



Government of India
Ministry of Earth Sciences



India Meteorological Department

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Sub: Severe Cyclonic Storm 'NISARGA' over Arabian Sea during 1st - 4th June, 2020

Life History of NISARGA:

- A low pressure area formed over southeast & adjoining eastcentral Arabian Sea and Lakshadweep area in the early morning (0530 hrs IST) of 31st May 2020.
- Under favourable environmental conditions, it concentrated into a depression over eastcentral and adjoining southeast Arabian Sea in the early morning (0530 hrs IST) of 1st June 2020.
- It intensified into deep depression over eastcentral Arabian Sea in the early morning (0530 hrs IST) and into cyclonic storm "NISARGA" in the noon (1130 hrs IST) of 2nd June.
- It moved northwards till evening (1730 hrs IST of 2nd June). Thereafter, it gradually recurved northeastwards and intensified into a severe cyclonic storm in the early morning (0530 hrs IST) of 3rd June 2020.
- Further moving northeastwards, it crossed Maharashtra coast close to south of Alibagh as a severe cyclonic storm with a maximum sustained wind speed of 100-110 kmph gusting to 120 kmph during 1230-1430 hrs IST of 03rd June.
- Continuing to move northeastwards after landfall, it weakened into a cyclonic storm in the evening (1730 hrs IST) over north Madhya Maharashtra and into a deep depression in the mid-night (2330 hrs IST) of 3rd June 2020 over the same region.
- It further weakened into a depression over western parts of Vidarbha and neighbourhood in the early morning (0530 hrs IST) and into a well marked low pressure area in the evening (1730 hrs IST) of 4th June over central parts of Madhya Pradesh.
- It lay as a low pressure area over southeast Uttar Pradesh and adjoining Bihar in the afternoon (1430 hrs IST) of today, the 5th June. The observed track of the system is presented in Fig. 1.

Monitoring of NISARGA:

India Meteorological Department (IMD) maintained round the clock watch over the north Indian Ocean and the cyclone was monitored since 21st May, about 10 days prior to the formation of low pressure area over the southeast & adjoining eastcentral Arabian Sea and Lakshadweep on 31st May. The cyclone was monitored with the help of available satellite observations from INSAT 3D and 3DR, SCAT SAT, polar orbiting satellites and available ships & buoy observations in the region. The system was also monitored by Doppler Weather radar (DWR) Goa and Mumbai. Various numerical weather prediction models run by Ministry of Earth Sciences (MoES) institutions, global models and dynamical-statistical models were utilized to predict the genesis, track, landfall and intensity of the cyclone. A digitized forecasting system of IMD was utilized for analysis and comparison of various models guidance, decision making process and warning products generation.

Forecast Performance:

i) Genesis Forecast

- First information about development of low pressure area over southeast Arabian Sea was given in the extended range outlook issued on 21st May about **10 days prior** to the formation of

low pressure area over the southeast & adjoining eastcentral Arabian Sea and Lakshadweep on 31st May.

- First information about development of depression over southeast Arabian Sea was issued in the tropical weather outlook and national weather forecast bulletin issued at 1200 hrs IST of 29th May about **3 days prior** to the formation of depression over southeast & adjoining eastcentral Arabian Sea on 1st June morning.

ii) Track, landfall and intensity forecast

- **With the formation of** low pressure area over southeast & adjoining eastcentral Arabian Sea on 31st May morning, IMD **issued first bulletin at 0855 hrs IST of 31st May and** indicated that the system would intensify into a cyclonic storm and reach north Maharashtra and Gujarat coasts by 3rd June, **(about 77 hours prior to landfall of severe cyclonic storm NISARGA).**
- **In the bulletin issued at 0920 hrs IST of 1st June,** it was indicated that the system would intensify upto severe cyclonic storm stage with maximum sustained wind speed of 105-115 kmph gusting to 125 kmph and cross north Maharashtra and south Gujarat coasts between Harihareshwar (Raigad), Maharashtra and Daman during evening/ night of 3rd June **(about 52 hours prior to landfall of severe cyclonic storm NISARGA).**
- **In the bulletin issued at 1130 hrs IST of 2nd June, it was indicated that the system would cross** close to Alibag (Raigad District, Maharashtra) during the afternoon of 03rd June as a Severe Cyclonic Storm with a maximum sustained wind speed of 100-110 kmph gusting to 120 kmph **(about 28 hours prior to landfall of severe cyclonic storm NISARGA).**
- **Actually, the severe cyclonic storm Nisarga** crossed north Maharashtra coast close to south of Alibagh with a maximum sustained wind speed of 100-110 kmph gusting to 120 kmph between 1230-1430 hrs IST of 03rd June.
- Thus, the track, landfall point & time, intensity and associated adverse weather like heavy rainfall, gale wind and storm surge were predicted well in advance by IMD.

iii) Cyclone warnings

- **Considering the expected short life of the system and it's intensification into a cyclonic storm with predicted landfall over north Maharashtra and south Gujarat coasts on 3rd June, the Pre cyclone watch** was issued for north Maharashtra and south Gujarat coasts in the bulletin issued at 1400 hrs IST of 31st May, when the system was a low pressure area over southeast and adjoining eastcentral Arabian Sea **(about 80 hours prior to landfall of severe cyclonic storm NISARGA).** This is for the first time that **Pre cyclone watch** was issued by IMD in the low pressure area stage. Usually, the pre cyclone watch is issued from depression/deep depression stage as per the Standard Operating Procedure.
- **Cyclone alert** was issued for north Maharashtra and south Gujarat coasts in the bulletin issued at 1150 hrs IST of 1st June, when the system was a depression over eastcentral & adjoining southeast Arabian Sea **(about 50 hours prior to landfall of severe cyclonic storm NISARGA)**
- **Cyclone warning** was issued for north Maharashtra and south Gujarat coasts in the bulletin issued at 1430 hrs IST of 2nd June, when the system was a cyclonic storm over eastcentral Arabian Sea **(about 24 hours prior to landfall of severe cyclonic storm NISARGA)**
- **Post landfall outlook** indicating expected severe weather over interior districts of Maharashtra was given in the bulletin issued at 2150 hrs IST of 2nd June, when the system was a cyclonic storm over eastcentral Arabian Sea **(about 16 hours prior to landfall of severe cyclonic storm NISARGA)**

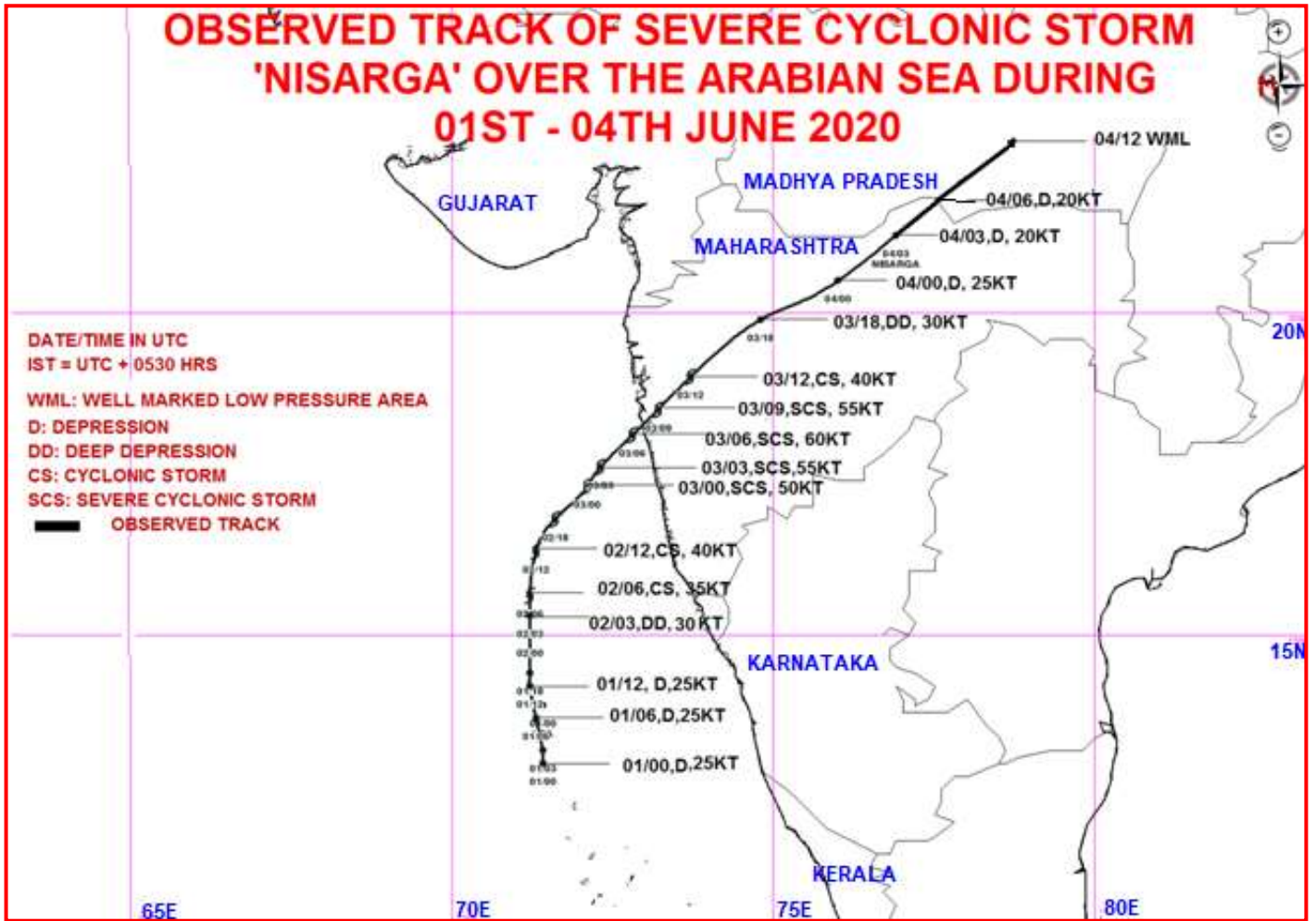


Fig. 1: Observed track of severe cyclonic storm ‘NISARGA’ over the Arabian Sea during 1st-4th June 2020