International Civil Aviation Organization

FIFTH MEETING OF THE ASIA/PACIFIC METEOROLOGICAL REQUIREMENTS WORKING GROUP (MET/R WG/5) OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND MPLEMENTATION REGIONAL GROUP (APANPIRG)

Bangkok, Thailand, 19 – 21 April 2016

Agenda Item 4:   MET information required to support end user systems

AUTOMATED THUNDERSTORM SIGMET GUIDANCE

(Presented by Ashwin Naidu of Australia)

SUMMARY

This paper presents information on automated thunderstorm SIGMET guidance used in the Australian FIRs.

1.   INTRODUCTION

1.1   The Australian Flight Regions (FIRs) of Brisbane and Melbourne cover an area stretching in latitudes from two degrees south (in parts) to 90 degrees south, and longitudes 75 to 163 degrees east. This poses a significant challenge for aviation forecasters who are responsible for issuing and monitoring SIGMETs for approximately 11 percent of the world's airspace.

1.2   The Australia's Bureau of Meteorology has developed automated thunderstorm SIGMET guidance to assist forecasters in issuing and monitoring thunderstorm SIGMETs across the Australian FIRs.

2.   AUTOMATED THUNDERSTORM SIGMET GUIDANCE

2.1   A new thunderstorm decision support tool has been developed called the Cloud Object Tracking and Classification (COTAC) software. The COTAC software uses a machine learning algorithm to detect and track areas of weather which may require the issuance of a thunderstorm SIGMET.

2.2   The software uses Himawari 8 imagery and real-time lightning data to determine the area, movement and growth of thunderstorms in order to provide forecasters with objective decision support guidance. **Figure 1** shows the COTAC broad scale analysis of the Australian FIRs on 19 January 2016 and **Figure 2** shows the detailed guidance for a single thunderstorm SIGMET candidate system.
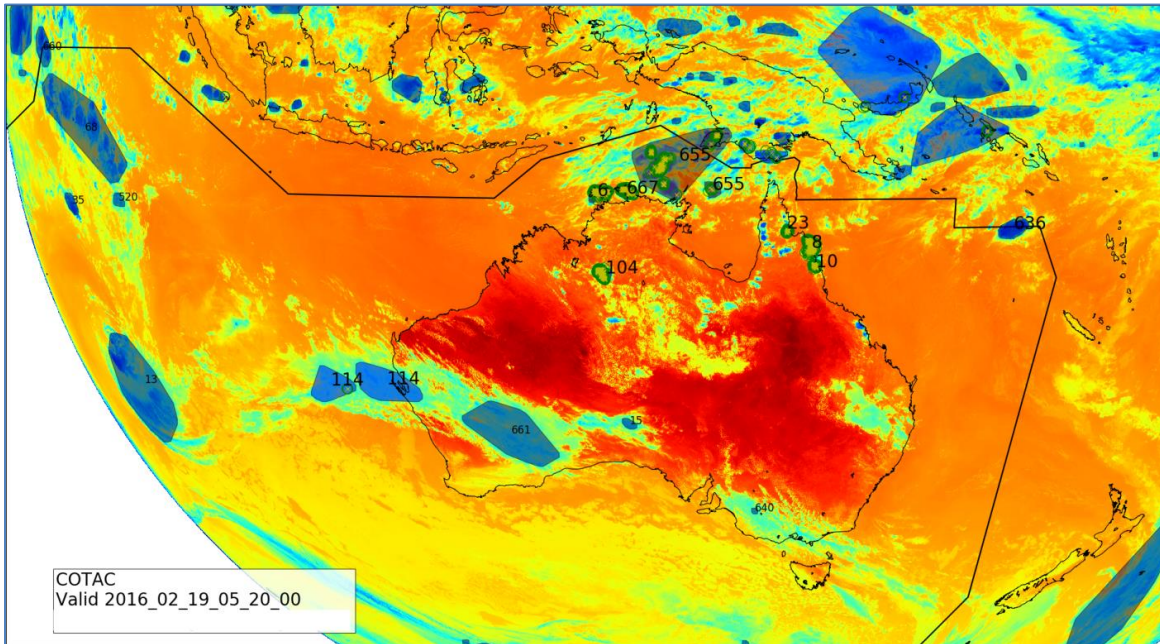
Figure 1: COTAC broad scale analysis (where blue polygons indicate potential TS SIGMET areas)
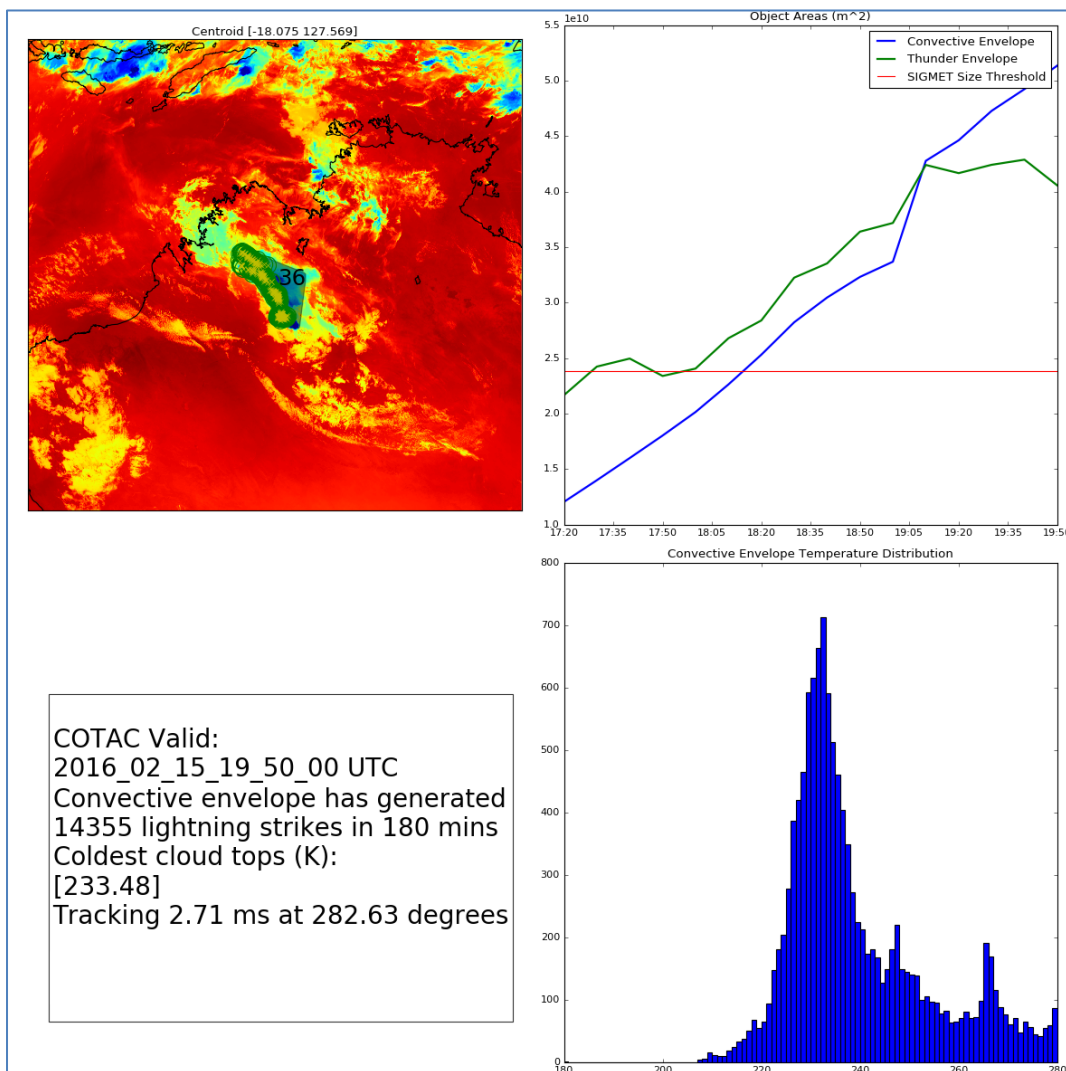

Figure 2: COTAC detailed guidance for a developing thunderstorm system

3.   CRITERIA FOR THUNDERSTORM SIGMETS

3.1   Criteria have been developed for thunderstorm SIGMETs to assist forecasters to make objective decisions around the issuance of thunderstorm SIGMETs. These criteria have been included in the COTAC software and are given in **Table 1**.

Phenomena	Issuance Criteria
Squall (SQL TS)	**ICAO Annex 3:** Recommendation – Squall line (SQL) should indicate a thunderstorm along a line with little or no space between individual clouds. **Australian criteria:** Thunderstorms along a line of about 100 nautical miles or more in length with little or no separation (less than 40 nautical miles) between clouds.
Frequent (FREQ TS)	**ICAO Annex 3:** Recommendation: An area of thunderstorms should be considered frequent (FRQ) if within that area there is little or no separation between adjacent thunderstorms with a maximum special coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon (at a fixed time during the period of validity). **Australian criteria:** An area of thunderstorms with little or no separation (less than 40 nautical miles) between adjacent storms and covering more than 75 per cent of the affected area. The area affected would be of the order of at least 3000 square nautical miles over land areas and at 7200 square nautical miles over oceanic regions.
Obscured (OBSC TS)	**ICAO Annex 3:** Recommendation: Obscured (OBSC) if it is obscured by haze or smoke or cannot be readily seen due to darkness. **Australian criteria:** Obscured (OBSC) by haze or smoke.
Embedded (EMBD TS)	**ICAO Annex 3:** Recommendation: Embedded (EMBD) if it is embedded within cloud layers and cannot be readily recognised. **Australian criteria:** Embedded (EMBD) within cloud layers and cannot be readily recognised. The area affected would be of the order of at least 3000 square nautical miles over land areas and at 7200 square nautical miles over oceanic regions.

Table 1: Thunderstorm SIGMET phenomena and criteria

4.   ACTION BY THE MEETING

4.1   The meeting is invited to:

a)   note the information contained in this paper; and

b)   discuss any relevant matters as appropriate.

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