Data to Accompany “Interactions between Lightning and Ship Traffic”

Abstract

This dataset contains the joint lightning, thunderstorm, and ship position data used in the publication “Interactions between Lightning and Ship Traffic.” None of the underlying data are LANL datasets. The lightning data were acquired from the University of Washington. The storm data was derived from NASA satellite observations. The ship position data was acquired from a NOAA data server.

In total, there are 6 data files in the HDF5 data format:

wwlln_db_areas_india_v2.h5

This database lists thunderstorm features (termed “areas”) that have been derived from the WWLLN data that are used in the publication, along with their attributes (durations, stroke counts, etc.). Figure 1 shows a snapshot of thunderstorm area density over the Bay of Bengal region examined in the study.

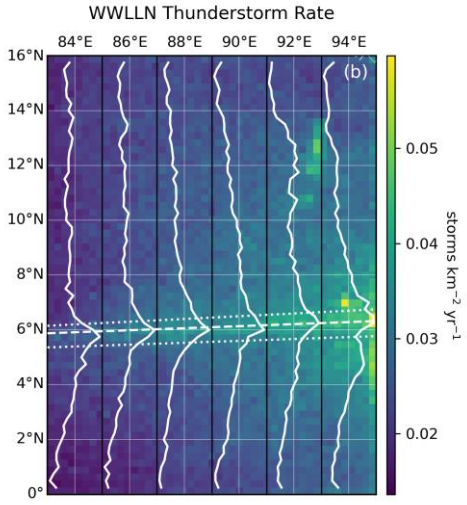

Figure 1. Density of WWLLN thunderstorm “area” features over the Bay of Bengal. The vertical lines represent density cross sections through each longitude bin. The peak (dashed) and width (dotted) of a shipping lane is noted with white lines.

TRMM_RPF_db.h5

This database contains storm measurements from NASA’s Tropical Rainfall Measuring Mission (TRMM) satellite. Storms are defined as contiguous regions of precipitation observed by the satellite – termed “Radar Precipitation Features” (RPFs). For each storm, the database lists a collection of properties measured by the satellite. Figure 2 shows a screenshot of the storm count (a) and average properties of these storms (b-d) over the Bay of Bengal region.

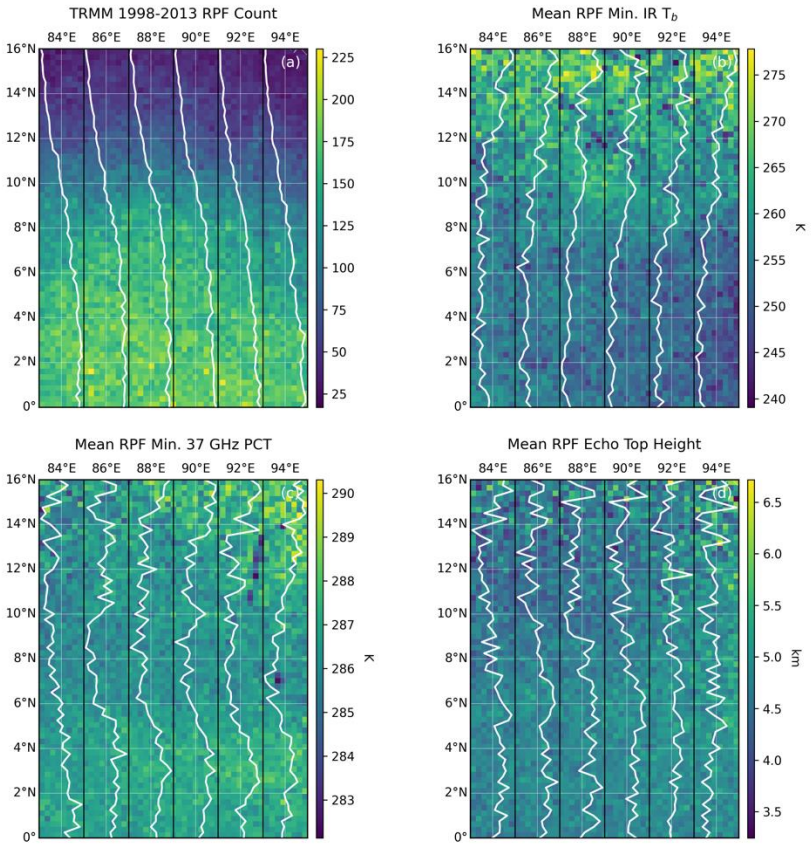

Figure 2. Screenshot of storm counts and average properties from TRMM_RPF_db.h5

TRMM_PR_profiles_Bay-of-Bengal_raining.h5

This database contains all of the vertical radar profiles observed over the Bay of Bengal by the TRMM satellite Precipitation Radar (PR). While the previous dataset summarizes storms, this dataset contains measurements from every pixel where rainfall is detected across the radar swath. A screenshot of the average profiles for two months (Feb and Aug) is shown in Figure 3.

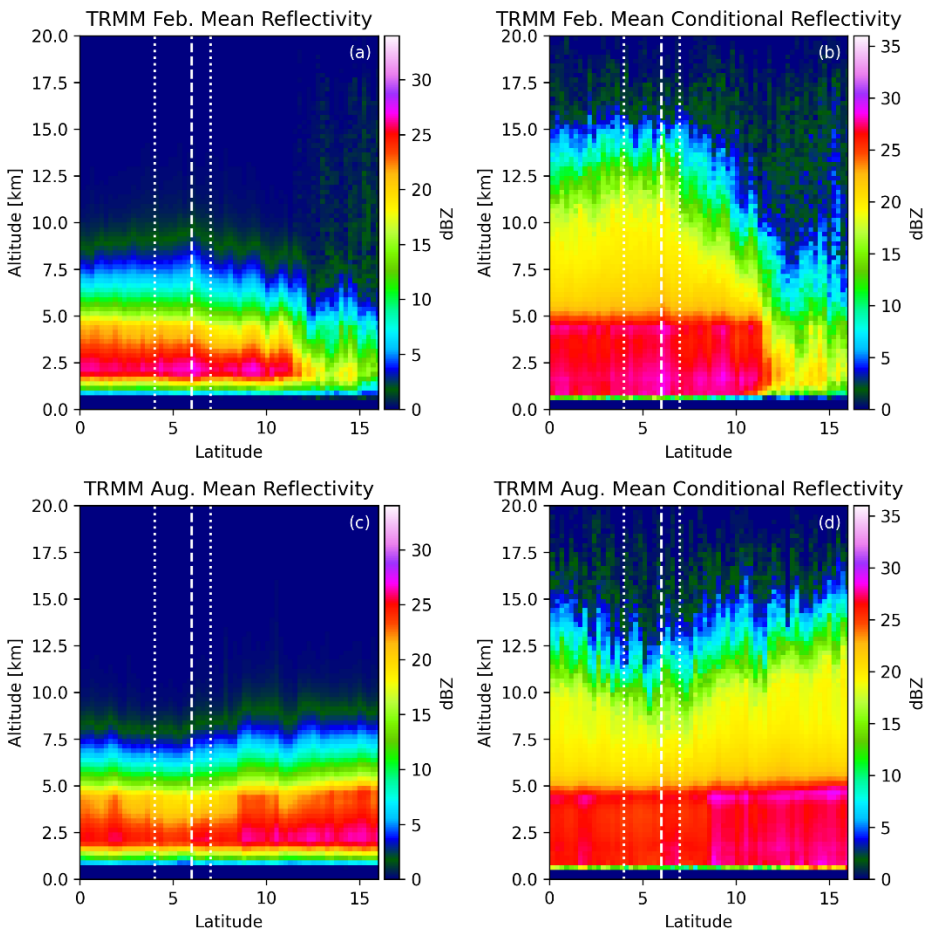

Figure 3. Average radar profiles by latitude across the Bay of Bengal contained within TRMM_PR_profiles_Bay-of-Bengal_raining.h5.

global_edgar_wwlln_maps.h5

This data file contains 2 maps: one showing the global shipping emissions from the EDGAR model averaged over 15 years (plotted from a public data source), and one showing the global lightning stroke rate derived from 15 years of World Wide Lightning Location Network (WWLLN) data from the University of Washington. Figure 4 shows both of these maps.

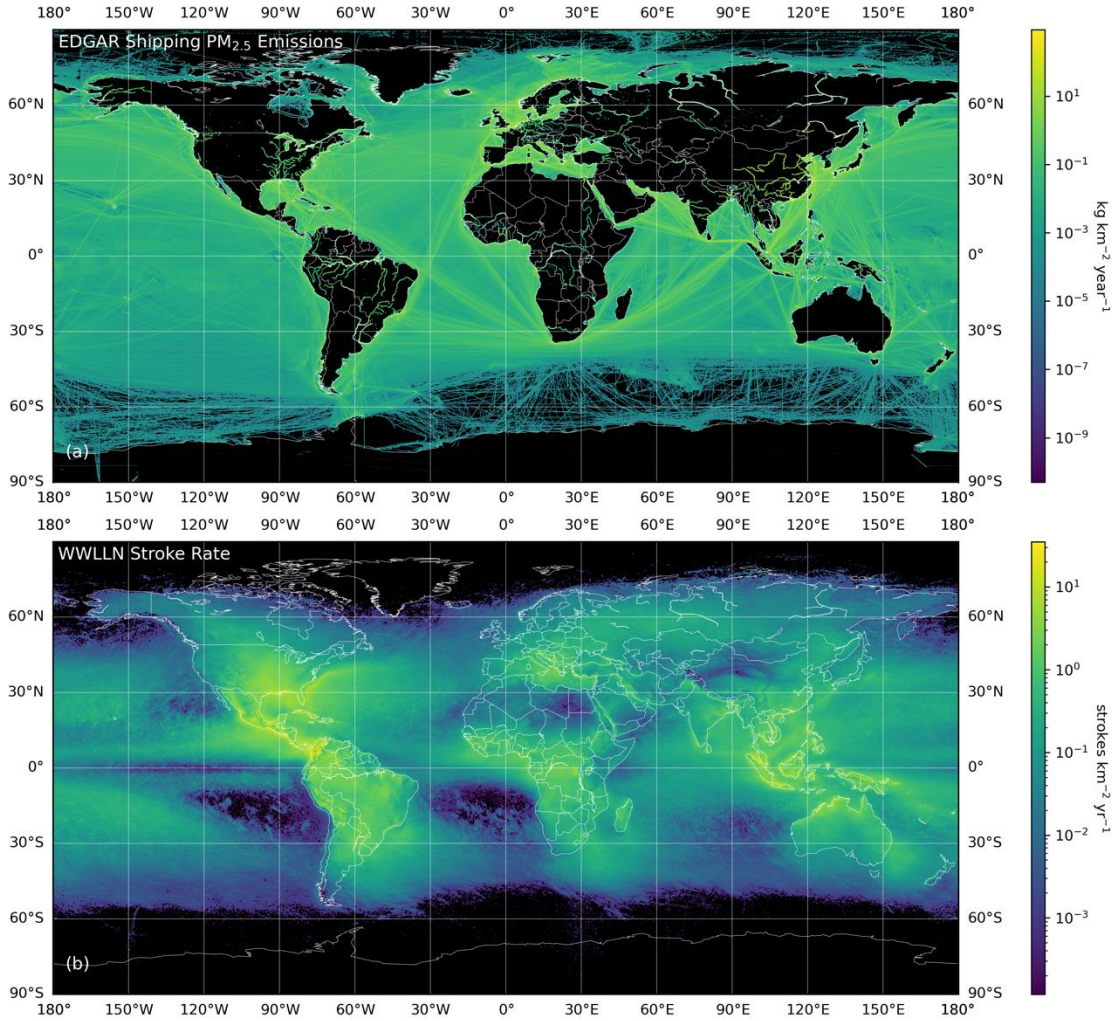

Figure 4. The global shipping aerosol emissions data (a) and lightning stroke rate data (b) contained within global_edgar_wwlln_maps.h5

ais_vessels.h5

This database lists the unique oceangoing vessels within the NOAA ship traffic dataset and their attributes (length, type, etc.).

ais_wwlln_matches.h5

This database lists matches between the NOAA ship database and WWLLN lightning strokes. For each lightning encounter with a ship, the identifier and attributes of the vessel are recorded.

A screenshot of the data from ais_vessels.h5 and ais_wwlln_matches.h5 is included in Figure 5. The distributions of all ships (red) and ships with lightning encounters (blue) by vessel length (top) and vessel width (bottom) are shown. The left plots show all events from

ais_wwlln_matches.h5 with repetition, while the right plots only show each vessel in ais_vessels.h5 once.

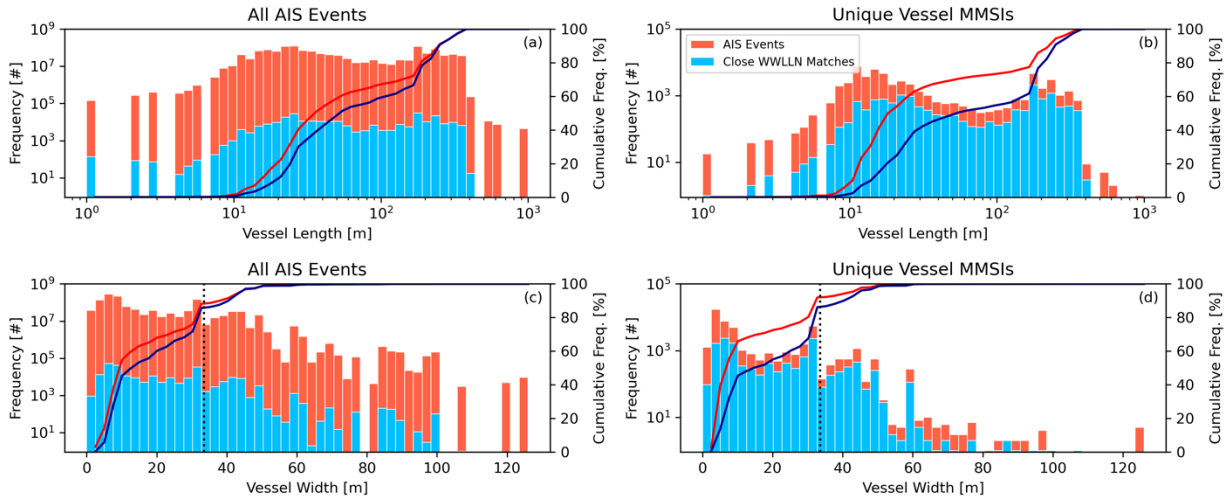

Figure 5. Distributions of ship positions and near lightning encounters by vessel dimensions from ais_vessels.h5 and ais_wwlln_matches.h5