International Civil Aviation Organization

INFORMATION PAPER

Asia and Pacific (APAC)
Thirteenth Meeting of the Meteorological Requirements Working Group (MET/R WG/13)

Bangkok, Thailand, 22 to 26 April 2024

Agenda Item 5: Any other business

INSAT 3DR SOUNDER DERIVED WIND INDEX AND DRY MICROBUST INDEX ROLE IN AVIATION

(Presented by India)

SUMMARY

The wind index(WI) and Dry microbust index(DMI) is one of the most valuable parameters and shows significant changeable and intermittent over a range of timescales since it is weather-dependent. Therefore, accurate WI and DMI observation is acknowledged as a vital contribution to trustworthy large-scale Thunderstorm forecasts. Ground-based radiosonde data have been used to evaluate Infrared (IR) sounder data onboard the Indian navigation satellite (INSAT-3DR) satellite. Furthermore, this paper emphasizes the Wind Index and DMI accuracy for helicopter operation. However, WI and DMI information is derived by satellite but always missing by Radiosonde. The proposed method is applied to the estimating Radiosonde WI and DMI.

1. INTRODUCTION

1.1 It was Dr. Ted Fujita who first time noticed that damages in the aftermath of a "super-outbreak" of 148 tornadoes on April 3-4, 1974 were from some weather events other than tornadoes. Donald W. McCann (1994) proposed a new index which he termed as WINDEX for predicting microbursts.

1.2 $WI = 5[H_M R_Q (G^2 - 30 + Q_L - 2Q_M)]^{0.5}$

H_M	Melting Levels (height in kilometers above ground)
G	lapse rate (degrees Celsius per kilometres)
Q_L	The Mixing Ratio (1 km above the surface)
Q_M	The mixing ratio at the melting level.
RQ	QL/12

1.3 Higher DMI values indicate an increased potential for the development of dry microbursts, which are characterized by intense downdrafts of air that can lead to localized damaging winds near the surface

1.4 DMI = Γ + (T −Td)700− (T − Td)500

Where, Γ: lapse rate (°C km-1) of the layer from 700 hPa to melting level (i.e. layer at 0o C), T – Temperature (°C), Td – Dew point (°C).

2. DISCUSSION

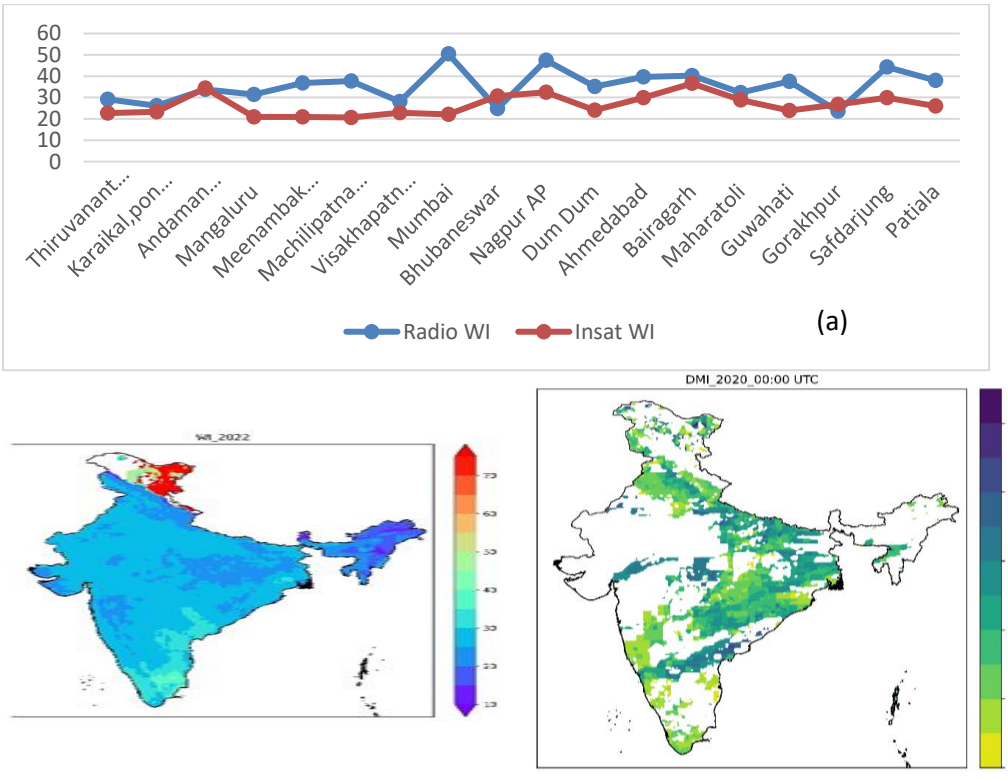
2.1 The study provides valuable insights into the spatial and temporal variability of microburst events in India, contributing to enhanced weather forecasting and hazard mitigation efforts.

2.2 This work is aimed towards evaluating the performance of INSAT-3DR derived WINDEX and DMI with WINDEX computed using RAOBs soundings over Indian region.

2.3 This indices Windex has proven to be a tool for initial assessment and evaluation of thunderstorm events

2.4 Wind gust negatively impacts the safety and causes the helicopter to move like an externally suspended aircraft, Windex high capability to work as an indicator of extreme events with Windex value will become a good forecasting tool for forecaster to make early decision of helicopter take-off.

2.5 WINDEX and DMI value before 4-5 h of event and greater than 30 is indicator of thunderstorm events.



(b)

Fig 1: (a) WI vs Radiosonde and WI 2022 spatil plot (b) DMI 2022 spatial plot

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

3.2 Aviation Wind Index and Dry Microbust Index precise threshold for different region and its impact on aviation service should be analysed.

– – – – – – – – – – – – – –