WindRiskTech, LLC

MATLAB Scripts User's Guide

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This guide provides tips on how to use WindRiskTech's scripts effectively and efficiently. It is designed to complement the Quick Start Guide and the ReadMe document. In what follows, it has been assumed that the instructions in the Quick Start Guide have been carried out.

1. Preparing an Event Set

In producing tropical cyclone event sets, we strive for the most compact representation of tropical cyclones to reduce storage and transmission requirements. Data for each storm consists of quantities similar to what might be found in historical compilations such as HURDAT but with a few enhancements. Data are tabulated every 2 hours and include such variables as maximum circular component of surface wind (not comparable to HURDAT maximum winds which tabulate the absolute maximum surface wind), radius of maximum winds, information about secondary wind maxima, and several unperturbed environmental variables interpolated to the storm centers, including potential intensity, wind shear, and a few other quantities. All these quantities are described in detail in the ReadMe document.

For most applications, this compact representation must be unpacked into a more complete description of the tropical cyclone, including the whole radial distribution of wind and rain. Some of the operations that must be performed to achieve this are common to many or most of the applications, so to maximize efficiency, we do some of the unpacking upfront, producing a few files that can then be read by all the other scripts.

The main utility for 'preparing' the event set is *prep.m* and this, or one of its variants described below, must be run before one can run the other scripts. Typing 'prep' in the MATLAB command window prompts you for the event file name (without the '.zip') and then prepares the event set. This may take a minute or so. The process produces two MATLAB binary files, *temp.mat* and *sorted.mat*, one or both of which are used by other scripts. These binaries contain the original contents of the event set file and useful arrays such as *vnet.mat*, which contains the absolute maximum surface wind for each storm. These processed arrays are described in detail in the ReadMe document.

Note that *prep* need only be run once, until and unless another event set is processed.

A variant of *prep* is *prepfilter*, which creates a subset of the original event set. This applies time and/or spatial filters, including subsetting by individual ocean basins (if one starts with a global event set), particular years or sets of years, only storms that pass within a set distance of a specified geographical location, or only storms that pass over any of a set of line segments defined in a special ascii file. (For a description of the format of this file, type "*doc prepfilterf*".)

The routines *prepf.m* and *prepfilterf.m* are simply the functional forms of *prep* and *prepfilter* that allow one to specify the event set and, in the case of *prepfilterf*, the filter parameters in the call to the routine rather than by responding to prompts.

2. Setting Parameters

For convenience, most of the parameters controlling the behavior of the scripts, including the character of the graphical output, are set in a single MATLAB file called *params.m*. It may prove helpful to review the contents of this file before using the scripts, and to keep it open in an editor while working with the event sets.

3. Utilities

The scripts subdirectory contains the scripts that can be used to process and analyze the event set data. The most useful of these are described here. For detailed instructions for any of these scripts, type *doc* at the MATLAB prompt, followed by the function name.

Windpdfx

This function creates time series of tropical cyclone wind speed and direction at a specified set of geographic points for each event in the set and also creates annual exceedance frequencies for peak winds at the specified points. Because it operates on all the events, it can be slow when many geographic points are specified.

Rainpdfx

Like *windpdfx* but creates time series of rainfall rate at each of a specified set of geographic points as well as annual exceedance frequencies of storm total rainfall.

Windfieldx

This function creates a gridded set of wind speeds for a particular storm at a given date and time. The grid can be specified or automatically generated by the function using parameters from the *params.m* file.

Rainfieldx

Like *windfieldx*, but creates a gridded set of rainfall rates for a particular storm at a given date and time.

Windswathx

Creates a gridded set of maximum surface winds speeds experienced at each of a gridded set of points during the passage of a particular tropical cyclone. The grid can be specified or automatically generated by the function using parameters from the *params.m* file.

Rainswathx

Like windswathx but creates a gridded set of storm total rainfalls for a particular tropical cyclone.

Ge_to_poly

Allows one to create a poly file for input to *prepfilter.m* using Google Earth. First use the "path" function in Google Earth to create one or more paths of contiguous line segments, then store each path in the format *filename(n).kml*, where *n* is 1, 2, 3….(omit the parentheses). Then use *ge-to-poly* to create an asciii file of the correct format to be used by *prepfilter*.

4. Graphics

There are many scripts for creating various kinds of plots. The easiest way to become familiar with these scripts is to type *gmenu* at the command prompt. This will bring up a menu that will access the various plots. Click on "*doc*" on the lower left corner of the plot to access a complete description of the plot. The document file name is also displayed, and this reveals the name of the primary script that was used to create the plot. (For example, *vhistobest.doc* is associated with the script *vhistobest.m*.) The scripts are stored in the *scripts* subdirectory. The description also indicates some of the parameters controlling the plot that can be set in the *params.m* file. Detailed descriptions of all the graphics-producing scripts can be found in the ReadMe document.