superBT-V04

a super Best Track (BT) for Tropical Cyclone (TC) forecasting and research

GitHub Location

Mike Fiorino
George Mason University
mfiorino@gmu.edu
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What is a superBT?

The superBT is a TC-centric superposition of reanalysis (***NWP-dynamics)*** and precipitation (***thermodynamics***) datasets onto TC track data from the two US operational forecasting centers: the Joint Typhoon Warning Center (JTWC), Pearl Harbor HI and the National Hurricane Center (NHC), Miami FL. The superBT can be thought of as a Best Track dataset with additional variables related to TC intensity and structure change (e.g., vertical wind shear).

A special property of the superBT is that it includes a curated and unique set of both ***developing*** (**9Xdev**) and ***non-developing*** (**9Xnon**) **pTCs**[1]. Furthermore, genesis is defined either as the first TC position in the best track or the first warning/advisory as both JTWC and NHC are required to issue warnings on a system analyzed to be a TC regardless of initial intensity (maximum surface wind speed). Unlike IBTrACS, or the JTWC/NHC best tracks, the superBT TC (**NN** - 0-50) includes positions from the pTC that became the TC (**9Xdev**).

V04 - initial beta version

- **2007-2022 – 16-y data set**
- **Final BT JTWC:2007-2021; NHC 2007-2022**
- **Global** - **NHEM** & **SHEM** basins
- **JTWC/NHC** - best tracks (“bdeck”) & aid files (“adeck”)
- **NN** - operationally designated TCs
- **9Xdev** - pre/potential TC (pTC) that developed into **NN** or TC (developers)
- **9Xnon** - pre/potential TC (pTC) that did ***not*** develop (non-developers)
- **ERA5 reanalysis *forecasts*** for storm and large-scale diagnostics
- **Three global** high-resolution **precipitation** analyses: **CMORPH, GsMAP & IMERG**

Technical Description

The superBT consists of three .csv data files and three metadata files describing the contents of the data files. Technically the superBT is consistent with IBTrACS (International Best Track Archive for Climate Stewardship (IBTrACS) | National Centers for Environmental Information (NCEI) (noaa.gov). The data can be accessed by any application that reads .csv files. An obvious data interface would be pandas - Python Data Analysis Library (pydata.org). The

[1] pre/potential TCs designated as **9XB** operationally where **B** is the basin code

superBT also includes python2 code in the py2 directory of the github repository for analysis and display[2]. My development environment is Linux/Anaconda/openGrADS.

The table below gives a description of the data files (the links open the file):

file name	description	# of lines-header
all-md3-2007-2022-MRG.csv	positions for NN/9Xdev/9Xnondev	107050 # posits
sum-md3-2007-2022-MRG.csv	summary of each storm	5233 # of storms
sbt-v04-2007-2022-MRG.csv	superBT	86595 # posits
h-meta-md3-vars.csv	metadata for all-md3-*.csv	32 variables
h-meta-md3-sum-vars.csv	metadata for sum-md3-*.csv	25 variables
h-meta-sbt-v04-vars.csv	metadata for sbt-v04*.csv	66 variables

NB: the number of positions in the all-md3* file does not equal the number of positions in the superBT file because of duplicates in the full storm positions (9X+NN). There is a superBT position for all unique positions.

Data Sources

The three main data sources are: 1) JTWC/NHC archives; 2) ERA5 reanalysis 00/12 UTC 10-d forecasts; and 3) three near global satellite rainfall analyses.

The table below gives more details:

Source	Name	Description	Availability	Link
JTWC	adeck	ATCF aids/operational info	partial	ucar.edu adecks_open
	bdeck	ATCF best track	open	JTWC best tracks
NHC	adeck	ATCF aids/operational info	open	NHC public adecks
	bdeck	ATCF best track	open	NHC Data Archive
ECMWF	***ERA5***	***00/12 UTC 10-d forecasts***	***not open***	ECMWF Reanalysis v5
NCEP	CMORPH	near-global satellite precipitation	open	CMORPH Precipitation
JAXA	GsMAP	near-global satellite precipitation	open	JAXA Global Rainfall Watch (GSMaP)
NASA	IMERG	near-global satellite precipitation	open	IMERG: Integrated Multi-satellitE Retrievals for GPM

NB: most of the data sets are open except for the ERA5 twice daily 10-d global model forecasts. The superBT 9Xdev and 9Xnon come from an archive of .zip files for all changes to the a/bdecks in real-time since 2007.

Links:

In: https://tenkiman.github.io/superBT-V04/)	description
sbt-tccodes-subbasin-codes.txt	codes for TC state and subbasin
tc-superBT-20230310.pptx	powerpoint talk for huracan project

[2] I"m an old-dog programmer…learning new tricks is getting more difficult. I leave it to the user to convert to python3 and/or setup to run in both python2 & 3. The Anaconda python distro (5.1) I use runs in both python2 and python3 mode. My development platform is Linux/openGrADS

ATCF	Automated Tropical Cycle Forecast system used at JTWC/NHC to maintain TC track data
ATCF_a/bdecks	format of the JTWC/NHC data files

Questions and What's next?

Please contact me at mfiorino@gmu.edu if you have any questions and/or comments. More processing and documents will be added soon…and a journal article is in the works