**Wong Po Hing**

**Visualize tropical cyclone tracks**

**Step 0: Preparation**

[**https://colab.research.google.com/drive/1nIDvgNXy7twIsMnt-v9-7tFjIN0Q9S7o?usp=sharing**](https://colab.research.google.com/drive/1nIDvgNXy7twIsMnt-v9-7tFjIN0Q9S7o?usp=sharing)

**After clicking the above link, pls login your google account**

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**Then upload the IBTrACS.last3years.v04r01.nc ( download from** [**https://www.ncei.noaa.gov/products/international-best-track-archive**](https://www.ncei.noaa.gov/products/international-best-track-archive)**, it attached with this file)**

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**After Uploading the data into google colab, you can “Run All” my code to see the result**

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**Brief Explanation (more detailed on the comment of the code)**

1. Install and Import Libraries:

* The code begins by installing cartopy`(a library for geospatial plotting) and importing necessary libraries: xarray for handling NetCDF data, numpy for numerical computations, matplotlib.pyplot for plotting, and cartopy components (crs, feature, and ticker) for map projections, geographic features, and gridline formatting.

1. Read the NetCDF File:

- The code loads cyclone data from the file {IBTrACS.last3years.v04r01.nc} using xarray into a dataset (ds), which contains variables like time, latitude, longitude, wind speed, and basin.

3. Filter Data for 2024 and Western Pacific Basin:

- The time variable is cleaned by removing null values and converted to datetime format to extract years.

- The basin variable, if stored as byte strings, is decoded into regular strings (e.g., "WP" for Western Pacific).

- Masks are created to identify storms from 2024 (mask\_2024) and the WP basin (mask\_wp) by checking if these conditions are met at any point in each storm’s lifecycle.

- A combined mask (storm\_mask) finds storms that satisfy both conditions, and their indices are stored in storm\_indices.

4. Set Up the Map:

- A figure is created with a Plate Carree projection (a simple cylindrical map projection).

- The map extent is set to East and Southeast Asia (100°E–160°E, 0°N–50°N).

- Features like a shaded relief background, coastlines, country borders, and gridlines with latitude/longitude labels are added.

- A title is set to describe the plot.

5. Plot Cyclone Tracks with Intensity:

- A color dictionary maps cyclone intensity categories (e.g., Tropical Depression, Typhoon) to specific colors.

- For each storm in `storm\_indices`, latitude (lat), longitude (lon), and wind speed (usa\_wind) are extracted, with null values dropped.

- Wind speed is converted from knots to km/h, and each data point is classified into an intensity category based on wind speed ranges (e.g., 63–87 km/h for Tropical Storm).

- Points are plotted as colored markers (representing intensity), and lines connect the points to show the storm’s path.

6. Add a Legend A custom legend is created with colored markers and labels explaining the wind speed ranges for each intensity category, placed in the upper-left corner of the map.

7. Display the Plot: The plt.show() command renders the final map, showing cyclone tracks with color-coded intensities for 2024 in the Western Pacific basin.

**Result:** 一張含有 文字, 地圖, 螢幕擷取畫面, 地圖集 的圖片

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