

Auxillary Material for: The Fossil Fuel Emission Source of Tokyo estimated directly from measurements of the TCCON site Tsukuba

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1 Wind direction vs. time of day

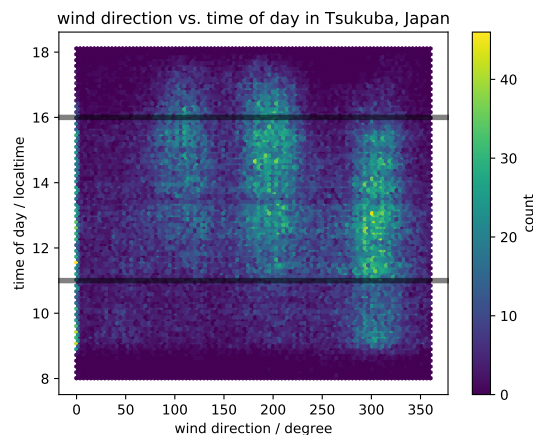


Figure 1. Histogram of Wind directions vs. time of day. This graph shows that between 11:00 and 16:00 there is only weak correlation between time of day and wind direction. The horizontal lines mark the lower and upper limit of the densely measured time of day. The measurements between 170 and 240 degree wind direction correspond to wind from Tokyo area. This graph is generated from the script `plot_daytime_vs_direction.py`.

2 Calculating emissions from a circular source

The calculation of the emissions from Tokyo in the main article assumes that the distribution around the center is symmetric parallel to the wind direction. To complement

3 Radiosonde data from Pangea

The four years of radiosonde data from Tateno is also available in monthly format from the PANGEA data archive (Ohkawara, 2011a, b, c, d, e, f, g; Ijima, 2011a, b, c, d, e, 2012a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, 2013a, b, c, d, e, f, g, h, 2014a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, 2015a, b, c, d, e, f, g, h, i, j, k, 2016a, b, c, d, e, f, g, h, i, j, k, l).

4 Trajectory calculations for Tokyo

The HYSPLIT model (Stein et al., 2015) allows calculating high resolution trajectories. This was used to verify the assumptions of vertical transport in this publication. Most of the trajectories calculated for this publication only extend up to 1000m even though they extend much further in horizontal direction than the 65 km from Tokyo to Tsukuba. This shows that it is viable to use the wind speed in the lower 1000m as base for a mean wind speed profile. The trajectory graphs show sample results.

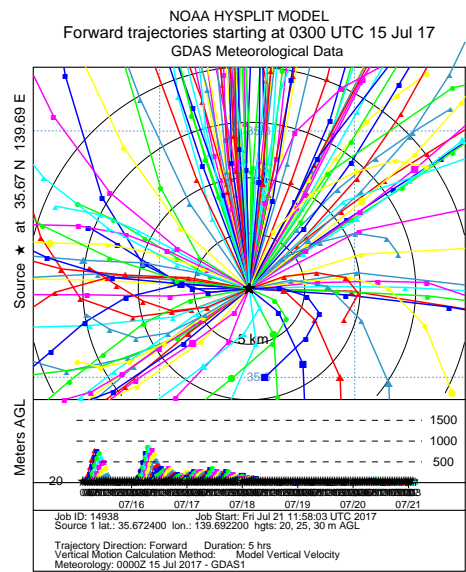


Figure 2. 5 hours trajectory plot starting at Tokyo. Required information to reproduce the graph is contained in the figure. Published with permission from NOAA ARL, under the condition that it is made it clear that they are not producing these images for us. Which we hereby do: To produce these images we used the great HYSPLIT from NOAA ARL, but the images were not created by someone for us.

Source ★ at 35.58 N 139.60 E

Meters AGL

35° 139° 140° 141°

0 300 600 900 1200 1500 1800 2100 2400 2700 3000

06/2406/2506/2606/2706/2806/2906/3007/0107/0207/0307/0407/0507/06

Job ID: 198071 Job Start: Fri Jun 30 10:05:31 UTC 2017

Source 1 lat.: 35.583333 lon.: 140.093889 height: 20 m AGL

Trajectory Direction: Forward Duration: 15 hrs

Vertical Motion Calculation Method: Model Vertical Velocity

Meteorology: 0000Z 30 Jun 2017 - GFS

<http://ready.arl.noaa.gov/HYSPLIT.php>

4

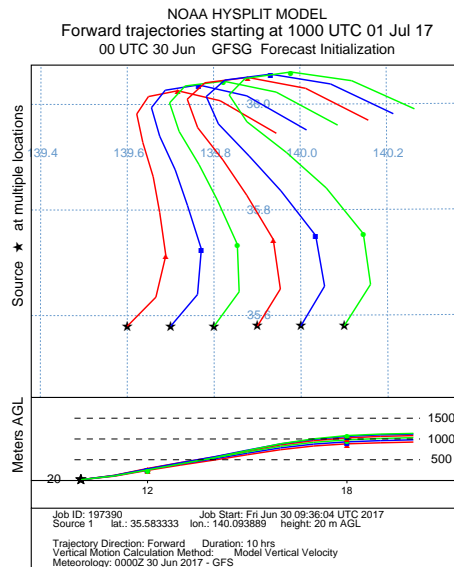


Figure 4. 10 hours trajectory plot starting at Tokyo. Required information to reproduce the graph is contained in the figure. Published with permission from NOAA ARL, under the condition that it is made it clear that they are not producing these images for us. Which we hereby do: To produce these images we used the great HYSPLIT from NOAA ARL, but the images were not created by someone for us.

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