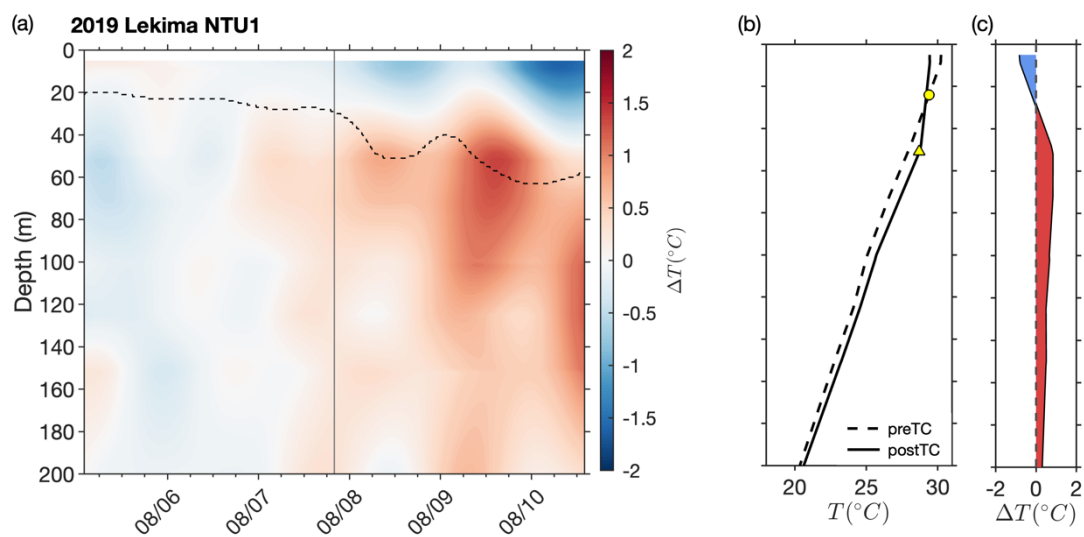


Figure S20: Temperature data of Lekima 1. The details are the same as those in Fig. S1.

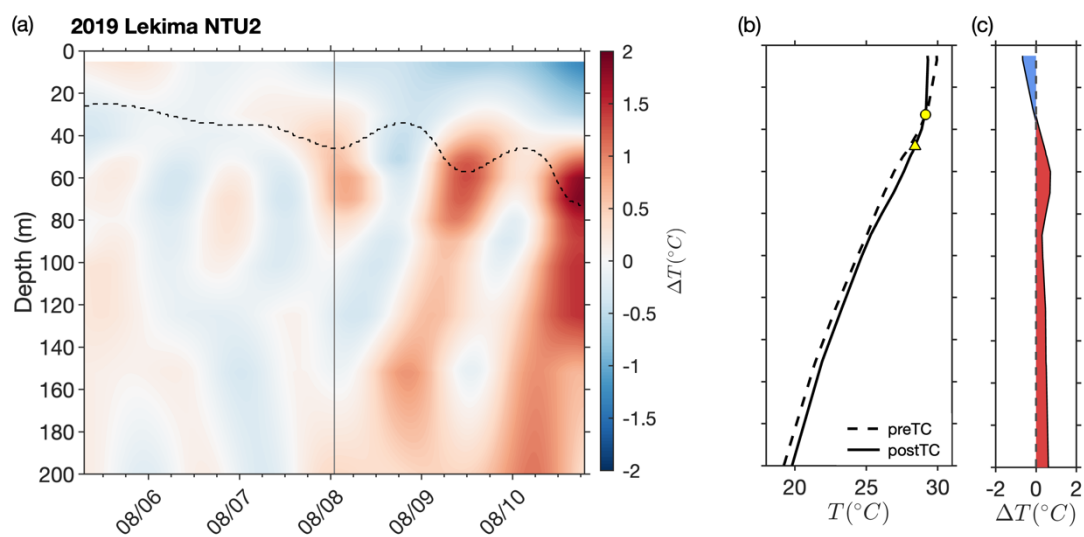


Figure S21: Temperature data of Lekima 2. The details are the same as those in Fig. S1.

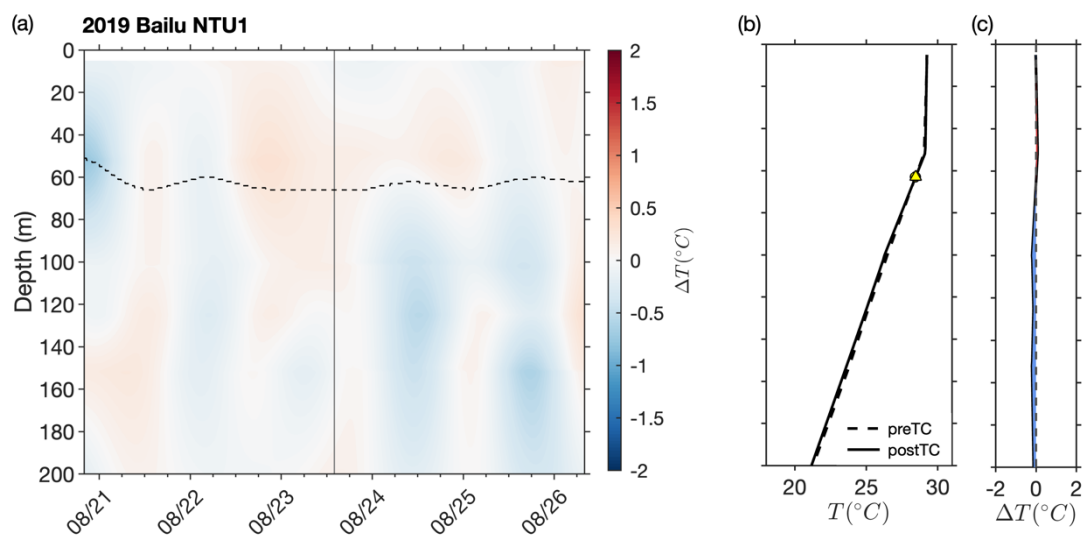


Figure S22: Temperature data of Bailu 1. The details are the same as those in Fig. S1.

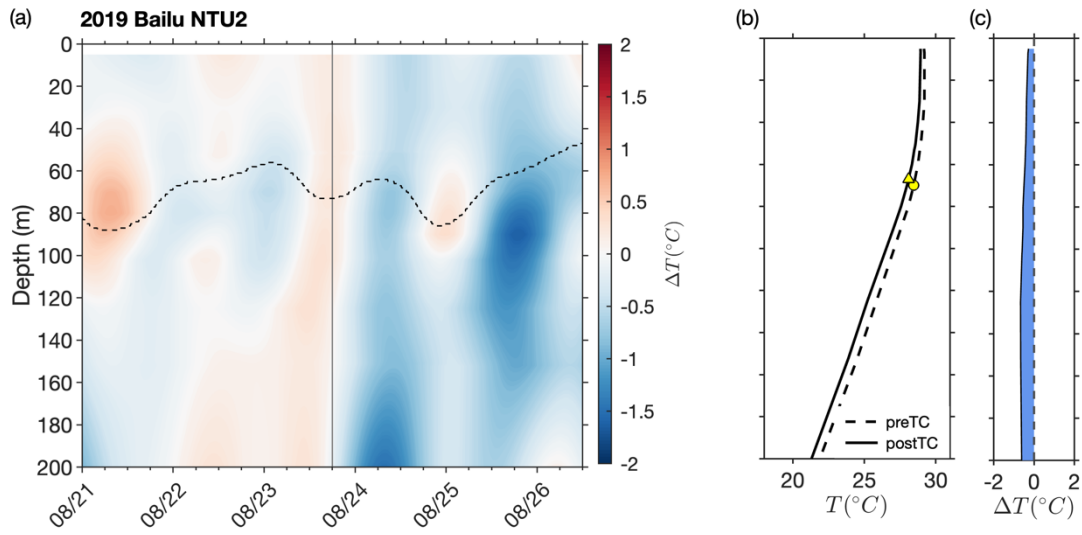


Figure S23: Temperature data of Bailu 2. The details are the same as those in Fig. S1.

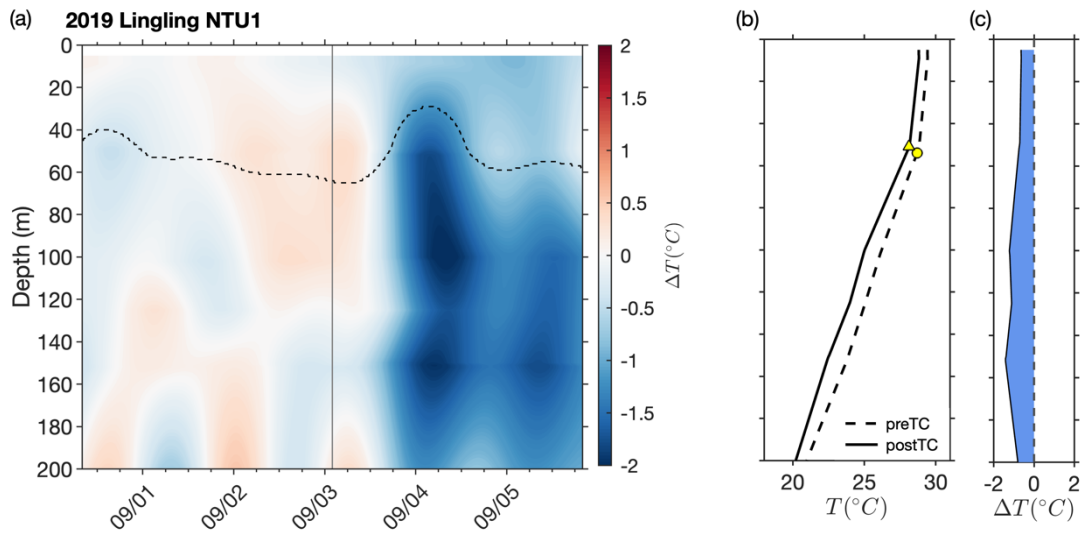


Figure S24: Temperature data of Lingling 1. The details are the same as those in Fig. S1.

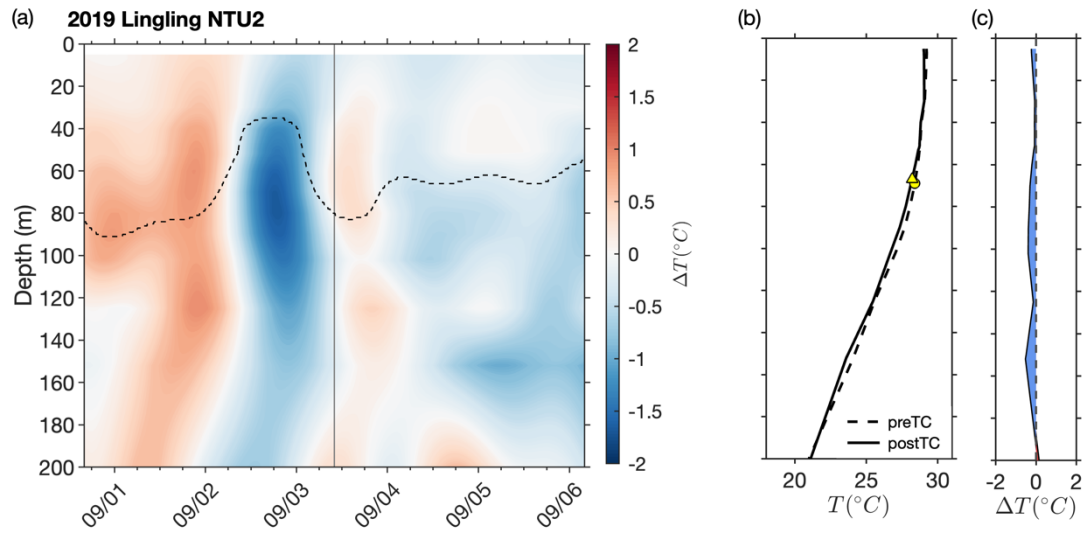


Figure S25: Temperature data of Lingling 2. The details are the same as those in Fig. S1.

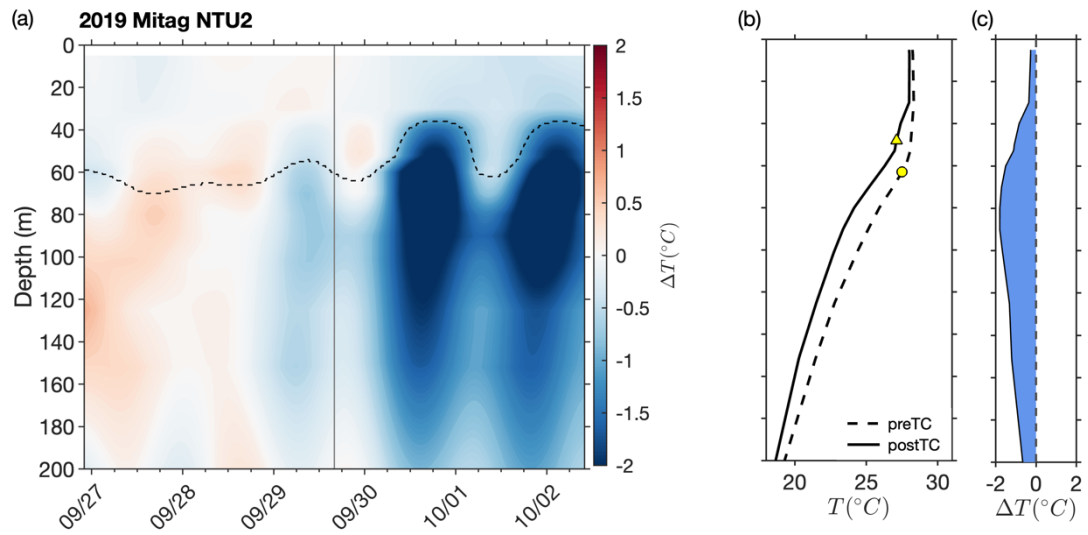


Figure S26: Temperature data of Mitag 2. The details are the same as those in Fig. S1.

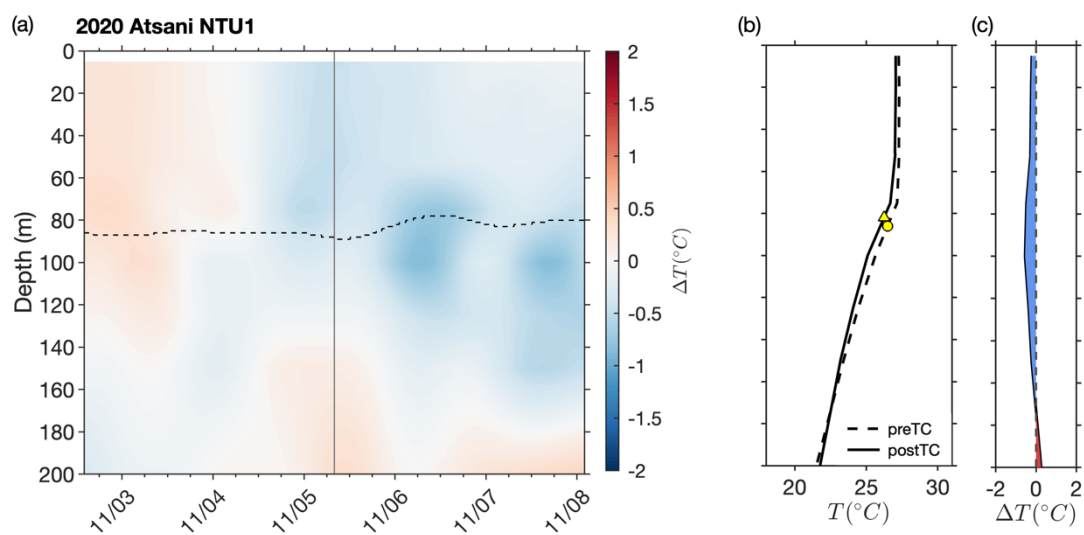


Figure S27: Temperature data of Atsani 1. The details are the same as those in Fig. S1.

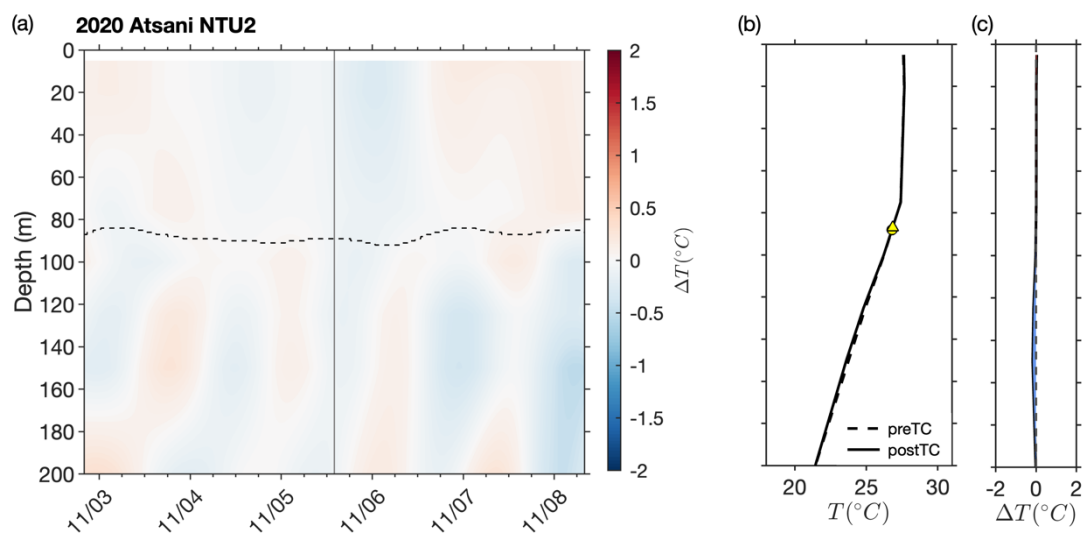


Figure S28: Temperature data of Atsani 2. The details are the same as those in Fig. S1.

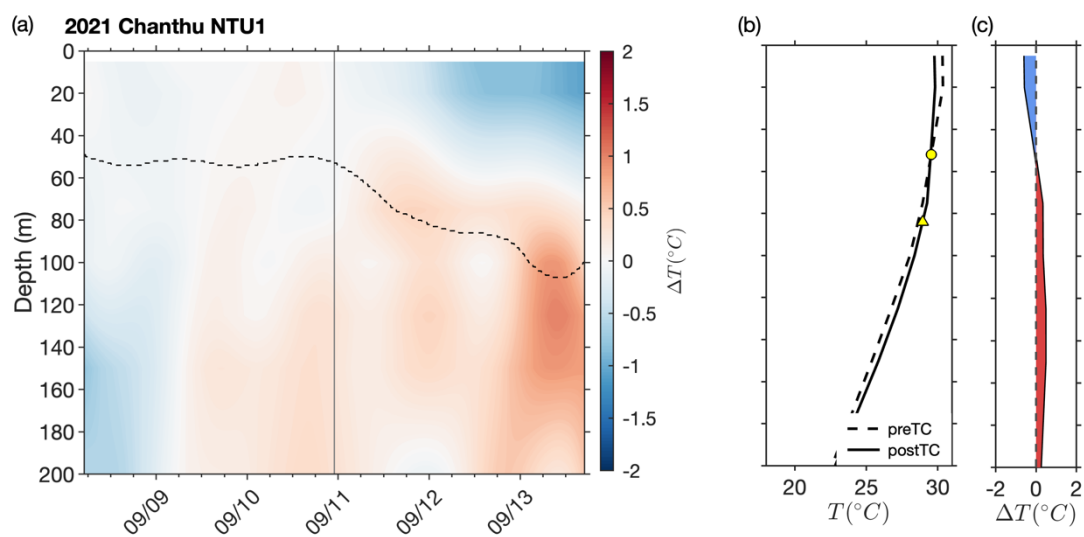


Figure S29: Temperature data of Chanthu 1. The details are the same as those in Fig. S1.

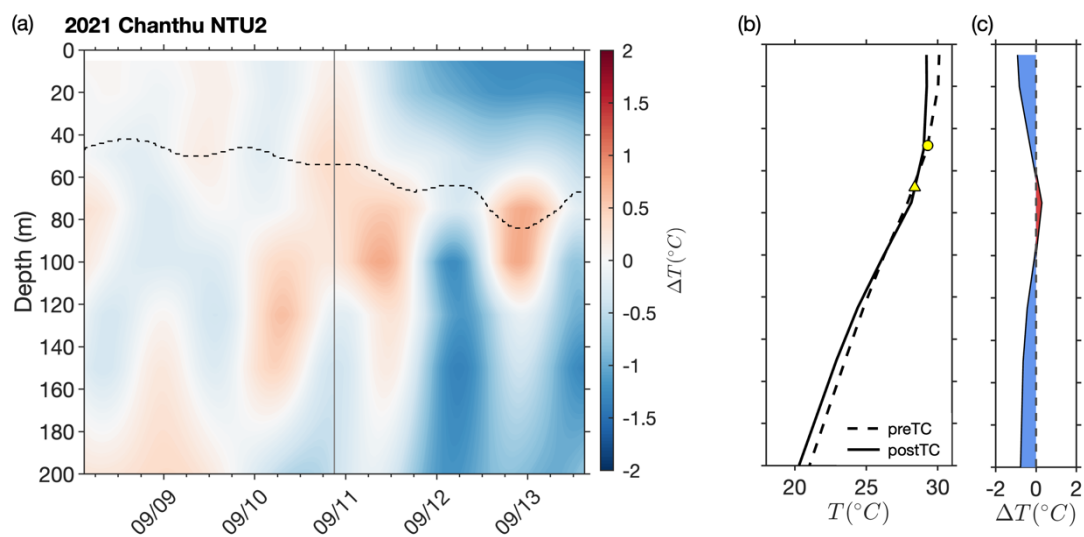


Figure S30: Temperature data of Chanthu 2. The details are the same as those in Fig. S1.

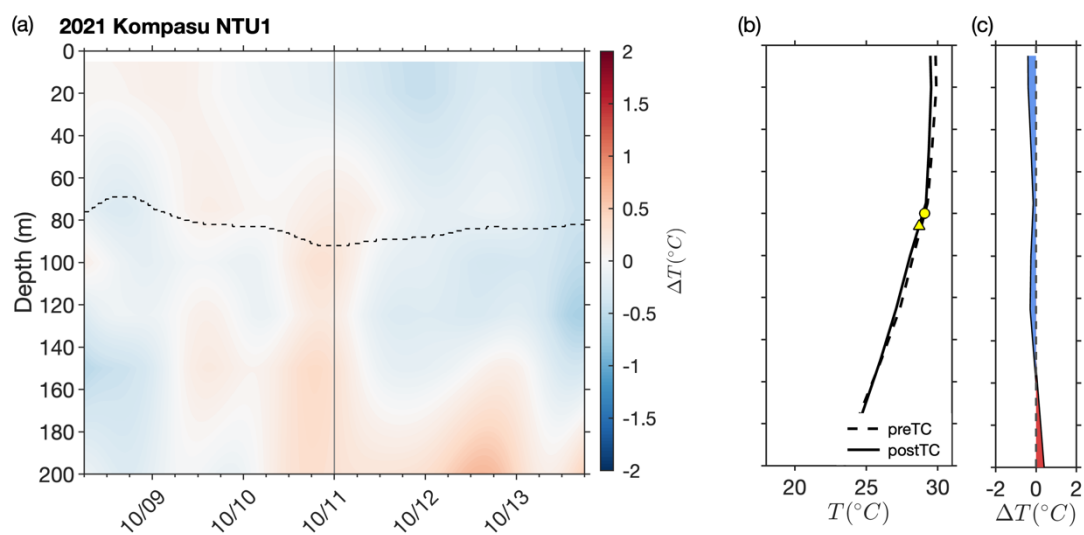


Figure S31: Temperature data of Kompasu 1. The details are the same as those in Fig. S1.

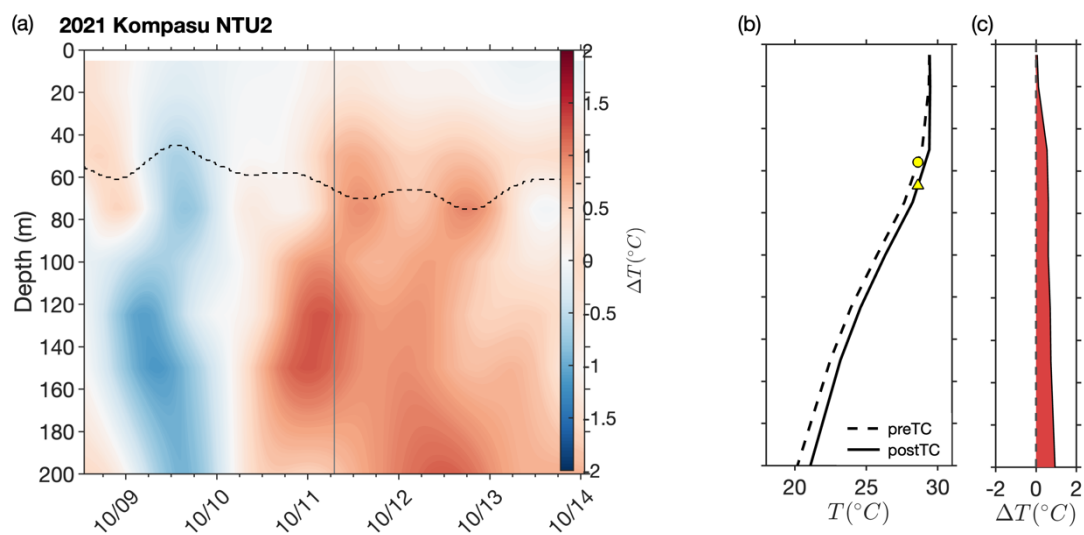


Figure S32: Temperature data of Kompasu 2. The details are the same as those in Fig. S1.

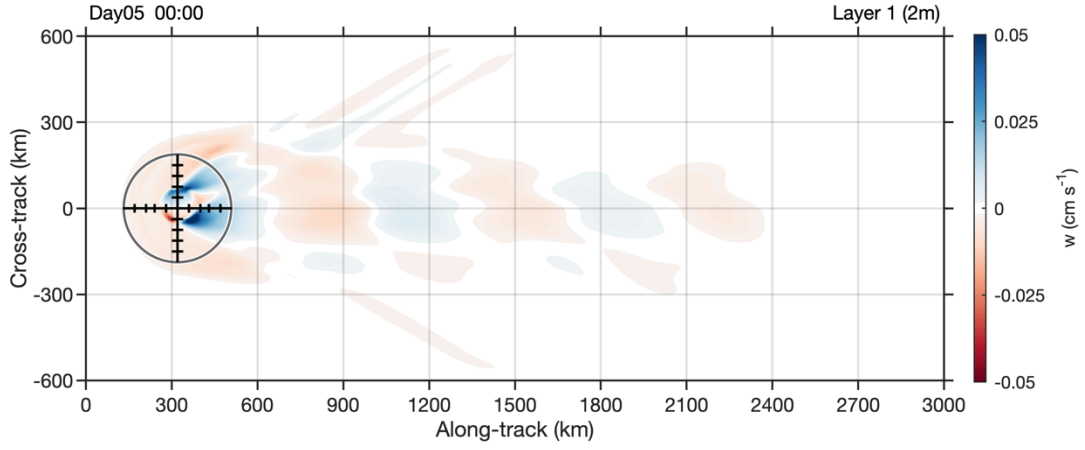


Figure S33: Snapshot of the surface (2 m) w velocity component on day 5 in Case A in the model experiments. The velocity is calculated via the continuity equation with horizontal currents. The red shading indicates downwelling, and the blue shading indicates upwelling. The gray circle denotes R_{34} of the TC. Each tick in the scale bar denotes $0.2R_{34}$ along four directions from the center of the TC.

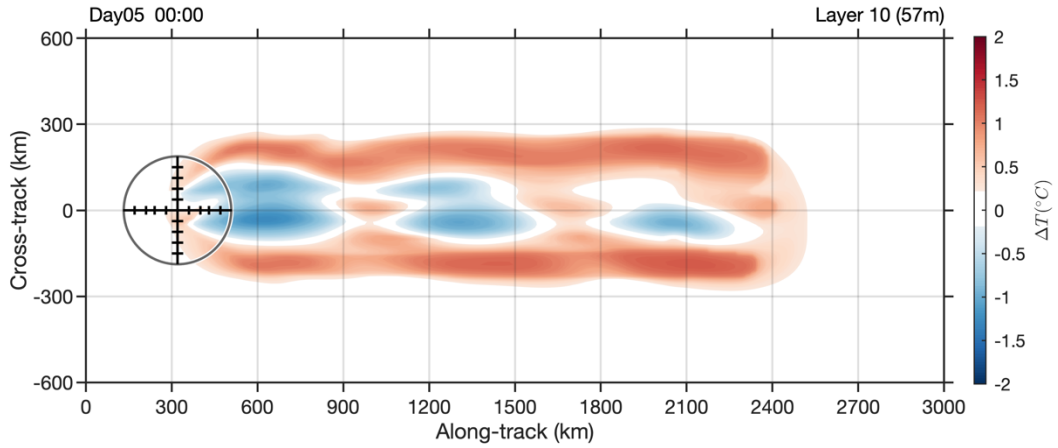


Figure S34: Snapshot of layer 10 (57 m) ΔT on day 5 in Case A in the model experiments. The red shading indicates temperature increases compared to the initial temperature, and the blue shading indicates temperature decreases. The circle and scale bar provide the same information as those in Fig. S33.