

Atlantic Basin Tropical Cyclone Database Reanalysis and Estimation of “Missed” Major Hurricane and Overall Activity

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Abstract

Hurricanes are arguably the single largest extreme weather event that impacts human society today as the over 1,500 lives lost during Hurricane Katrina in Louisiana and Mississippi and damages of at least \$50 billion from Hurricane Sandy in the mid-Atlantic states will attest. A high quality database of historical hurricane activity is crucial for studies of importance to the general public, the business community, governmental groups, and emergency managers. In addition to applications for the above users, the North Atlantic basin tropical storm and hurricane database (or HURDAT) has been extensively utilized for meteorological applications as well as climate variability and change studies ranging from intraseasonal, interannual, decadal, and multidecadal timescales.

HURDAT currently extends back from present to 1851. However, this cornerstone database contains many systematic and random errors that need to be corrected. Additionally, as our understanding of tropical cyclones has advanced, analysis techniques have evolved over the years at NOAA’s National Hurricane Center, leading to biases in the historical database that have not been addressed. Another difficulty in applying HURDAT to studies concerned with tropical cyclone events is the lack of exact location, time and intensity information for landfalling systems. Finally, due to incomplete observations in past hurricane seasons, tropical storms and hurricanes that existed over the open Atlantic may not have been included in the database. The comprehensive collection and analysis of historical observations that is proposed in this work will result in the addition of many of these “missing” storms to HURDAT.

This proposal details research that will focus on storms occurring during the satellite and aircraft reconnaissance era in the latter third of the 20th Century. Products to be provided include: the revised HURDAT; metadata files providing details about the individual changes to the database; a complete database of all raw observations of gale force winds or stronger; the Best Track Change Committee’s comments and our team’s responses; track maps for individual years; and specific detailed listing of U.S. and international tropical storms and hurricanes.

Additionally, work will be conducted that quantifies the amount of subsampling that likely occurs in the intensity and duration analyses of historic tropical cyclones because of limited observations of a primarily oceanic, mesoscale feature (i.e, the maximum 1 min winds and the central pressure). Previously published work has estimated the likely amount of “missed” tropical storm frequency as well as “missed” hurricane frequency (either wrongly considered to be only of tropical storm intensity or completely left out of HURDAT altogether) before the satellite era began. The new research will use similar methodology to analyze the likely frequency of “missed” major hurricanes, again either thought to be weaker than they actually were or not in HURDAT at all. Finally, a method for determining the undersampling present in the Accumulated Cyclone Energy (ACE) will be developed and applied in the pre- satellite era.