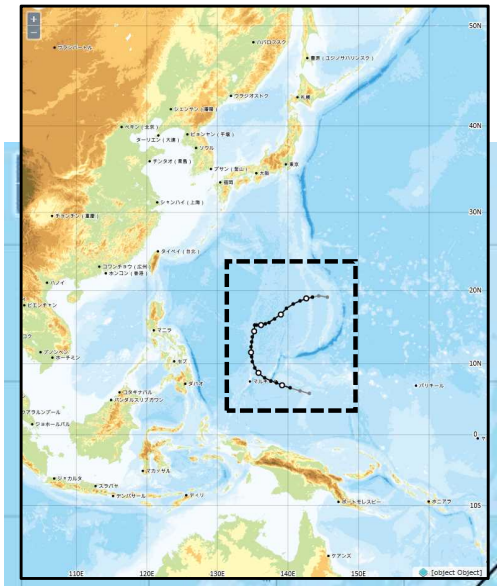
T1803 JELAWAT

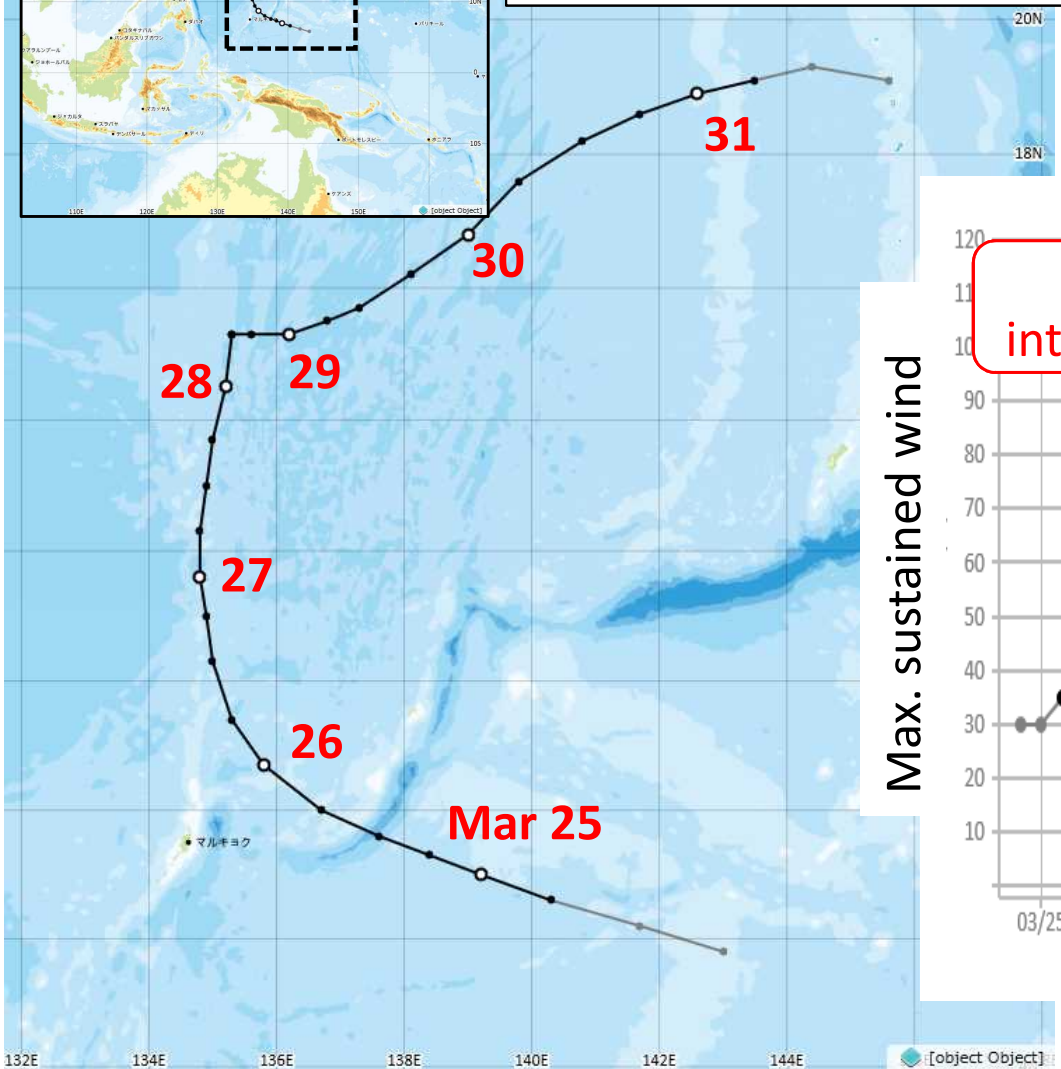
RSMC Tokyo – Typhoon Center

Japan Meteorological Agency

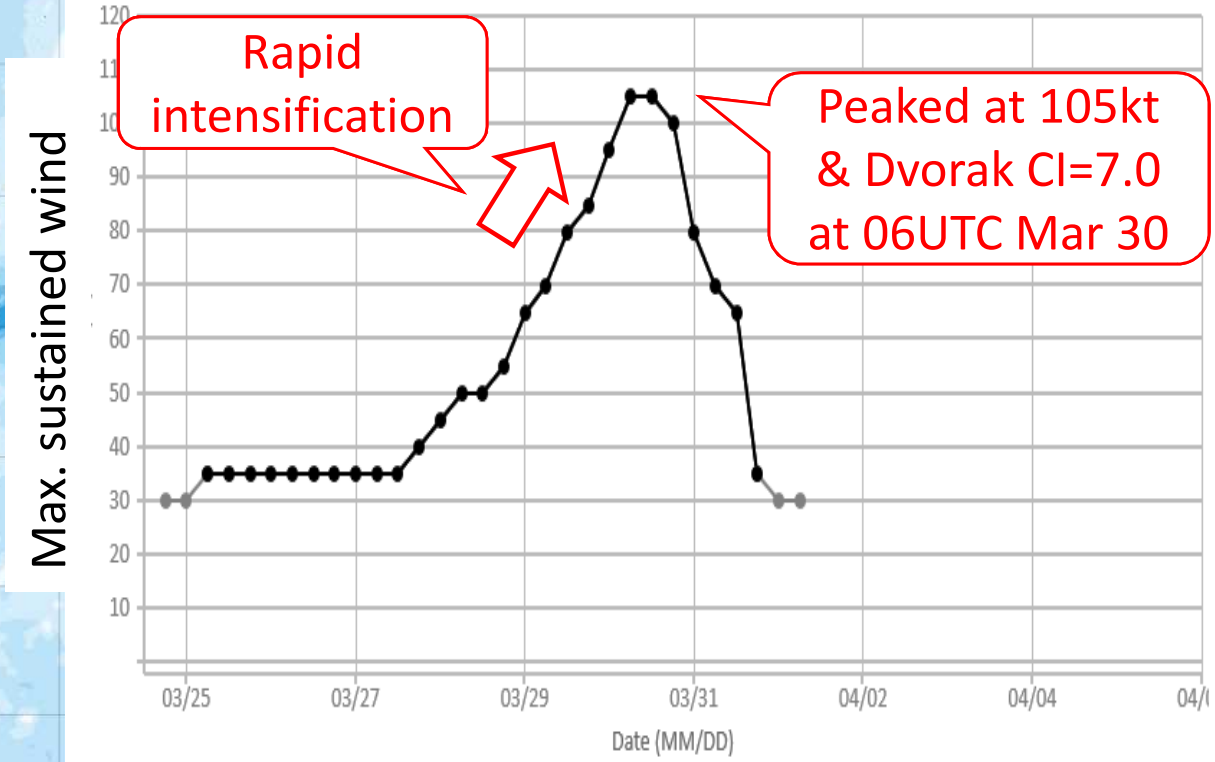
Track & Intensity of JELAWAT

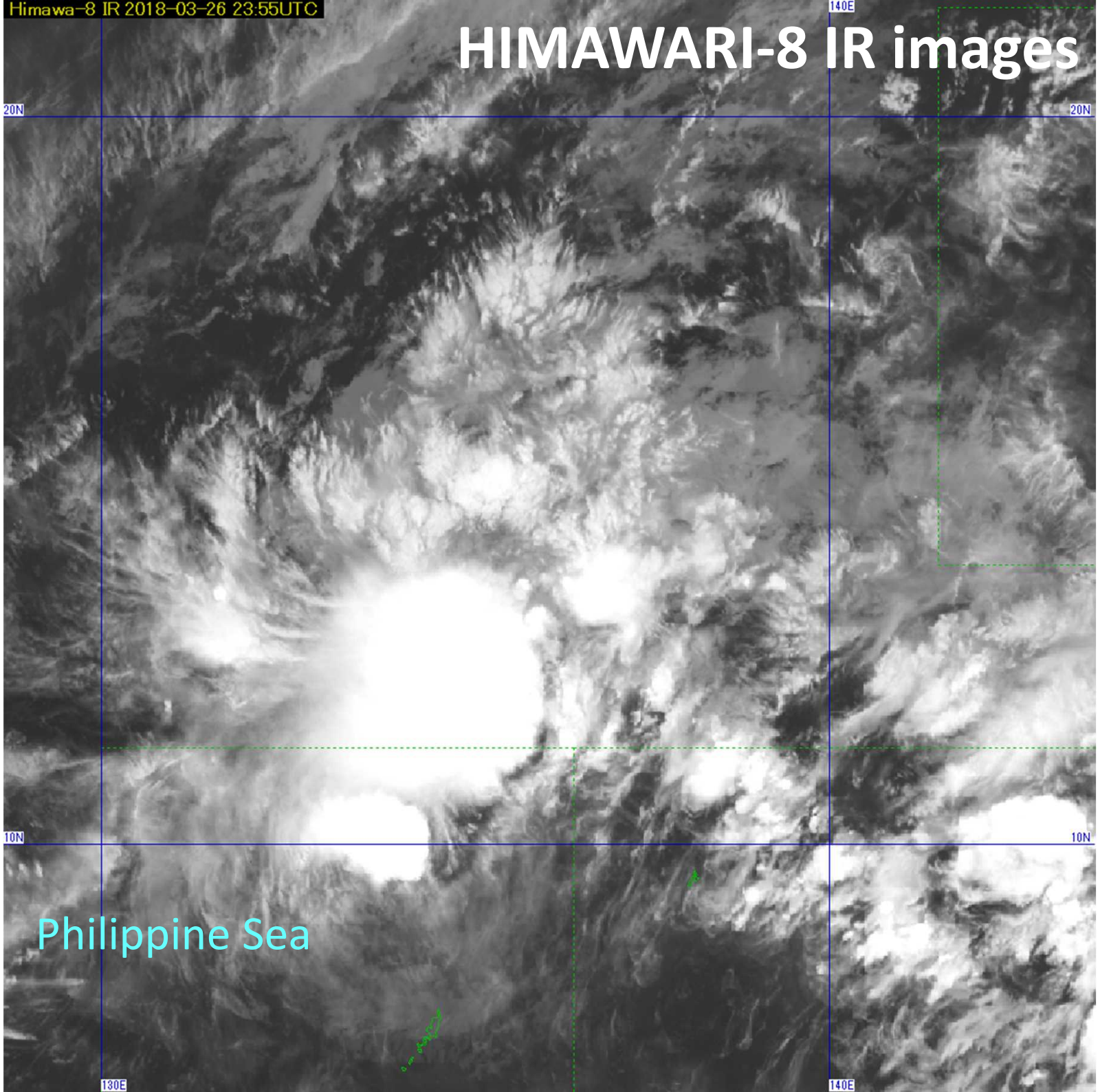
- JELAWAT formed east of Palau late March 2018
- Initially moved WNW and gradually turned north
- Made a nearly right-angle sudden turn eastward
- Reached 105kt, Dvorak CI=7.0 at peak





Best track intensity changes

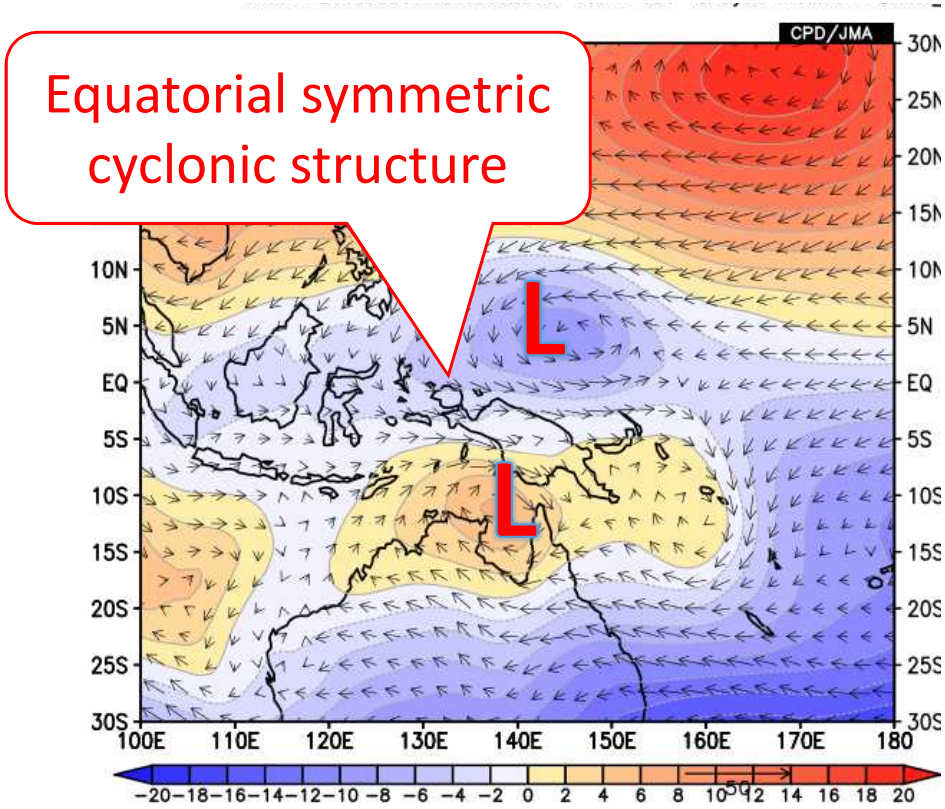



Himawa-8 IR 2018-03-26 23:55UTC
HIMAWARI-8 IR images
140E
20N
20N
10N
10N
Philippine Sea
130E
140E

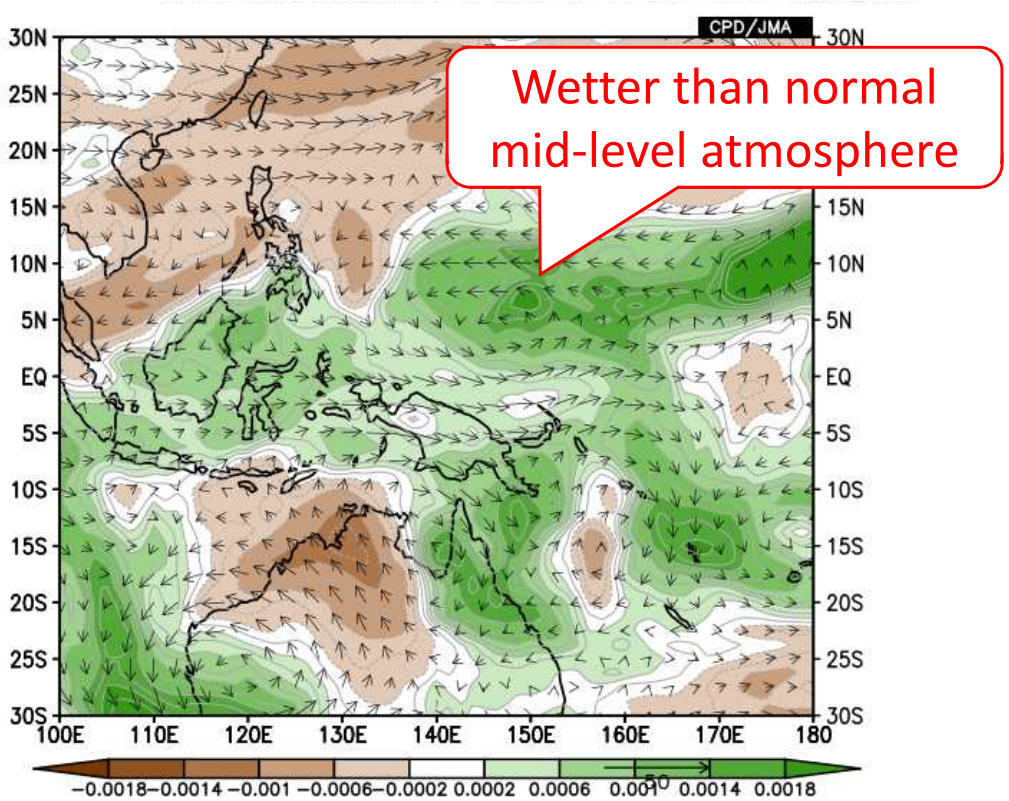
Genesis of JELAWAT

- Climatologically, average TC genesis frequency in March is 0.3.
- Genesis of JELAWAT was associated with an equatorial Rossby wave structure seen during the preceding days
- This Rossby wave structure led to wetter than normal mid-level atmosphere.

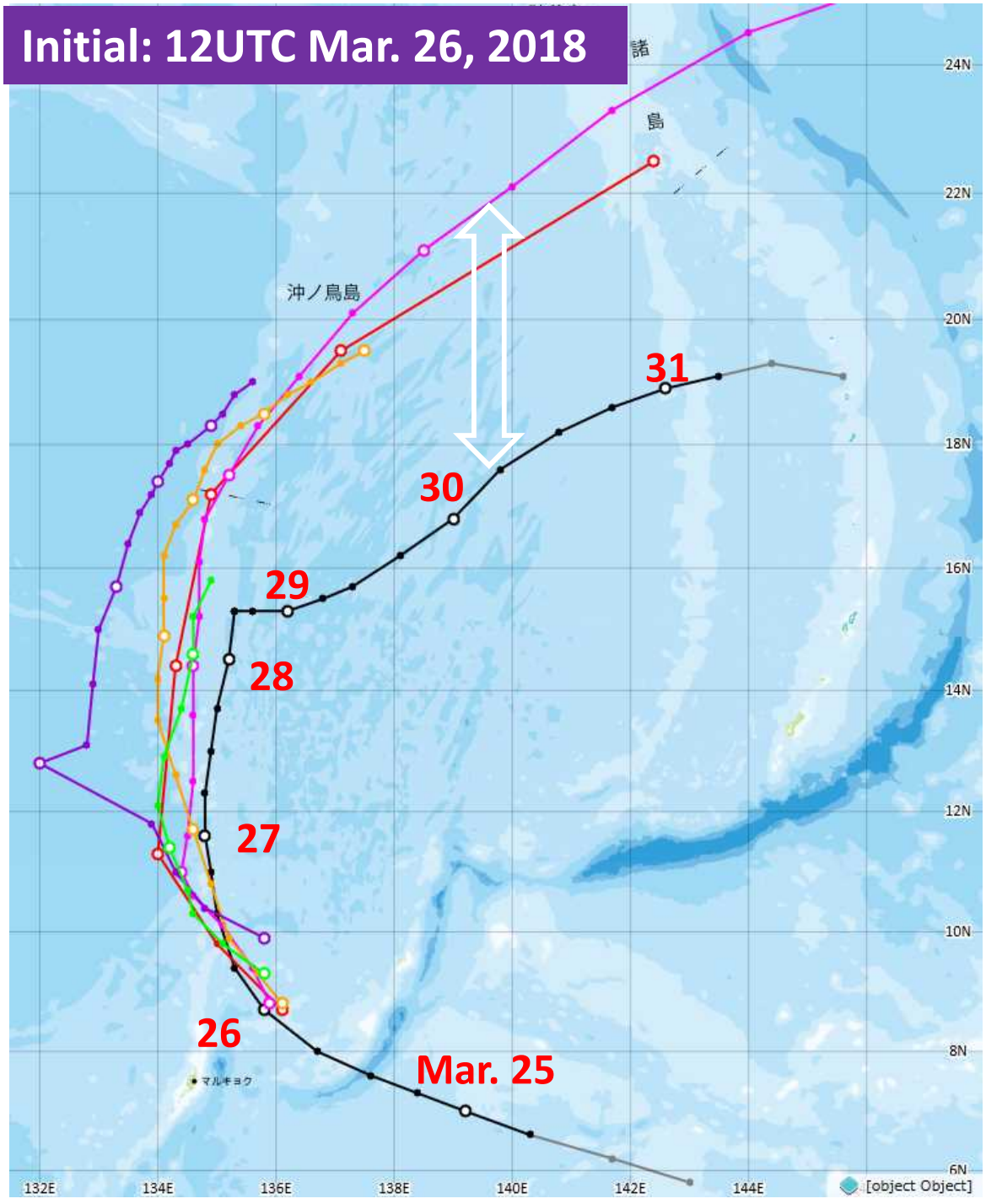
Stream function and wind vectors at 850hPa averaged for Mar. 21 to 25 2018



Specific humidity anomalies at 600hPa averaged for Mar. 21 to 25 2018



Best track & track forecast for JELAWAT



- No NWP model was able to predict the sudden eastward turn
- Discrepancy in latitude between forecast and actual track is over 4°

Best track

JMA official

GSM

ECMWF

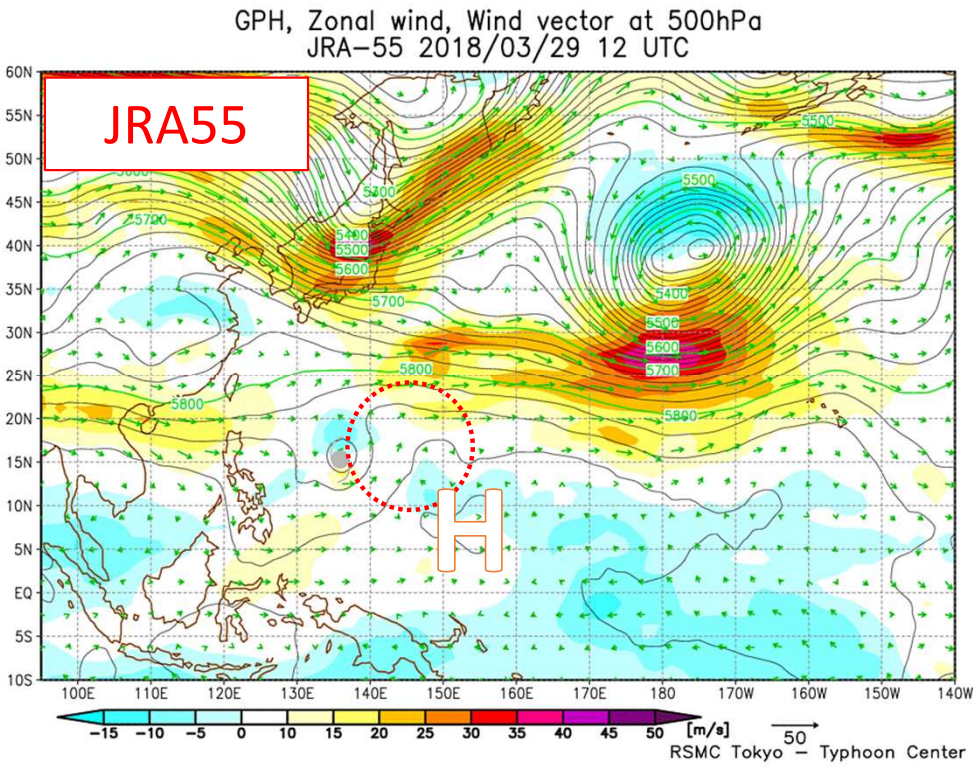
UKMET

NCEP

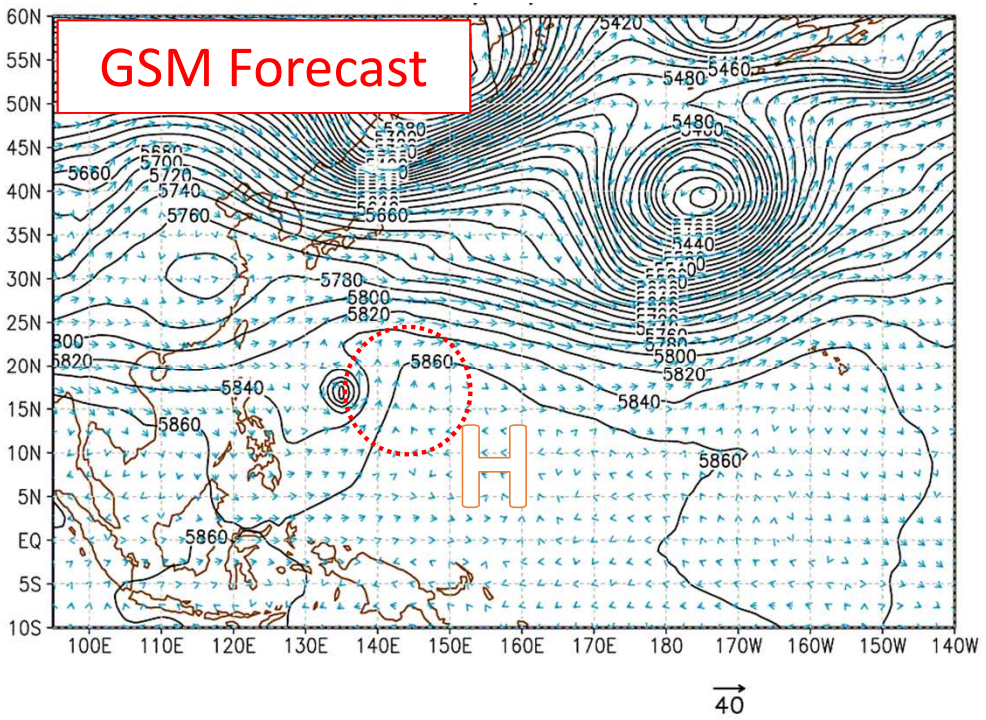
Why was JELAWAT's early track forecast so poor?

- In GSM forecast starting at 12UTC Mar 26, a slightly stronger ridge was predicted to the east of JELAWAT than the analysis
- This ridge might have prompted JELAWAT to head northward in NWP model

GPH at 500hPa for 12UTC Mar 29



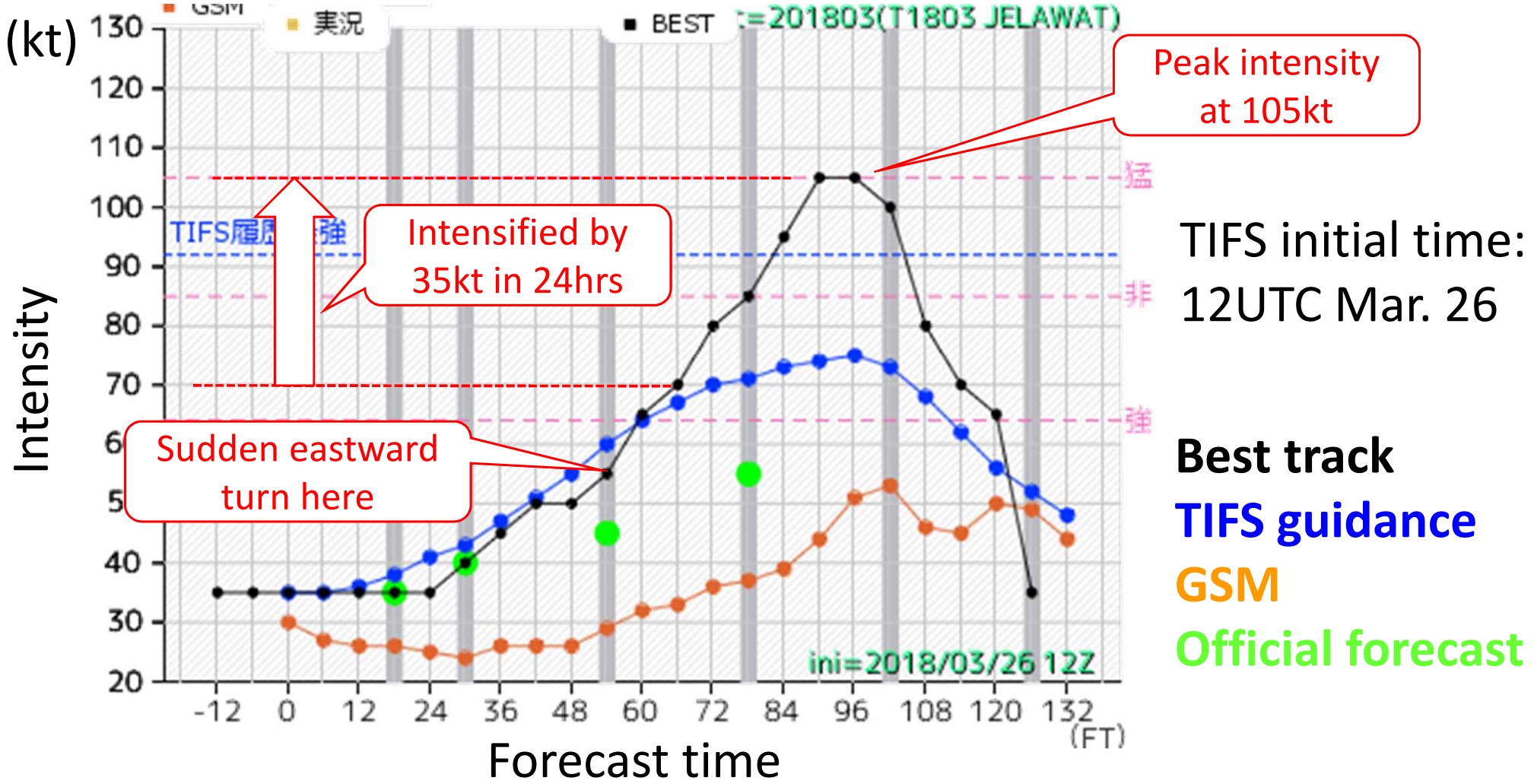
GPH at 500hPa for 12UTC Mar 29
(initial: 12UTC Mar 26)



Best track & intensity forecast for JELAWAT

- Rapidly intensified by 35kt in 24 hours from 06UTC Mar. 26 and peaked at 105kt.
- TIFS failed to predict this RI but predicted a conventional intensification instead.
- JMA Official forecast was further conservative, because adjusted down toward GSM.

Intensity changes (Best track & forecast)

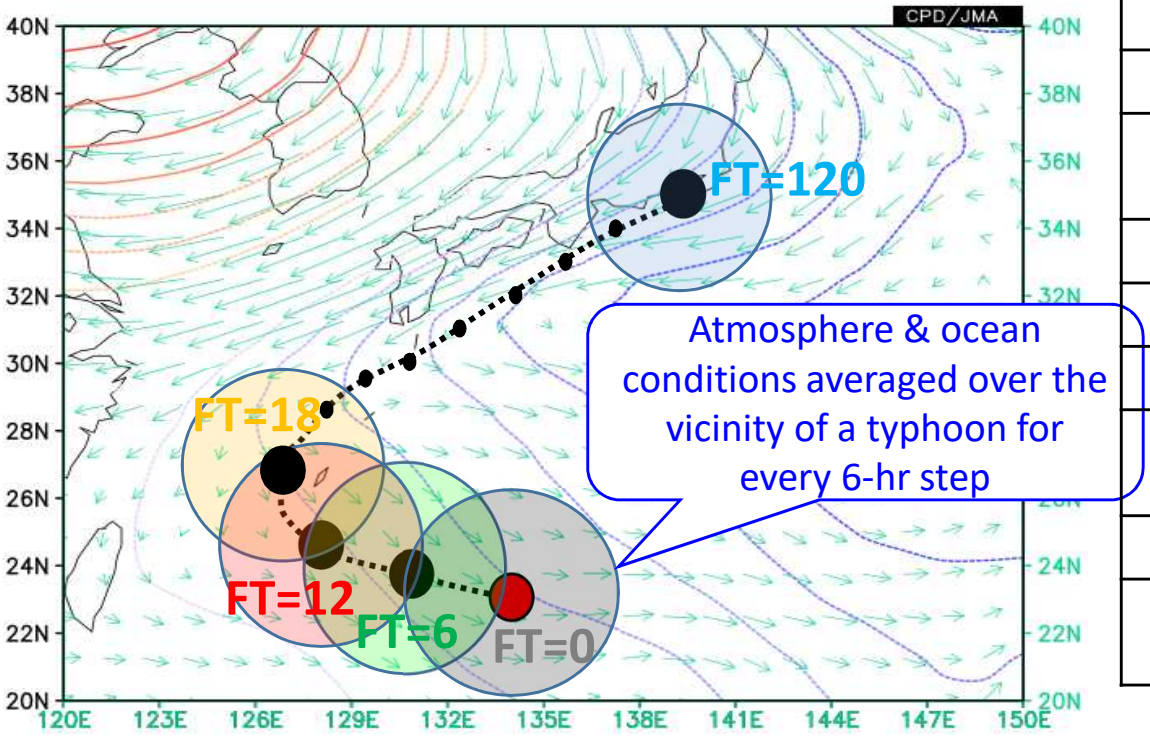


TIFS initial time:
12UTC Mar. 26

Best track
TIFS guidance
GSM
Official forecast

TIFS (intensity forecast guidance)

- JMA forecasters primarily depend on **T**yphoon **I**ntensity **F**orecast **S**cheme based on SHIPS (**TIFS**) for forecast guidance
- TIFS predicts intensity changes exploiting statistical relationship btw TC intensity changes and environmental conditions.
- TIFS originates from SHIPS, adapted for the western North Pacific. (Many thanks to Dr. DeMaria)



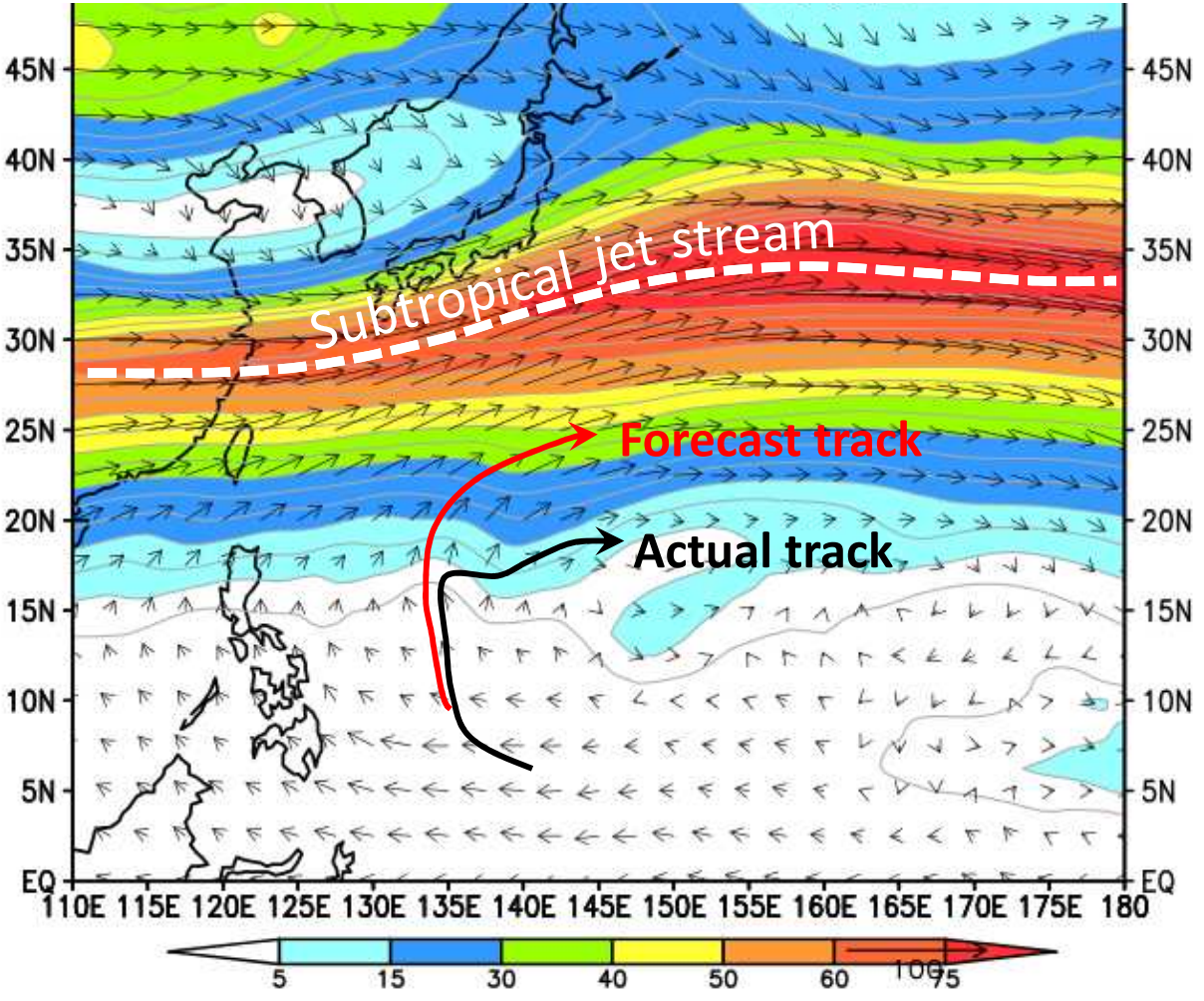
Explanatory factors for TIFS (not exhaustive)

Variable name	Description
PERSISTENCE	Change in max sustained wind during the last 12 hours
SHEAR	Vertical wind shear between 200 and 850hPa levels
POTENTIAL	Difference between the latest TC intensity and its maximum potential intensity
TANGENTIAL	Tangential wind speed around the TC at 850hPa level
MAXWIND	The latest max sustained wind
TEMP200, TEMP250	Temperature at 200 and 250hPa
MID_RH	Relative humidity in the mid-troposphere
VOR850	Vorticity at 850hPa
DIV200	Divergent at 200hPa
MOTION	Zonal component of translation speed of the TC
OHC	Ocean heat content
IR	Portion of cloud area with infrared irradiance below -30°C

Atmospheric conditions

- The subtropical jet stream flowed around the latitudes of 25-35 degrees north.
- Vertical wind shear (VWS) was to increase along the forecast track
- VWS was weak to moderate along the actual track

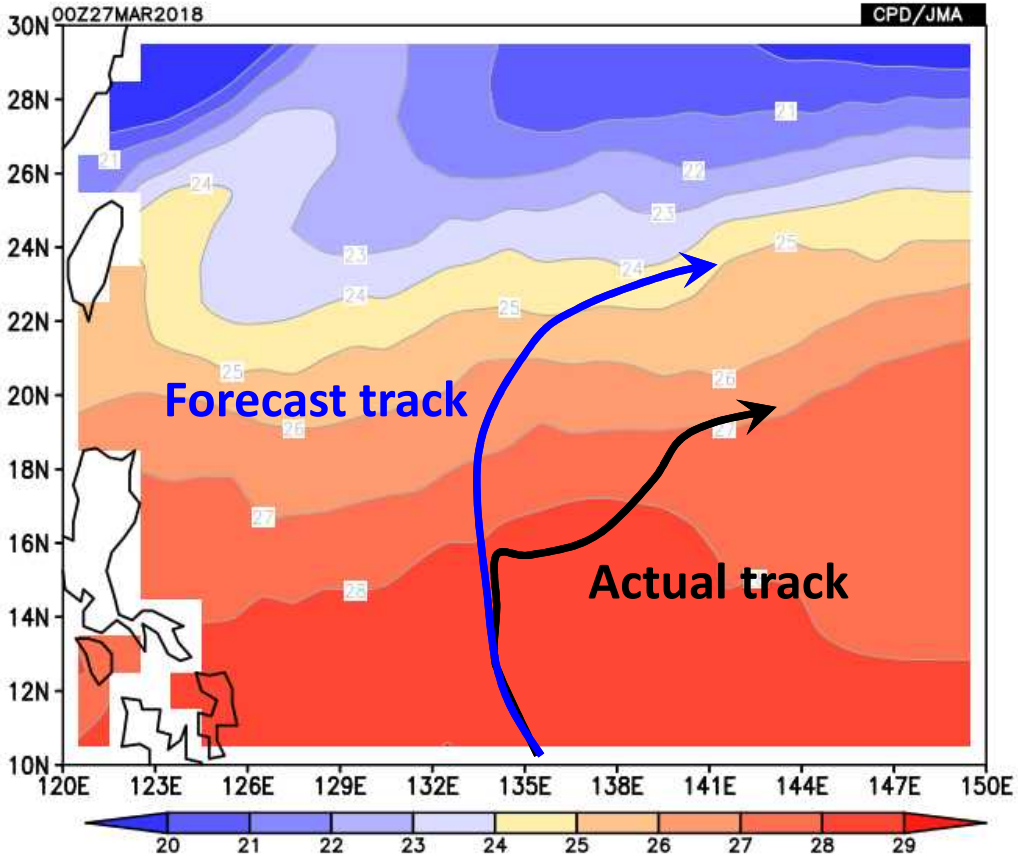
Wind vector and zonal wind at 200hPa
for 12UTC Mar. 29, 2018



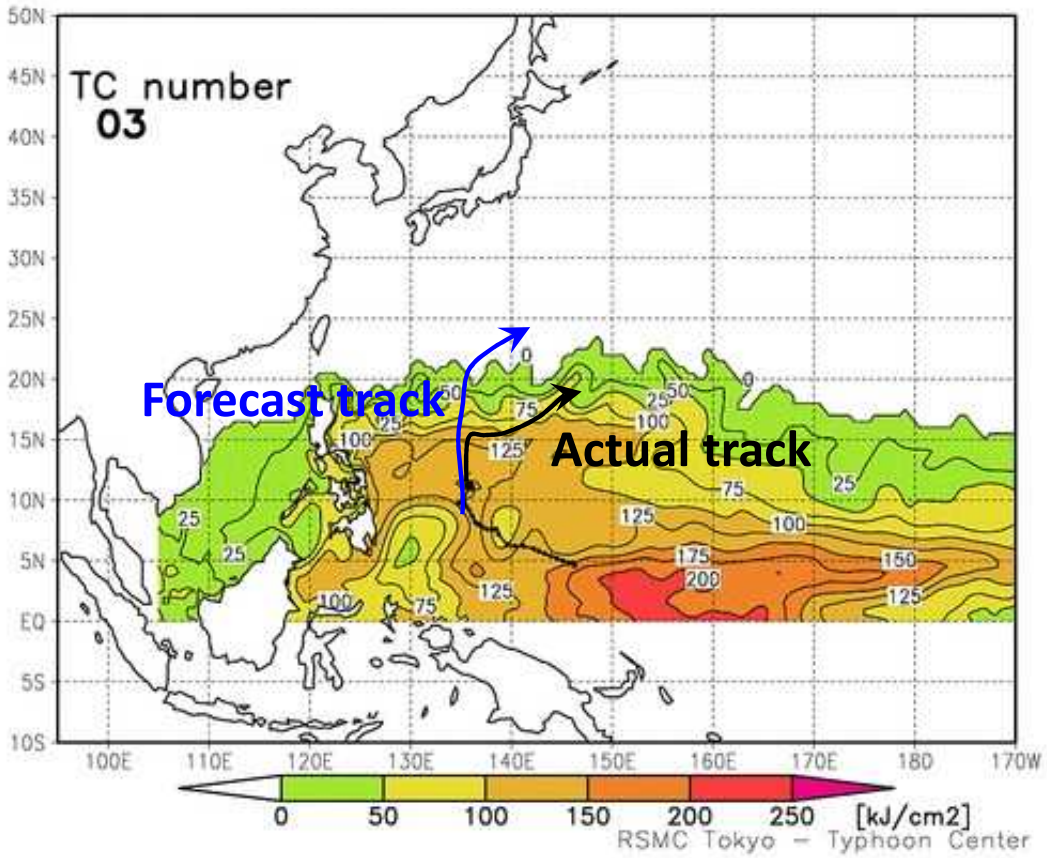
Ocean conditions

- SSTs were unfavorable for intensification at 24-26°C along the forecast track
- SSTs were more favorable at above 27°C along the actual track
- Same can be said about TCHP
- This discrepancy might have partly caused the poor intensity forecast

Sea surface temperatures
for Mar. 27, 2018



Tropical cyclone heat potential
for Mar. 27, 2018



Summary

- JELAWAT formed late March from an equatorial Rossby wave structure
- Track forecasts at early stages were poor. No NWP model was able to predict JELAWAT's sudden turn
- Intensity forecasts at early stages were poor as well, at least partly attributable to track forecast error
- Acknowledge track forecasts have come a long way thanks to NWP model improvement
- But NWP models could sometimes miserably fail.
- Encourage NWP modelers & researchers to investigate "bust cases" of track forecast like JELAWAT.