# WWMWIS Committee revision of tropical cyclone RSMC functions in GDPFS Manual (WMO No.485)

The following has been extracted from the Manual version Feb 2018.

***2.2.2.6 Tropical cyclone forecasting, including marine-related hazards***

Note: This activity is performed within the five Tropical Cyclone Programme regional bodies, each composed of an RSMC and a number of NMCs forming a network.

**2.2.2.6.1 Regional Specialized Meteorological Centres conducting tropical cyclone forecasting shall:**

**(a) Monitor continuously meteorological phenomena such as convective activities to predict or detect tropical cyclone formation;**

**(b) Analyse and forecast tropical cyclones based on all available observational data and forecasting guidance, including NWP, EPS and satellite-based products;**

**(c) Issue tropical cyclone advisories to associated NMCs;**

**(d) As appropriate, add information in tropical cyclone advisories on hazardous phenomena associated with tropical cyclones such as heavy rains, strong winds and storm surges;**

**(e) Name tropical cyclones when they have been analysed with maximum wind speeds of 34 knots or more;**

**(f) Conduct post-event analysis of tropical cyclones based on quality-assured observational data and issue best-track data within an appropriate period of time (preferably on an annual basis); issue such data to the tropical cyclone community, including the International Best Track Archive for Climate Stewardship;**

**(g) Promote research and development, and training in tropical cyclone analysis, forecasting and warning techniques.**

**2.2.2.6.2 National Meteorological Centres associated with this activity shall:**

**(a) Issue forecasts and warnings of tropical cyclones to threatened communities;**

**(b) Coordinate with national agencies responsible for disaster risk reduction;**

**(c) Provide relevant regional centres with observational data of tropical cyclones on a real-time basis.**

**2.2.2.6.3 All six RSMCs for tropical cyclone forecasting together with Tropical Cyclone Warning Centre Darwin, which are designated as Tropical Cyclone Advisory Centres by regional air navigation agreement within the framework of the tropical cyclone watch of the International Civil Aviation Organization (ICAO), shall issue tropical cyclone advisories for aviation in accordance with the provisions made in *Meteorological Service for International Air Navigation*, Annex 3 to the Convention on International Civil Aviation, ICAO; and *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II. SIGMET information concerning tropical cyclones shall be issued by meteorological watch offices for the flight information region concerned and shall be based on the tropical cyclone advisory information issued by the Tropical Cyclone Advisory Centres.**

**2.2.2.6.4 Members holding Metareas under their responsibility within the Global Maritime Distress and Safety System (GMDSS) protocols – established by the International Maritime Organization in Chapter IV of the International Convention of Safety Of Life At Sea – shall include information on tropical cyclones as needed in their GMDSS maritime weather information for shipping.**

Note: The bodies in charge of managing the information contained in the present Manual related to tropical cyclone forecasting are specified in Table 15.

**Table 15. WMO bodies responsible for managing information related to tropical cyclone forecasting**

|  |
| --- |
| *Responsibility* |
| *Changes to activity specification* |
| To be proposed by: | Technical coordination meeting |  |  |
| To be recommended by: | CBS | Regional tropical cyclone committee |  |
| To be decided by: | EC/Congress |  |  |
| *Centres designation* |
| To be recommended by: | CBS | Regional tropical cyclone committee |  |
| To be decided by: | EC/Congress |  |  |
| *Compliance* |
| To be monitored by: | Technical coordination meeting |  |  |
| To be reported to: | CBS |  |  |

**APPENDIX 2.2.38. STANDARDIZED VERIFICATION OF TROPICAL CYCLONE FORECAST PRODUCTS**

**1. Introduction**

This appendix presents detailed procedures for the production and exchange of a standard set of verification scores for tropical cyclone forecasts produced by the Lead Centre(s) for TCFV based on gridded forecast fields provided by GDPFS-participating centres. The goal is to provide consistent verification information on the tropical cyclone forecast products of GDPFS-participating centres for forecasters in NMHSs, and to help the GDPFS-participating centres compare and improve their forecasts. The Lead Centre functions, as described in 2.2.3.5, include creating and maintaining a website for TCFV information, so that potential users can benefit from a consistent presentation of the results.

The standardized verification should provide key relevant information appropriate to the state of the art in tropical cyclone forecasting, while being as simple and as easy to implement as possible, and ensuring a consistent implementation across GDPFS-participating centres.

**2. Tropical cyclones to be verified**

Tropical cyclones whose intensity has reached the category of tropical storm with a sustained wind of 34 knots or stronger are set as targets for this verification. The tropical depression stage of the targeted tropical cyclones is also included in this verification. However, the tropical cyclones that never evolve from the tropical depression to tropical storm stage during their life time are excluded.

Tropical cyclones that are not recorded in the best track dataset (see section 7) are also excluded.

**3. Parameters**

Mandatory:

– MSLP.

Recommended:

– u and v wind components at 850 hPa.

**4. Forecast times**

**Scores shall be computed for forecasts initialized at 1200 UTC. Annual scores shall be computed for a year from 1 January to 31 December in the northern hemisphere and for a year from 1 September to 31 August in the southern hemisphere.**

**5. Forecast steps**

**Forecast steps shall be every 6 hours to 192 hours of the forecast range.**

**6. Verification areas**

Scores are to be calculated separately for each verification area shown in the table below:

|  |  |
| --- | --- |
| *Verification area* | *Specification of area* |
| Western North Pacific: | 0°–90°N, 100°E–180°E |
| Eastern North Pacific, including central North Pacific | EQ–90°N, 180°W–West Coast of North and South American Continent(Tropical cyclones that are generated in this area are categorized as being of this area throughout their lifetime.) |
| North Atlantic Ocean | Caribbean Sea, Gulf of Mexico, and EQ–90°N, East Coast of North and South American Continent–35°W(Tropical cyclones that are generated in this area are categorized as being of this area throughout their lifetime.) |
| North Indian Ocean | EQ–Eurasian Continent, 30°E–100°E |
| South Indian Ocean | EQ–90°S, 30°E–90°E |
| South Pacific and around Australia | EQ–90°S, 90°E–120°W |

**7. Verifying datasets**

**Verification shall be carried out for best-track datasets available at the Lead Centre(s).** Best-track datasets are originally provided by RSMCs participating in tropical cyclone forecasting, as defined in 2.2.2.6.

**8. Grid and interpolation**

**Verification shall be made using forecast data on a regular latitude–longitude grid. The Lead Centre(s) shall calculate position and pressure of tropical cyclone centres by linear interpolation using five data of the nearest grid point and its four neighbouring grid points to the north, south, east and west.**

**9. Scores**

Scores are to be calculated for each tropical cyclone individually.

The following scores are to be calculated against the best-track dataset:

(a) Detection rate;

(b) Storm track verification:

– Position error: Distance between predicted and analysed tropical cyclone centres;

– Along-track/cross-track (ATCT) bias (shown in the pictorial form of scatter diagram) (AT bias: bias in the direction of cyclone movement; CT bias: bias in the rectangular direction of cyclone;

(c) Bias of central pressure.

The mathematical formulation of the scores is documented on the Lead Centre(s) for TCFV website(s), together with supplementary information on score calculation.

**10. Exchange of forecast fields**

**Each GDPFS-participating centre shall provide global fields annually to the Lead Centre(s) for TCFV on a regular latitude–longitude grid at the resolution of 1.5° longitude by 1.5° latitude resolution or finer.** Details of the procedure and the required format for the data are provided on the website(s) of the Lead Centre(s).

**11. Exchange of scores**

**All calculated scores in the text or binary form shall be made available on the Lead Centre(s) for TCFV website(s).**

**The Lead Centre(s) for TCVF shall also make available the scores in the pictorial form on its website(s) as follows:**

**(a) Detection rate of tropical storm: The score is drawn every 12 hours until 120 hours;**

**(b) Storm track verification: Position error and ATCT bias are shown every 24 hours until 192 hours; position error is shown as a map; ATCT bias is shown in scatter-diagram form;**

**(c) Bias of central pressure: A scatter diagram of analysed and predicted central pressure is shown every 24 hours until 192 hours.**

**12. Documentation**

**Global Data-processing and Forecasting System-participating centres shall provide to the Lead Centre(s) on TCFV information on any changes to the production of the exchanged forecast fields.**