## SUPPLEMENTARY MATERIALS FOR

## Air-Sea-Land Forcing in the Gulf of Tonkin: Assessing Seasonal Variability Using Modern Tools

By Peter Rogowski, Javier Zavala-Garay, Kipp Shearman, Eric Terrill, John Wilkin, and Tran Hong Lam

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**FIGURE S1.** (a) Scatter plot of historical data from 1960 to 2016 used in the validation of a regional ocean model. Data includes temperature profiles from mechanical bathythermographs (MBT) and expendable bathythermographs (XBT), Ocean Station Data (OSD; temperature, salinity), CTD profiles (i.e., salinity, temperature) from the World Ocean Database, profiles from Argo floats (PFL), CTD profiles provided by the Vietnam Center for Oceanography (CFO), and sea level (SL) stations. Continuous black lines denote winter radial data coverage boundaries (30% data threshold) for two radar installations at Nghi Xuan and Dong Hoi. (b) Image of SIO fabricated miniature wave buoy used for the program.



FIGURE S2. Surface drifter data from 2000 to 2018 illustrating buoy (a) tracks and (b) density in the South China Sea region. This data set is compiled and maintained by the Drifter Data Center at NOAA's Atlantic Oceanographic and Meteorological Laboratory (http://www.aoml.noaa.gov/ phod/gdp/index.php).



FIGURE S3. Summary of monthly temperature observations along a 25 km across-shore survey line that originates near the XUAN radar site.



**FIGURE S4.** (a) Satellite infrared (IR)/Water Vapor (WV)/Microwave product for September 15, 2017, from the Regional and Mesoscale Meteorology Branch, National Environmental Satellite Data and Information Service, NOAA, Ft. Collins, Colorado. The image is overlaid with concurrent wind barbs from XUAN and DHOI meteorological stations and the location of a free drifting miniature wave buoy. September 14, 2017, HF radar surface current magnitude and vectors at (b) 0300 UTC, (c) 0900 UTC, and (d) 1600 UTC.



**FIGURE S5.** (a) Kipp Shearman (Oregon State University), center, provided Spray Glider education training to CFO staff. Proposed autonomous technologies for the next phase of the US-Vietnamese program include Scripps Institution of Oceanography Coastal Observing Research and Development Center unmanned underwater vehicles (b), an unmanned surface vehicle (c), and an aerial drone (d).