Electronic Supplementary Material (ESI) for Environmental Science: Atmospheres.

Supplement for

Unraveling the interaction of urban emission plumes and marine breezes involved in the formation of summertime coastal high ozone on Long Island

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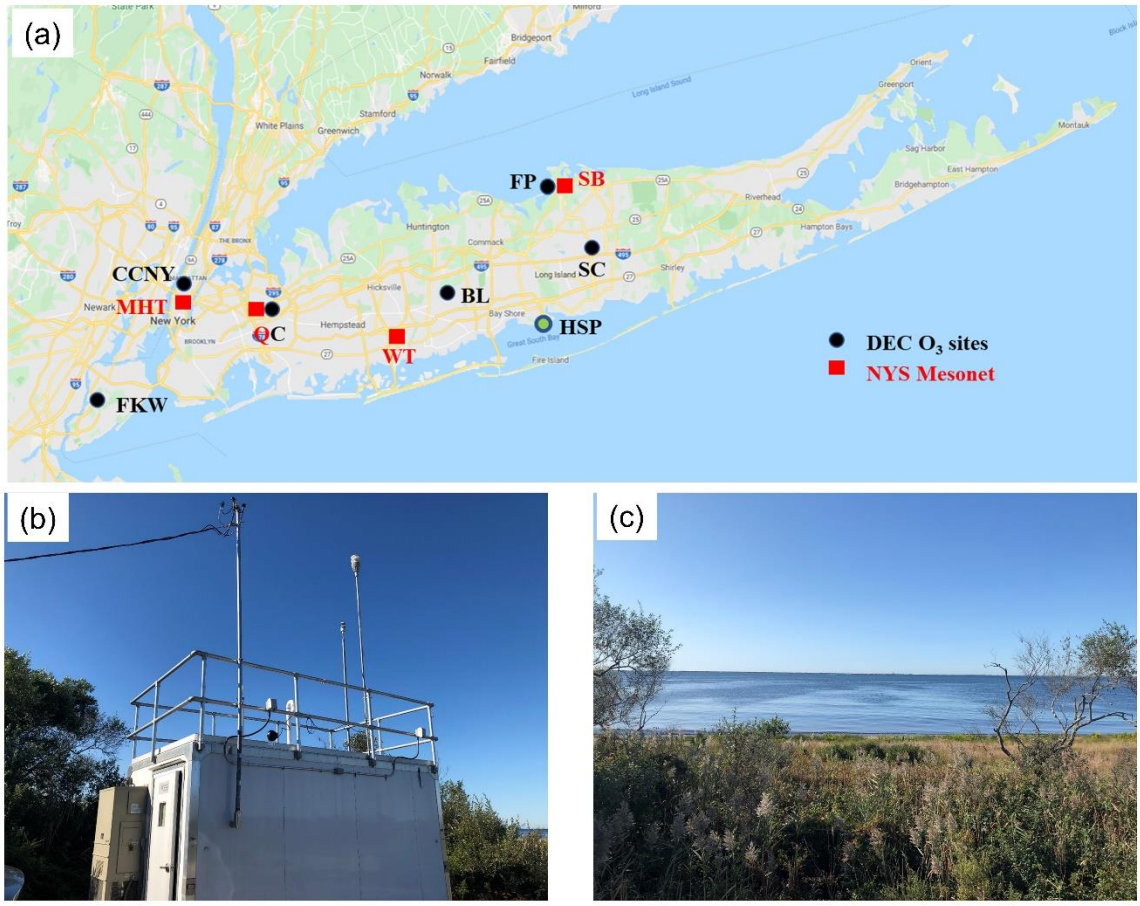

Figure S1. (a) The locations of (1) the three wind profiler sites on Long Island that are maintained by the New York State Mesonet (NYSM), (2) the seven DEC O_3 measurement sites (including HSP), and the standard NYSM site at Manhattan for surface meteorology (made from Google Map. https://www.google.com/maps/. FKW: Fresh Kills West; CCNY: City College of New York; MHT: Manhattan; QC: Queens College; WT: Wantagh; BL: Babylon; FP: Flax Pond; SB: Stony Brook; SC: Suffolk Country; HSP: Hecker State Park).

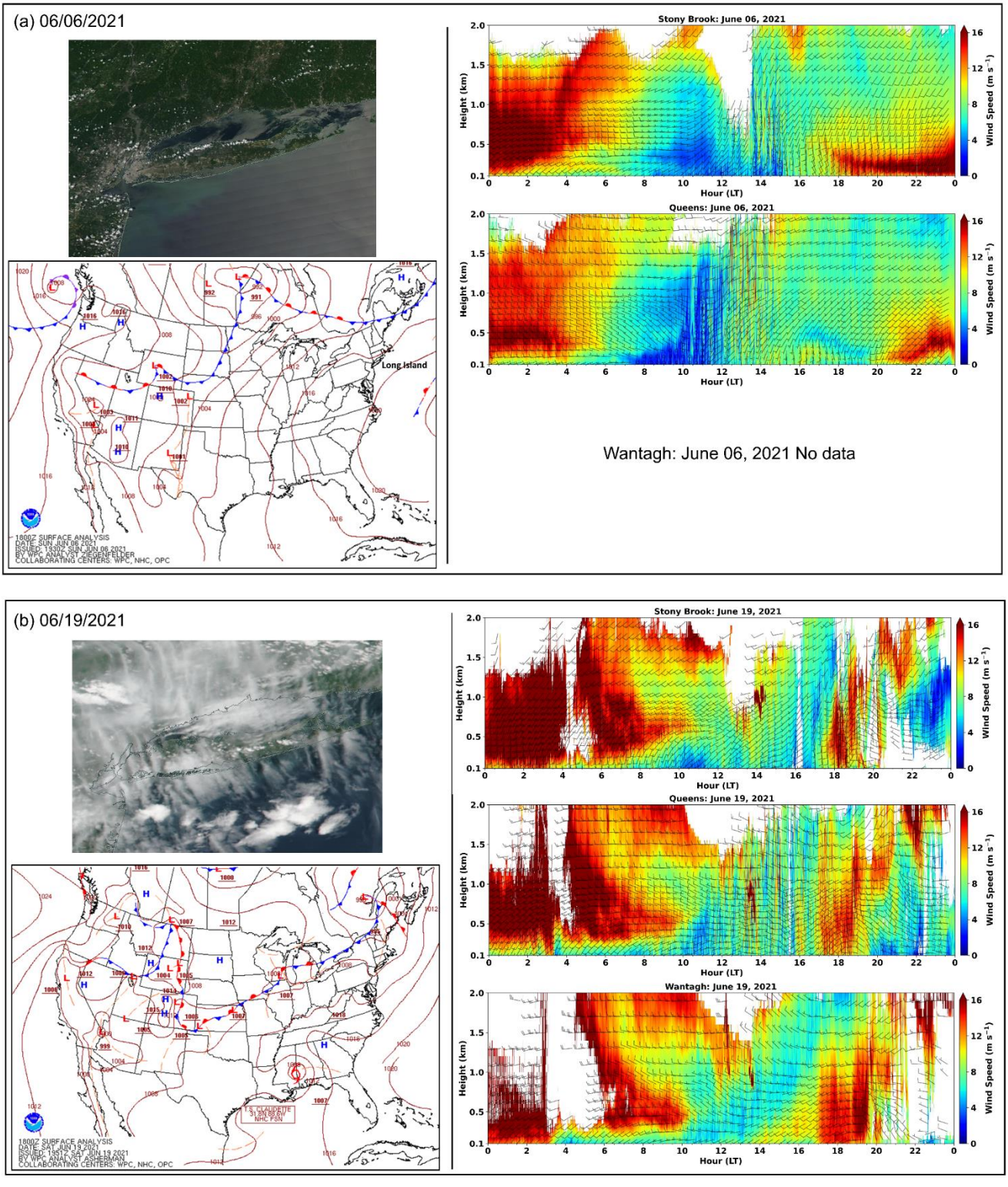

Figure S2. Plots for the days with higher ozone concentration at the north shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (a) 06/06/2021, and (b) 06/19/2021

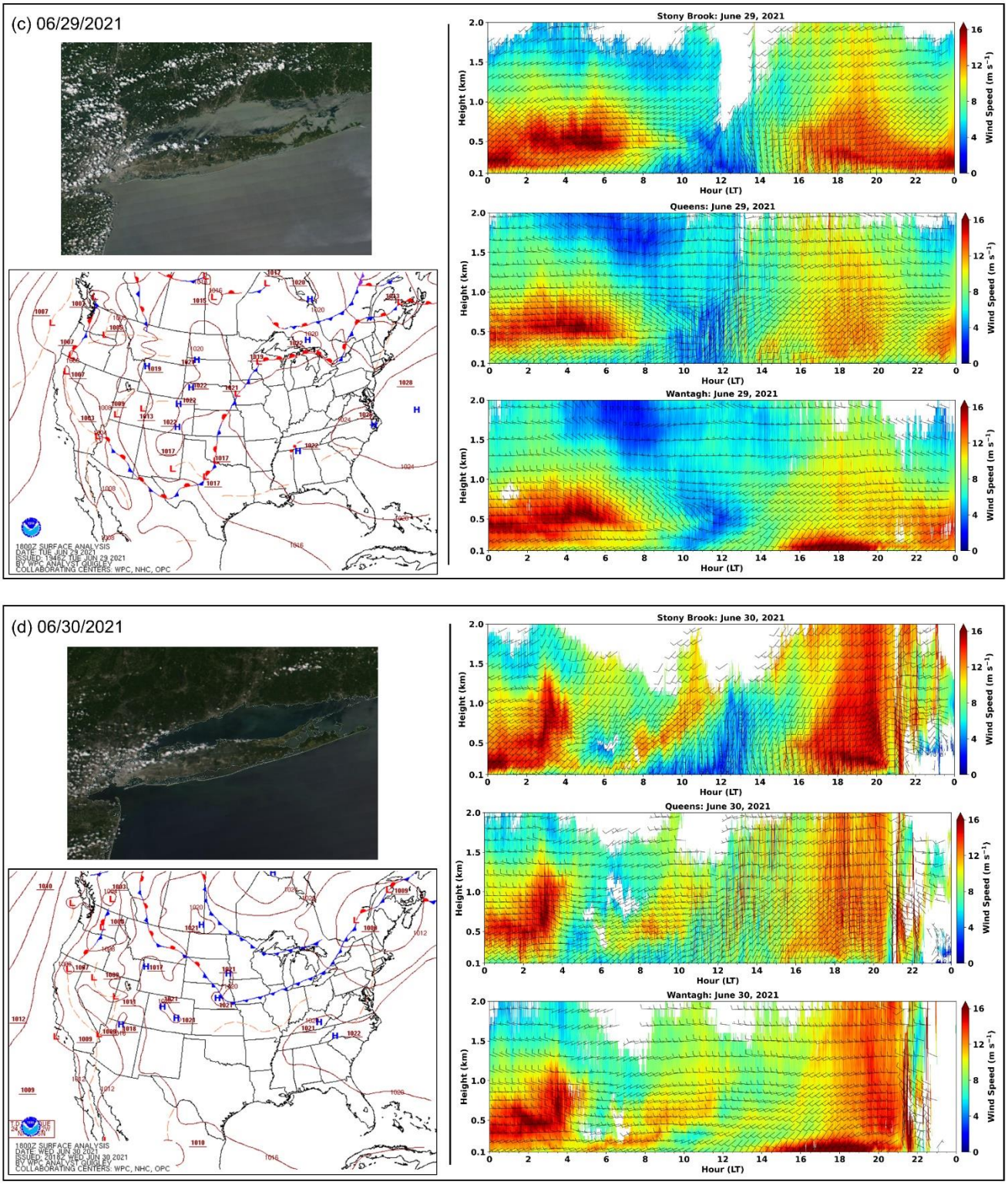

Figure S2 (continued). Plots for the days with higher ozone concentration at the north shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (c) 06/29/2021, and (d) 06/30/2021

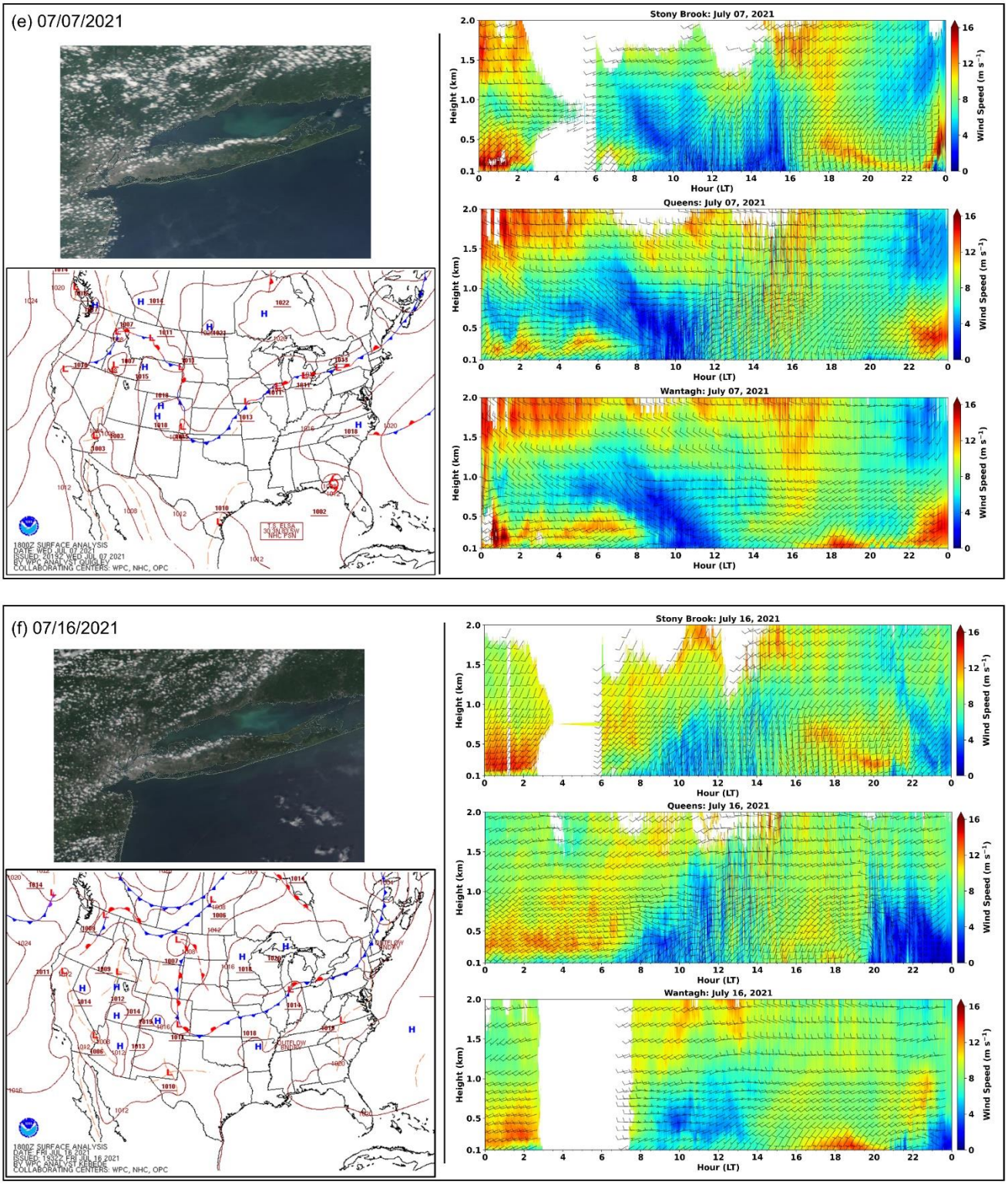

Figure S2 (continued). Plots for the days with higher ozone concentration at the north shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (e) 07/07/2021, and (f) 07/16/2021

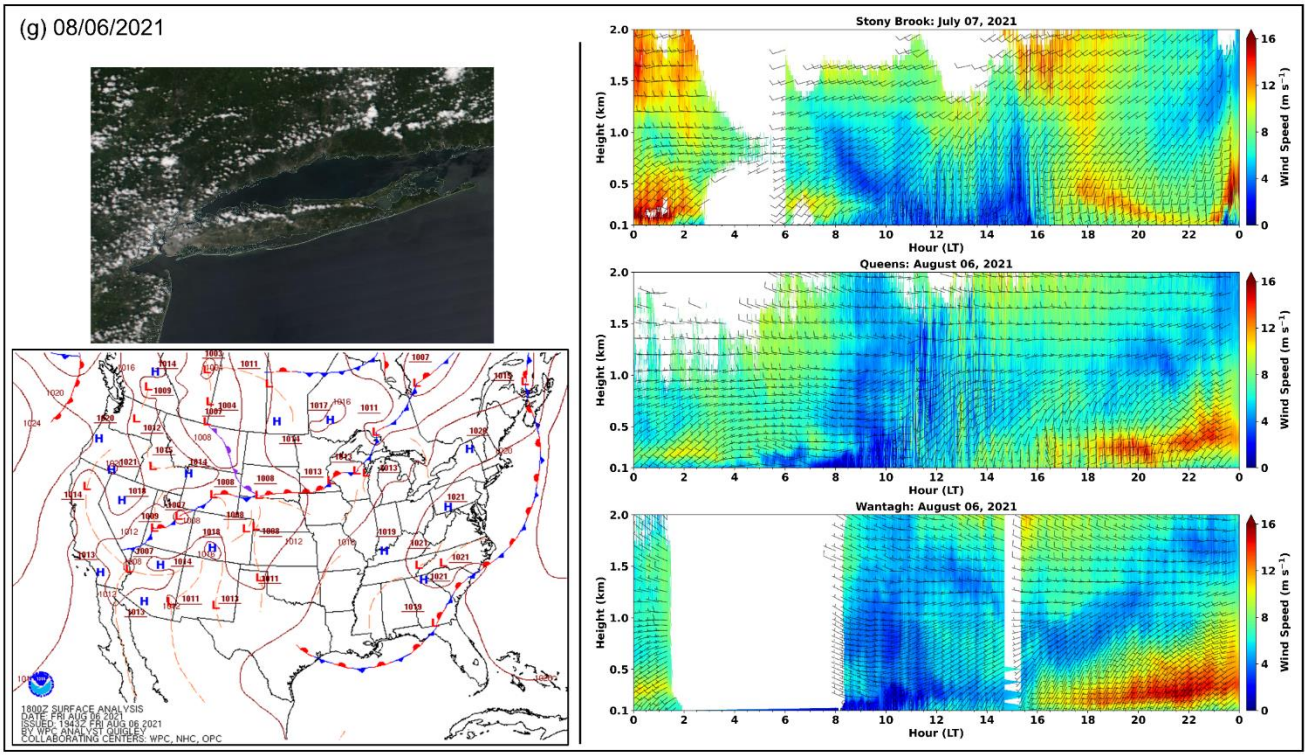

Figure S2 (continued). Plots for the days with higher ozone concentration at the north shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (g) 08/06/2021

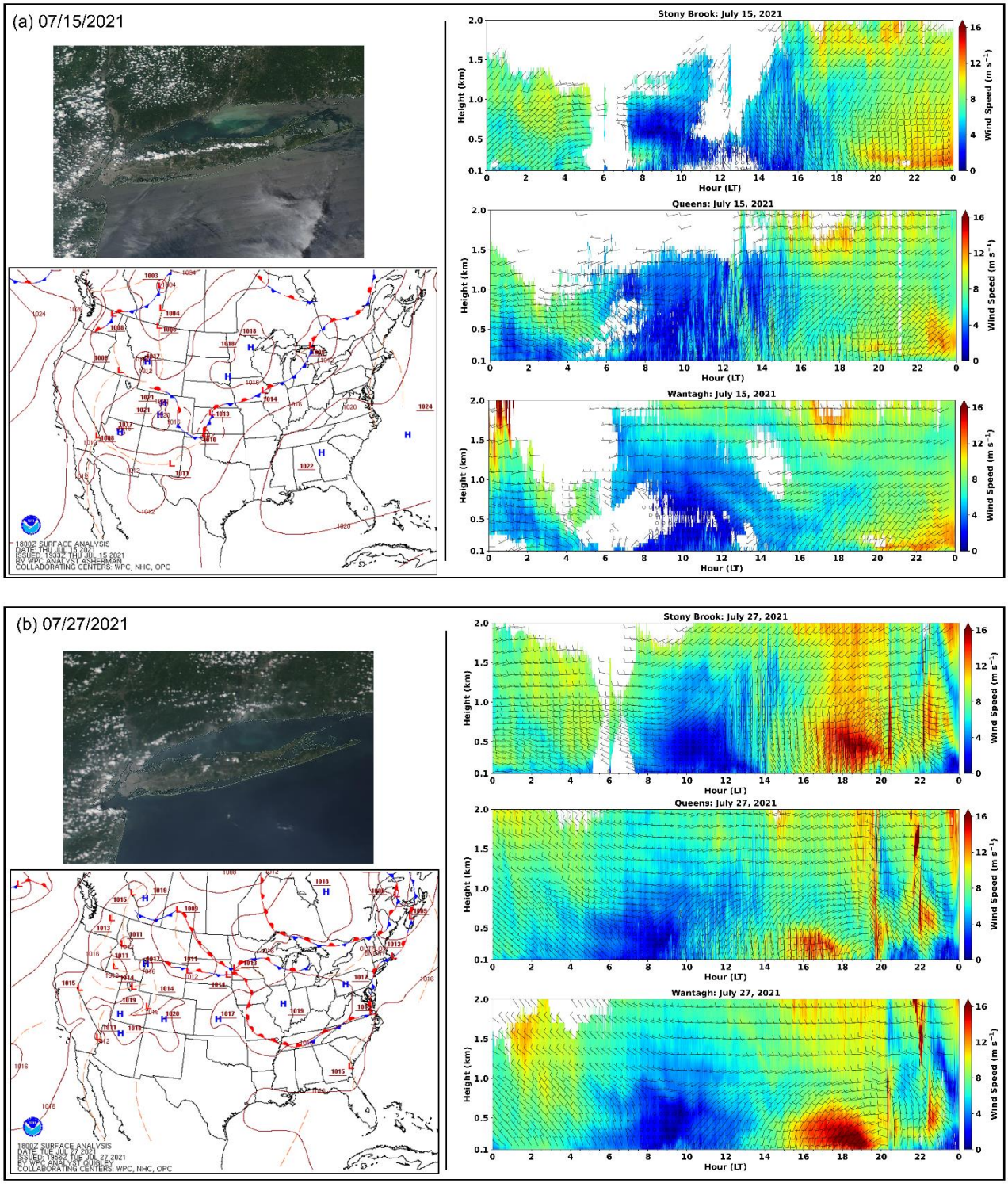

Figure S3. Plots for the days with higher ozone concentration at the south shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (a) 07/15/2021, (b) 07/27/2021 (Note: The dates are sorted following the appearance order in Section 3.3)

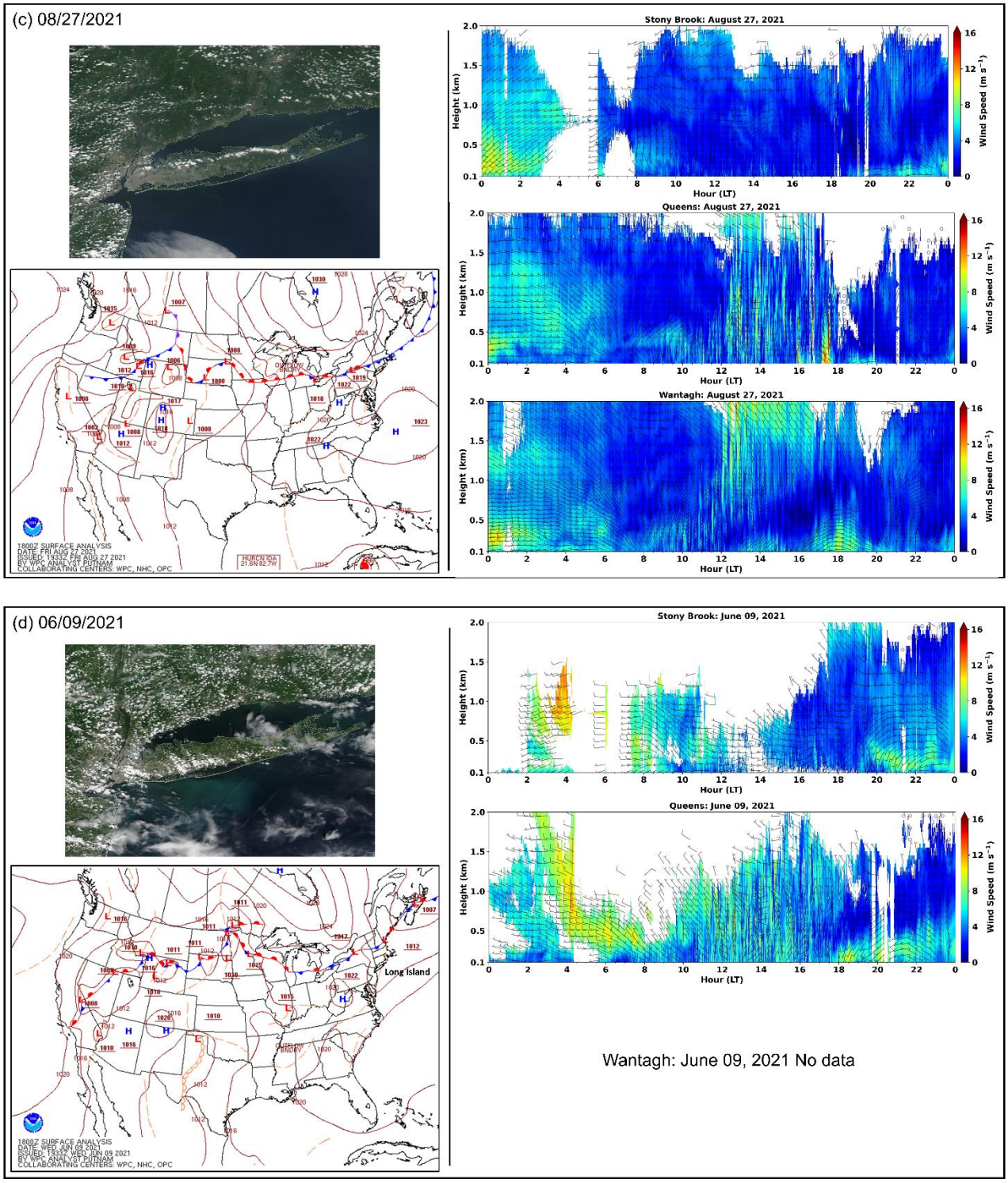

Figure S3 (continued). Plots for the days with higher ozone concentration at the south shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (c) 08/27/2021, (d) 06/09/2021 (Note: The dates are sorted following the appearance order in Section 3.3)

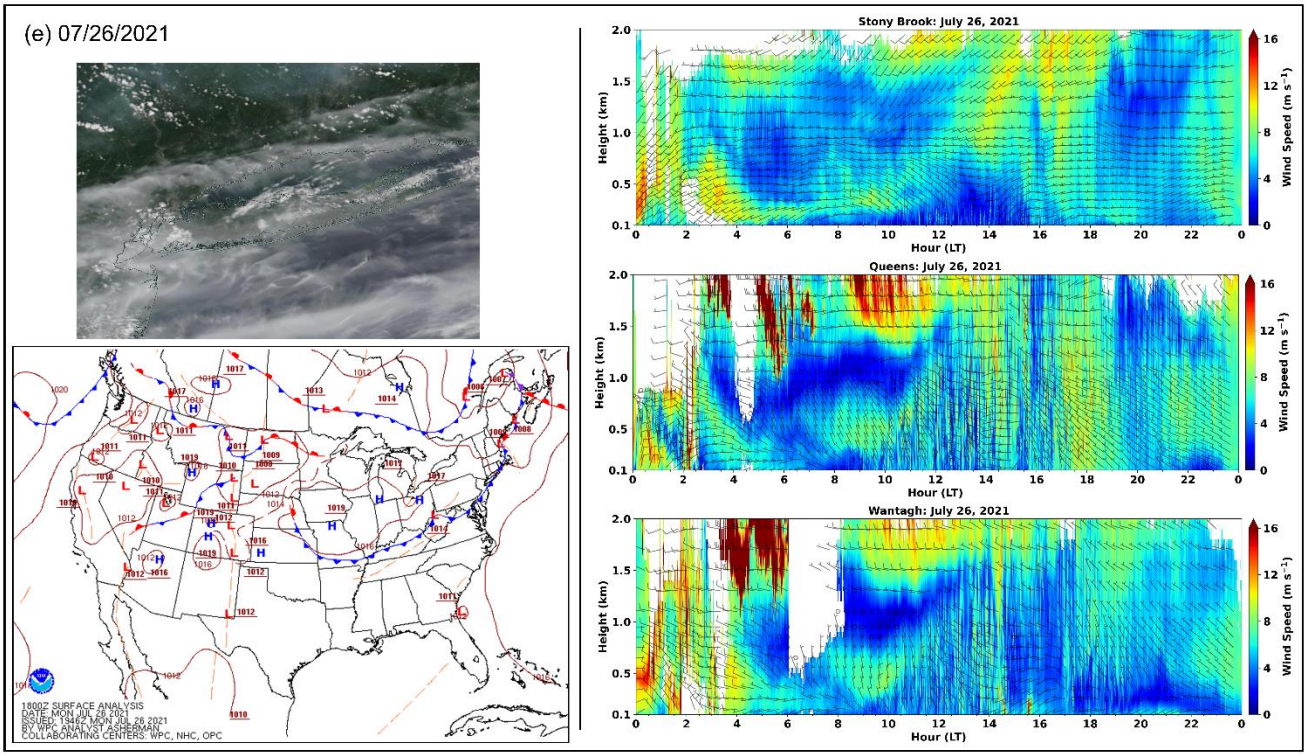

Figure S3 (continued). Plots for the days with higher ozone concentration at the south shore as listed in Table 1. The EOSDIS Worldview visible satellite imagery, the Weather Prediction Center surface analysis weather maps for US (14:00 EDT), and the lidar horizontal wind profiles for Stony Brook, Queens, Wantagh on (e) 07/26/2021 (Note: The dates are sorted following the appearance order in Section 3.3)

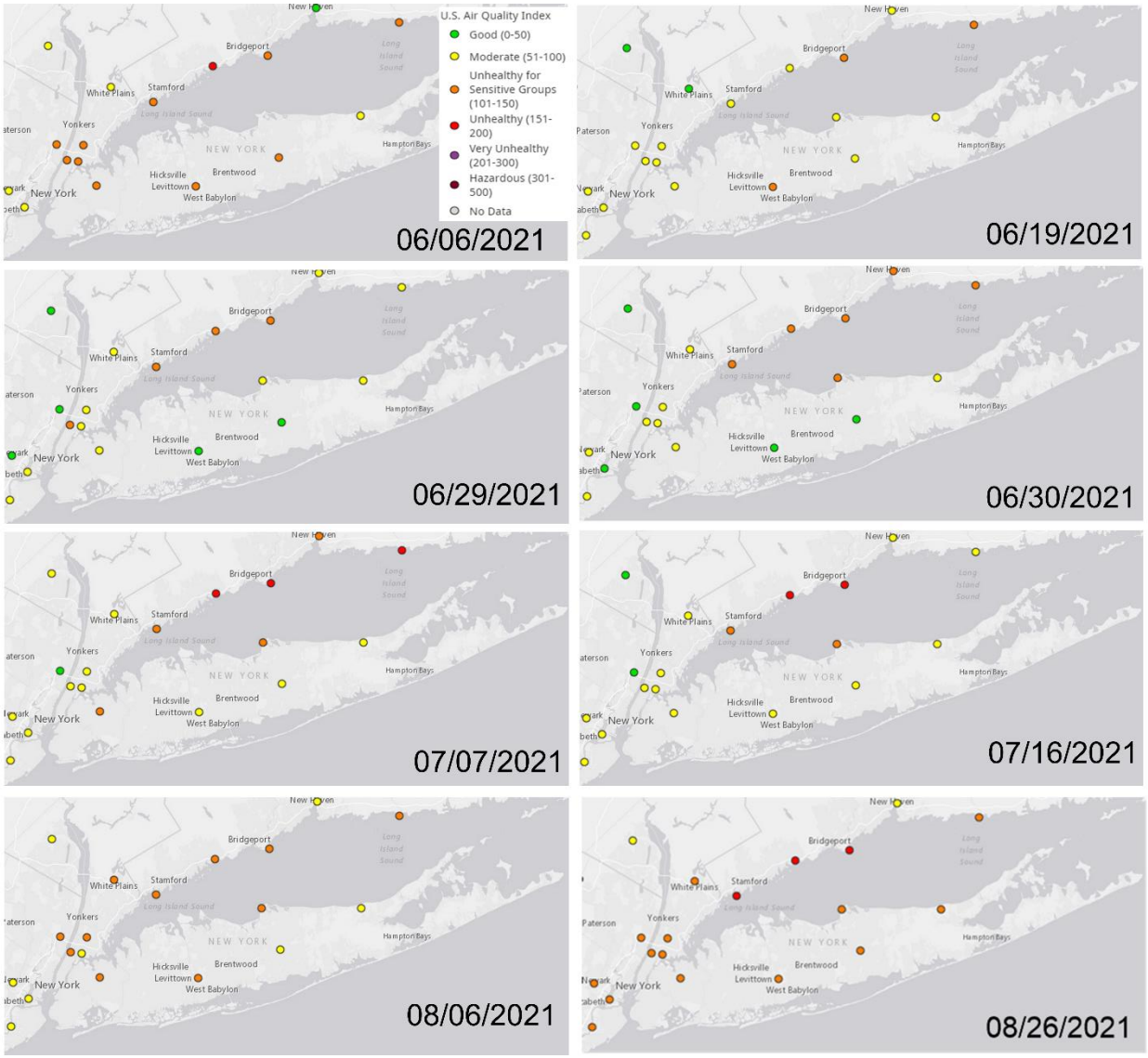

Figure S4. The EPA's AirNow maximum daily 8 h average (MAD8) O_3 Air Quality Index (AQI) map of the case days with higher ozone concentration at the north shore as listed in Table 1 (https://gispub.epa.gov/airnow/). The AirNow provides the current and forecast air quality maps and data for more than 500 cities across the U.S. and the U.S. Embassies and Consulates around the world.

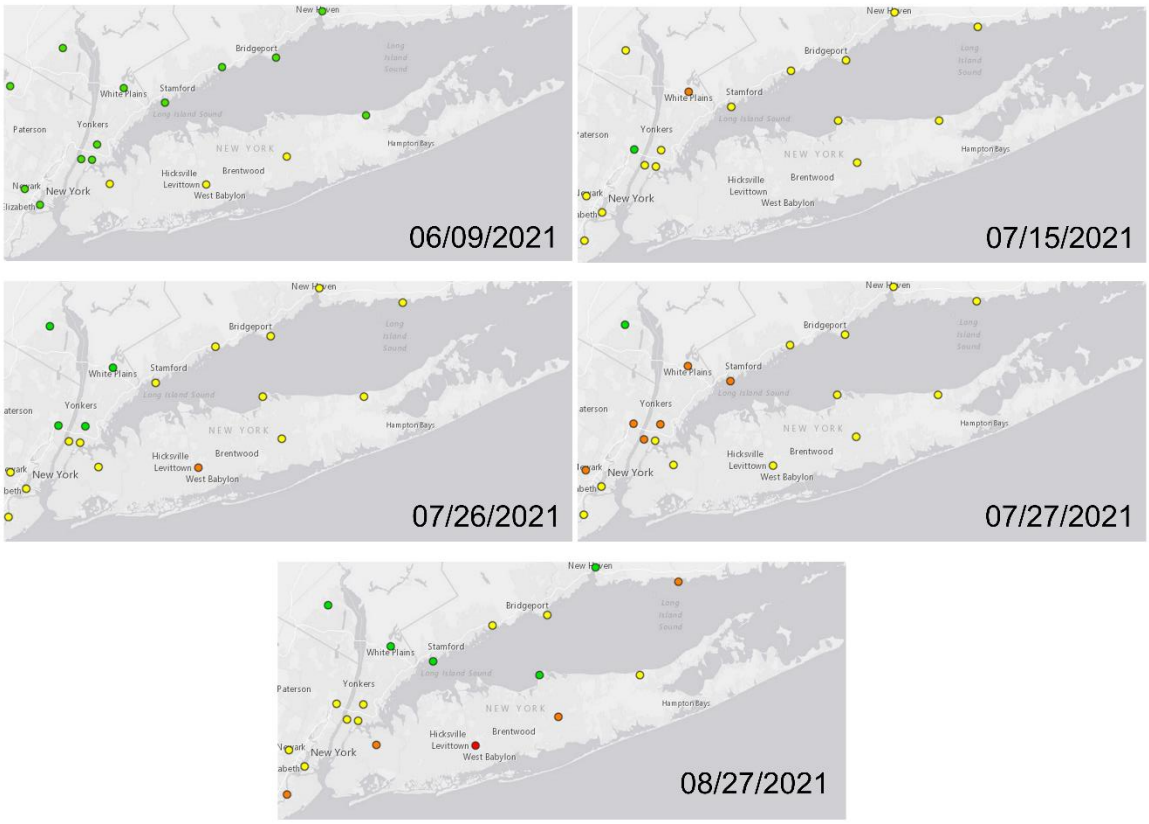

Figure S5. The EPA's AirNow MDA8 O_3 AQI map of the case days with lower ozone concentration at northside and higher values at HSP (Only EPA sites are shown, so HSP is not included)

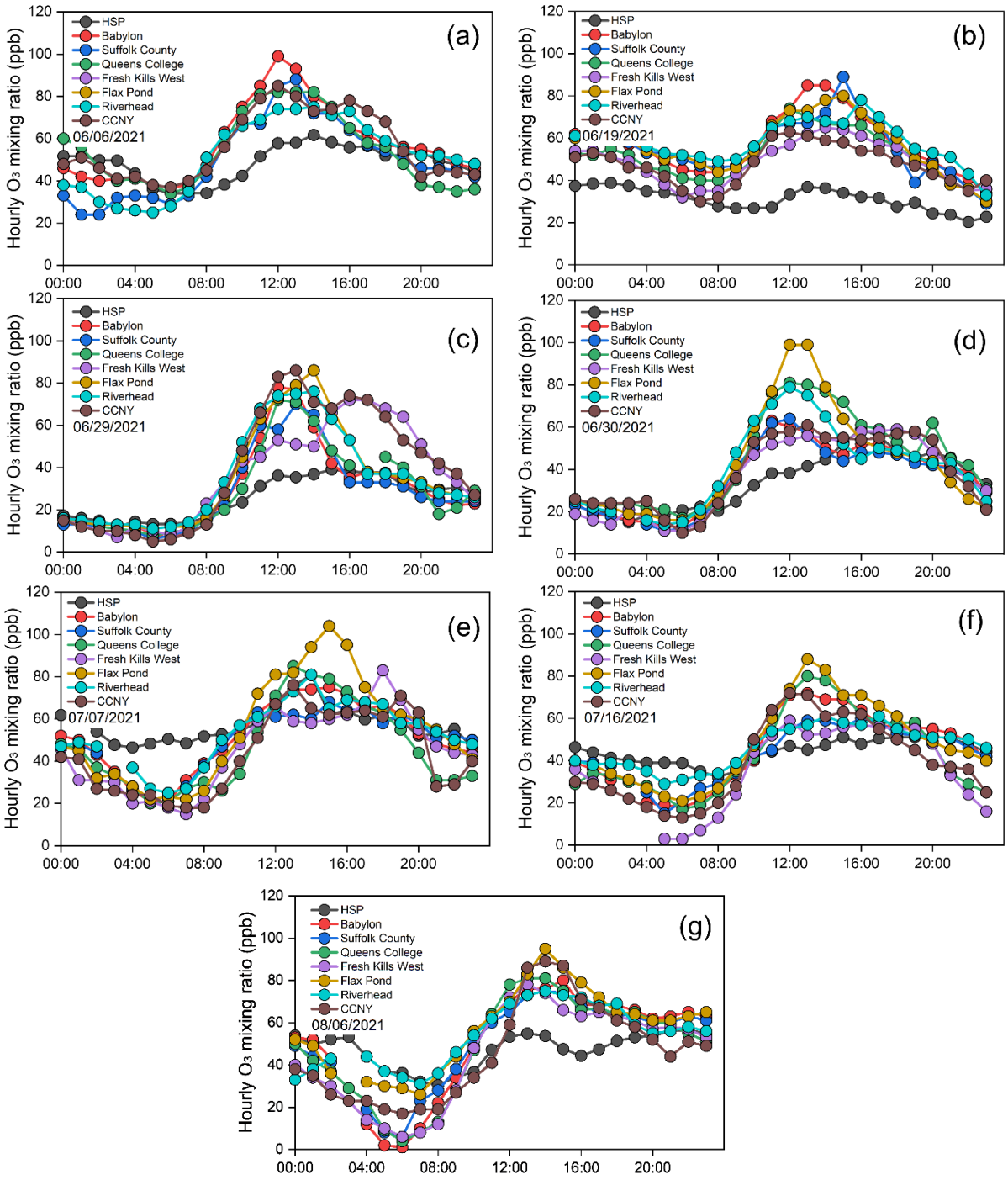

Figure S6. The comparison of hourly average O_3 concentration of the DEC sites in Fig. S1 for the days with higher ozone concentration at the north shore (besides 08/26/2021 which is shown in Fig. 2 (Note: 06/05 and 06/06 were selected due to the high ozone over Long Island Pond as shown in **Fig. S3**, even though data from FP was missing)

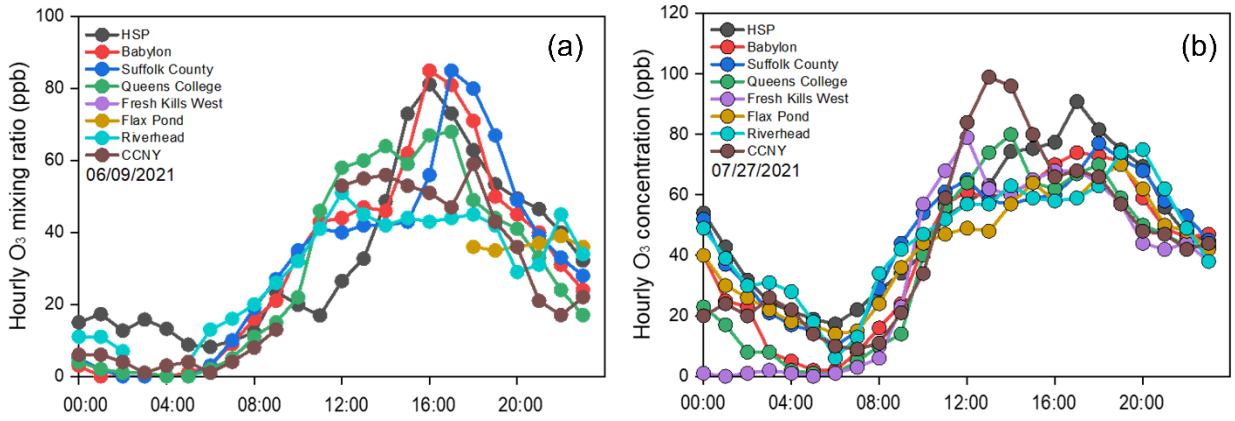

Figure S7. The comparison of hourly average O_3 concentration of the DEC sites in Fig. S1 for the days with higher ozone concentration at the south shore (besides 07/15/2021, 07/26/2021, and 08/27/2021 which are shown in Fig. 4)

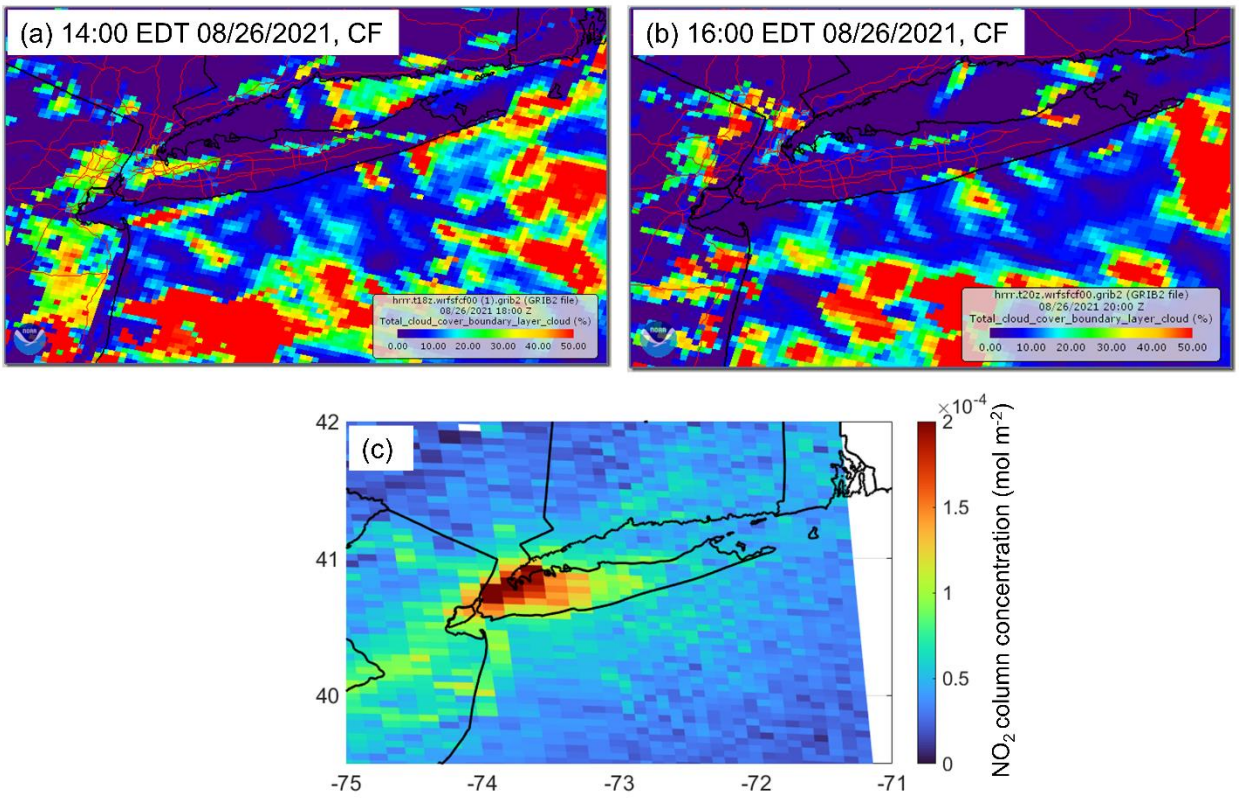

Figure S8. Plots for 08/26/2021 with north coastal high ozone. (a) The HRRR model simulated boundary layer total cloud cover fraction (CF) at 14:00 EDT; (b) The HRRR model simulated boundary layer total cloud cover fraction (CF) at 16:00 EDT; (c) The TROPOspheric Monitoring Instrument (TROPOMI) satellite tropospheric NO_2 column concentration spatial distribution with a spatial resolution of approximately 7×3.5 km^2 (overpass time: about 13:30 local time; http://www.temis.nl/airpollution/no2.html)

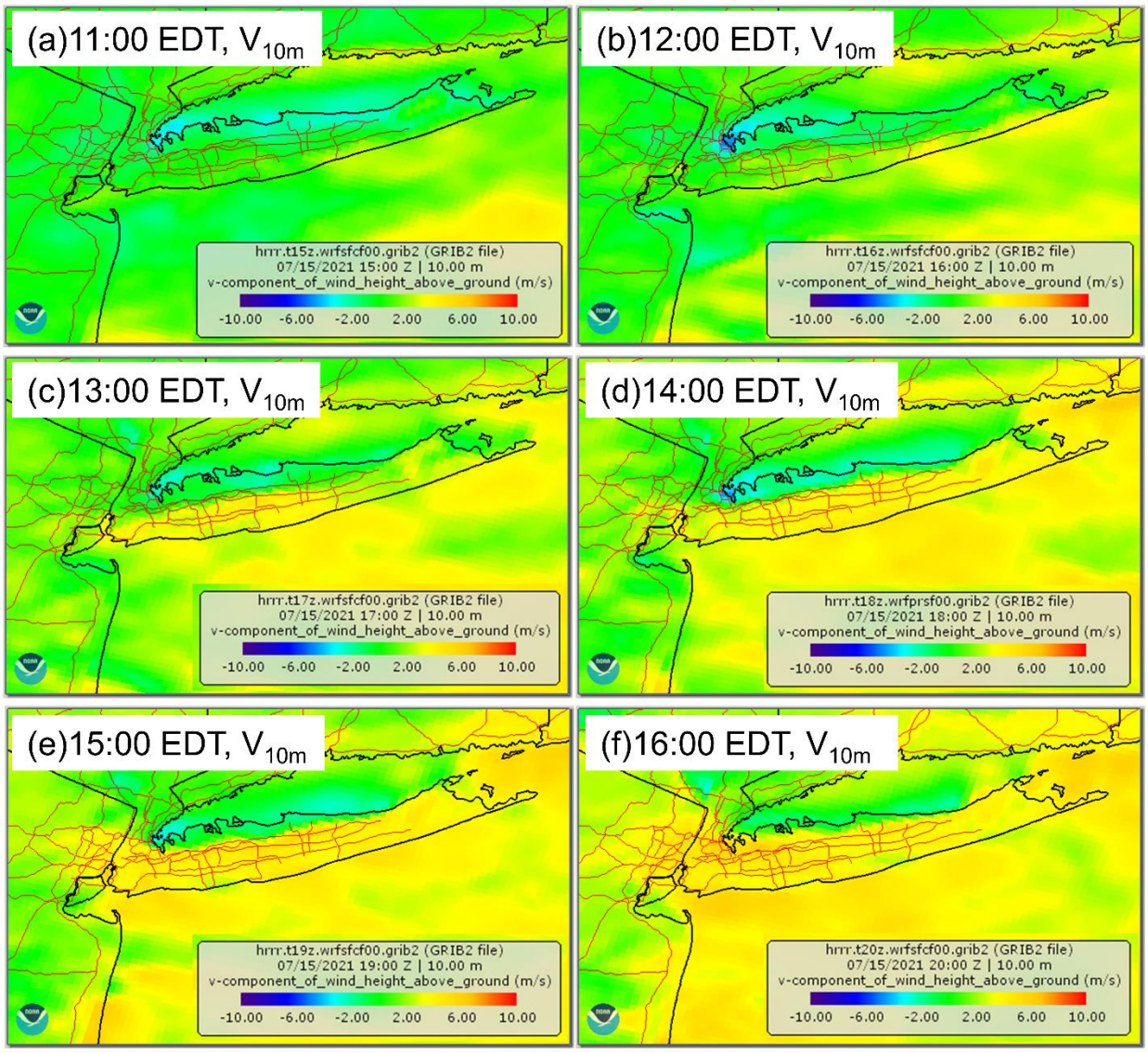

Figure S9. Plots for 07/15/2021 with south coastal high ozone affected by the New York Basin Jet. The HRRR ground wind v-component (south-north direction) speed over Long Island and the surrounding regions from 11:00 EDT to 16:00 EDT.

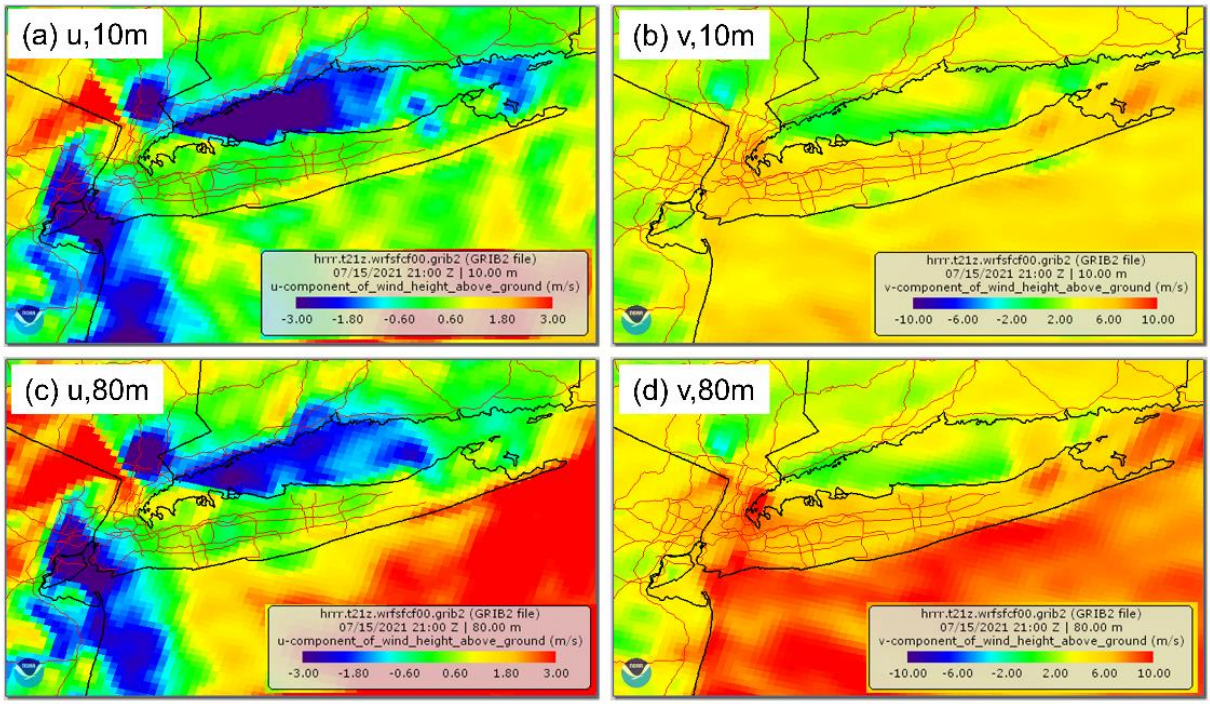

Figure S10. Plots for 07/15/2021 17:00 EDT with south coastal high ozone affected by the New York Basin Jet. The HRRR ground wind (a) u-component (west-east direction) of 10 m height; (b) v-component (south-north direction) of 10 m height; (c) u-component (west-east direction) of 80 m height; (d) v-component (south-north direction) of 80 m height.

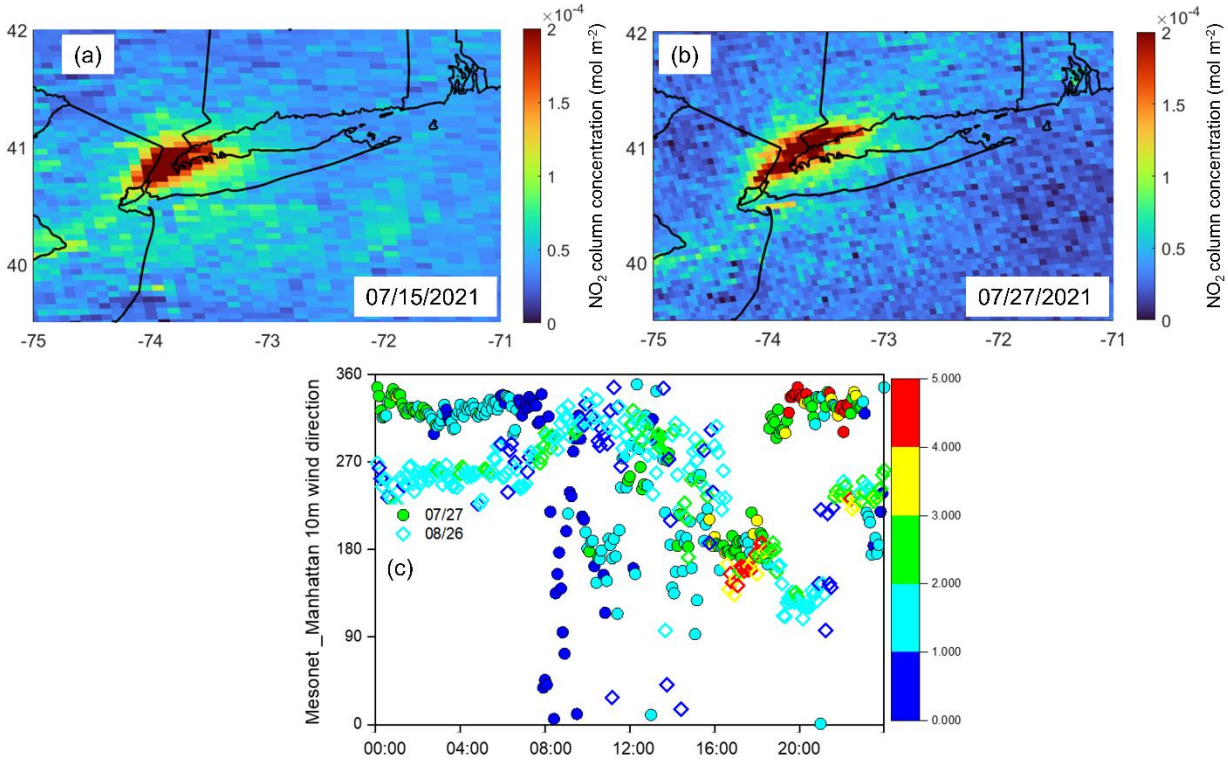

Figure S11. (a) The TROPOMI NO_2 spatial distribution for 07/15/2021; (b) TROPOMI NO_2 spatial distribution for 07/27/2021; (c) the wind direction from the Manhattan Mesonet site with colored by the wind speed. Manhattan site is chosen to represent the center of the NYC urban region.

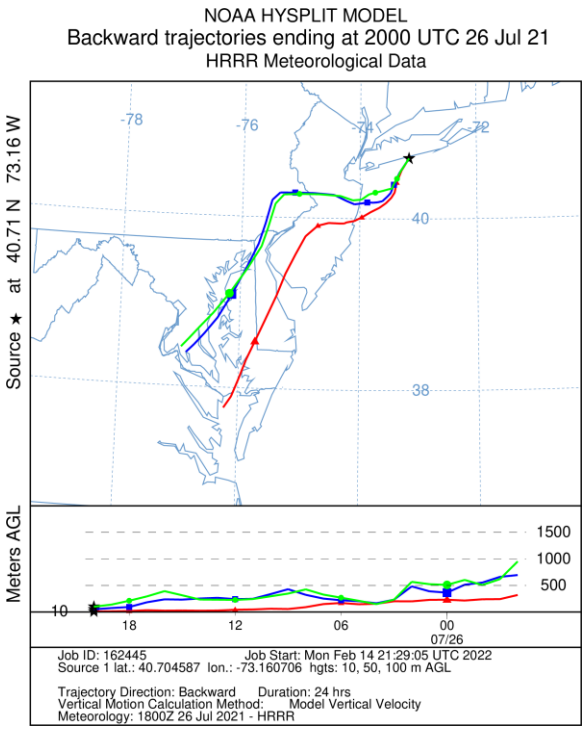

Figure S12. The HYSPLIT back trajectories with HSP as receptor at 20:00 EDT on 07/26/2021. The HYSPLIT back trajectories receptor heights are 10 m (red), 50 m (blue), and 100 m (green).