1. Format of FYSATTY dataset

The processed data, including interpolated TC best-track data, latitude-longitude grid information derived from satellite observations, and multi-band satellite observations, are systematically stored in NetCDF format. Each data file is structured with two main components: global attribute variables and scientific data variables, the detailed specifications being respectively documented in Table 1 (global attributes) and Table 2 (scientific data variables).

Table 1 Global attribute variables

Variables name	Description	Datatype
TC_id	The serial number of TC in the Tropical Cyclone Yearbook	8-bit signed char
TC_nno	The serial number of TC assigned by National Meteorological Center (NMC)	8-bit signed char
TC_name	TC name	8-bit signed char
Satellite Name	Satellite Name	8-bit signed char
Sensor Name	Sensor Name	8-bit signed char
FY File Name	File Name	8-bit signed char
NOM Center Lon	Nominal projection center longitude	Float
NOM Center Lat	Nominal projection center latitude	Float
Base date	Start date	16-bit signed char
time_coverage_start	Starting time of observation	16-bit signed char
time_coverage_end	Termination time of observation	16-bit signed char
geospatial_lat_min	Minimum latitude	Float
geospatial_lat_max	Maximum latitude	Float
geospatial_lon_min	Minimum longitude	Float
geospatial_lon_max	Maximum longitude	Float
geospatial_lat_units	Unit of latitude	16-bit signed char
geospatial_lat_resolution	Resolution of latitude	Float
geospatial_lon_units	Unit of longitude	16-bit signed char

geospatial_lon_resolution	Resolution of longitude	Float
Create_url	The Uniform Resource Locator of the Creator	32-bit signed char
Create_email	Creator email	32-bit signed char
Create_name	Creator	32-bit signed char
Institution	Institution (Shanghai Typhoon institute, CMA)	32-bit signed char
Keywords	Keywords (Earth science > Atmosphere > Tropical cyclone)	32-bit signed char
Date_created	Creation date	16-bit signed char
Data_modified	Modification date	16-bit signed char
Date_issued	Release date	16-bit signed char
_NCProperties	NC attributes	16-bit signed char

Table 2 Scientific data variables

Variables name	Description	Datatype
CentLat	TC center latitude	Float
CentLon	TC center longitude	Float
CentPrs	Minimum sea level pressure	Float
WindSpd	Maximum wind speed	Float
VZA	View zenith angle at the TC Center	Float
SubSatLat	Sub-satellite point latitude	Float
SubSatLon	Sub-satellite point longitude	Float
lat	Latitude	Float
lon	Longitude	Float
NOMChannelVIS	0.65μm channel	Float
NOMChannelIR3	6.95μm channel	Float
NOMChannelIR1	10.8μm channel	Float
NOMChannelIR2	12.0μm channel	Float

2. Sample description of the dataset

2.1. A sample illustration of the TC storage and file-naming format

Using the file "2012\201207.1206\2012177N11134.Doksuri.2012.06.25.0600.37.FY2-E.12.0.Tcsat.v01.nc" as an illustrative example, the hierarchical storage structure and systematic naming convention can be explained as follows: The root directory (2012) represents

a four-digit year identifier. The subsequent subfolder (201207) combines the four-digit year (2012) with a two-digit tropical cyclone serial number (07) as documented in the corresponding year's Tropical Cyclone Yearbook. Additionally, the 1206 component signifies the unique four-digit numerical identifier assigned by the National Meteorological Center (NMC) to each TC event within the specified year.

The 64-character filename follows a precisely structured format with specific semantic representations: The initial 7 characters "2012177" encode temporal information, comprising a 4-digit year followed by a 3-digit day-of-year identifier. The 8th character "N" serves as a hemisphere indicator, specifically denoting the Northern Hemisphere. The subsequent 5-character segment "11134" (positions 9-13) contains geospatial information, where the first 3 digits represent the rounded longitude of the TC center and the remaining 2 digits indicate its rounded latitude. The TC identifier segment ".Doksuri." (Positions 14-22) specifies the official tropical cyclone name. The temporal observation segment "2012.06.25.0600" (positions 23-37) provides precise timing information in a year-month-day-hour-minute format. The satellite observation parameter segment ".37." (Positions 38-41) contains the Viewing Zenith Angle (VZA) of the TC satellite in its central two digits. The platform identifier "FY2-E" (positions 42-46) denotes the specific satellite name. The intensity indicator ".12.0." (Positions 47-52) encodes the TC's maximum wind speed derived from best track data. The dataset identifier "Tcsat.v01" (positions 53-61) specifies both the dataset name and its version number. Finally, the 3-character extension ".nc" (positions 62-64) indicates the NetCDF file format.

2.2. Sample description of the global attributes

Using "2022239N24151.Hinnamnor.2022.08.27.1800.34.FY4-B.15.0.Tcsat.v01.nc" as a representative case, the file incorporates 28 distinct global attributes, whose comprehensive specifications are systematically detailed in table 3.

Table 3 Description of the global attributes

ID	Global attributes
1	:TC_id = "202212";
2	:TC_nno = "2211";
3	:TC_name = "Hinnamnor";
4	:Satellite_Name = "FY4B";
5	:Sensor_Name = "AGRI";
6	:FY_File_Name = "FY4B-_AGRI--_N_DISK_1330E_L1-_FDI-_MULT_NOM_20220827174500_20220827175959_4
7	:NOM_Center_Lon = 133.0f; // float
8	:NOM_Center_Lat = 0.0f; // float
9	:base_date = 2022, 8, 27; // int
10	:time_coverage_start = "2022-08-27 17:45:02.339";
11	:time_coverage_end = "2022-08-27 17:57:54.294";
12	:geospatial_lat_min = 13.8; // double
13	:geospatial_lat_max = 33.8; // double
14	:geospatial_lon_min = 140.8; // double
15	:geospatial_lon_max = 160.8; // double
16	:geospatial_lat_units = "degrees_north";
17	:geospatial_lat_resolution = 0.05; // double
18	:geospatial_lon_units = "degrees_east";
19	:geospatial_lon_resolution = 0.05; // double
20	:create_url = "https://www.sti.org.cn/";
21	:create_email = "luxq@typhoon.org.cn";
22	:create_name = "Xiaoqin Lu, STI/CMA";
23	:institution = "Shanghai Typhoon Institute of China Meteorological Administration"; :keywords = "EARTH SCIENCE > Atmosphere > Tropical Cyclone";
24	:date_created = "2023-11-27 03:11:49";
25	:data_modified = "2023-11-27 03:11:49";
26	:date_issued = "2023-11-27 03:11:49";
27	:_NCProperties = "version=2, netcdf=4.9.2, hdf5=1.14.2".
28	

The definitions of the variables in the above global attributes correspond one-to-one to the variable descriptions in Table 1.

2.3. Sample description of the science data attributes

Using "2022239N24151.Hinnamnor.2022.08.27.1800.34.FY4-B.15.0.Tcsat.v01.nc" as a representative case, the file encompasses 24 distinct scientific data attributes, whose detailed specifications are systematically presented in table 4.

Table 4 Description of the science data attributes

Item	Science data attributes
dimensions:	lat = 751;
	lon = 751;
variables:	float CentLat;
	:long_name = "Latitude of Tropical Cyclone Circulation Center";
	:units = "degrees_north";
	:valid_range = -90.0f, 90.0f; // float
	float CentLon;
	:long_name = "Longitude of Tropical Cyclone Circulation Center";
	:units = "degrees_east";
	:valid_range = -180.0f, 360.0f; // float
	float CentPrs;
	:long_name = "Central Pressure";
	:units = "mb";
	:valid_range = 700.0f, 1100.0f; // float
	float WindSpd;
	:long_name = "Wind Speed";
	:units = "m/s";
	:valid_range = 0.0f, 200.0f; // float
	float VZA;
	:long_name = "View Zenith Angle at storm center";
	:units = "degrees";
	float SubSatLat;
	:long_name = "Sub-satellite latitude";
	:units = "degrees_north";
	float SubSatLon;
	:long_name = "Sub-satellite longitude";

:units = "degrees_east";
float NOMChannelVIS(lat=751, lon=751);
:band_names = "band2(band number is range from 1 to 20)";
:center_wavelength = "0.65um";
:long_name = "0.65um channel 4km image data layer";
:units = "NUL";
:valid_range = 0.0f, 1.5f; // float
:missing_value = 65535.0f; // float
float NOMChannelIR3(lat=751, lon=751);
:band_names = "band10(band number is range from 1 to 20)";
:center_wavelength = "6.95um";
:long_name = "6.95um channel 4km image data layer";
:units = "NUL";
:valid_range = 100.0f, 500.0f; // float
:missing_value = 65535.0f; // float
float NOMChannelIR1(lat=751, lon=751);
:band_names = "band13(band number is range from 1 to 20)";
:center_wavelength = "10.8um";
:long_name = "10.8um channel 4km image data layer";
:units = "NUL";
:valid_range = 100.0f, 500.0f; // float
:missing_value = 65535.0f; // float
float NOMChannel IR2 (lat=751, lon=751);
:band_names = "band14(band number is range from 1 to 20)";
:center_wavelength = "12.0um";
:long_name = "12.0um channel 4km image data layer";
:units = "NUL";
:valid_range = 100.0f, 500.0f; // float
:missing_value = 65535.0f; // float
float lat(lat=751);
:units = "degrees_north";
:long_name = "lat";
float lon(lon=751);
:units = "degrees_east";
:long_name = "lon";

The definitions of the variables in the above science data attributes correspond one-to-one to the variable descriptions in Table 2.