superBT-V04 ([.doc](https://tenkiman.github.io/superBT-V04/QuickStart-V04.docx)

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

[GitHub Location](https://github.com/tenkiman/superBT-V04)

Mike Fiorino

George Mason University

[mfiorino@gmu.edu](mailto:mfiorino@gmu.edu)

21 October 2023

**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]](#footnote-0). 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)](https://www.ncei.noaa.gov/products/international-best-track-archive). 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)](https://pandas.pydata.org/). The superBT also includes python2 code in the [py2](https://github.com/tenkiman/superBT-V04/tree/main/py2) directory of the [github repository](https://github.com/tenkiman/superBT-V04/) for analysis and display[[2]](#footnote-1). My development environment is [Linux/Anaconda/openGrADS](https://tenkiman.github.io/superBT-V04/mike5-specs.txt).

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**](http://all-md3-2007-2022-mrg.csv) | **positions for NN/9Xdev/9Xnondev** | **107050 # posits** |
| [**sum-md3-2007-2022-MRG.csv**](http://sum-md3-2007-2022-mrg.csv) | **summary of each storm** | **5233 # of storms** |
| [**sbt-v04-2007-2022-MRG.csv**](http://sbt-v04-2007-2022-mrg.csv) | **superBT** | **86595 # posits** |
| [**h-meta-md3-vars.csv**](http://h-meta-md3-vars.csv) | **metadata for all-md3-\*.csv** | **32 variables** |
| [**h-meta-md3-sum-vars.csv**](http://h-meta-md3-sum-vars.csv) | **metadata for sum-md3-\*.csv** | **25 variables** |
| [**h-meta-sbt-v04-vars.csv**](http://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](https://hurricanes.ral.ucar.edu/repository/data/adecks_open/) |
| bdeck | ATCF best track | open | [JTWC best tracks](https://www.metoc.navy.mil/jtwc/jtwc.html?best-tracks) |
| NHC | adeck | ATCF aids/operational info | open | [NHC public adecks](https://ftp.nhc.noaa.gov/atcf/aid_public/) |
| bdeck | ATCF best track | open | [NHC Data Archive](https://www.nhc.noaa.gov/data/#hurdat) |
| ***ECMWF*** | ***ERA5*** | ***00/12 UTC 10-d forecasts*** | ***not open*** | [ECMWF Reanalysis v5](https://www.ecmwf.int/en/forecasts/dataset/ecmwf-reanalysis-v5) |
| NCEP | CMORPH | near-global satellite precipitation | open | [CMORPH Precipitation](https://www.cpc.ncep.noaa.gov/products/janowiak/cmorph.shtml) |
| JAXA | GsMAP | near-global satellite precipitation | open | [JAXA Global Rainfall Watch (GSMaP)](https://sharaku.eorc.jaxa.jp/GSMaP/index.htm) |
| NASA | IMERG | near-global satellite precipitation | open | [IMERG: Integrated Multi-satellitE Retrievals for GPM](https://gpm.nasa.gov/data/imerg) |

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](https://tenkiman.github.io/superBT-V04/sbt-tccodes-subbasin-codes.txt) | codes for TC state and subbasin |
| [tc-superBT-20230310.pptx](http://tc-superbt-20230310.pptx) | powerpoint talk for huracan project |
| [ATCF](https://www.nrlmry.navy.mil/atcf_web/index1.html) | Automated Tropical Cycle Forecast system used at JTWC/NHC to maintain TC track data |
| [ATCF a/bdecks](https://www.nrlmry.navy.mil/atcf_web/docs/database/new/abdeck.txt) | format of the JTWC/NHC data files |

**Questions and What’s next?**

Please contact me at [mfiorino@gmu.edu](mailto: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

1. pre/potential TCs designated as **9XB** operationally where **B** is the basin code [↑](#footnote-ref-0)
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 [↑](#footnote-ref-1)