*International Civil Aviation Organization*

**WORKING PAPER**

**Twenty-fifth Meeting of the Meteorology Sub-group (MET SG/25)**

Online, 18 – 22 October 2021

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**Agenda Item 5:** Research, development and other initiatives

# OUTCOME FROM A SIGMET COORDINATION CUM USER REQUIREMENTS WORKSHOP

(Presented by Hong Kong, China)

**SUMMARY**

This paper presents and summarizes the outcome of a SIGMET Coordination cum User Requirements Workshop organized by Hong Kong Observatory in late June 2021. It also presents the results of an interactive survey performed during the workshop which recommend for further actions to narrow the gaps between Meteorological Watch Offices practices and user expectations on SIGMET services.

## 1. INTRODUCTION

1.1 SIGMET Coordination has become a recommended practice on November 2020 under Amendment 79 on ICAO Annex 3. In MET/S WG/10 in 2020, an ad hoc group was formed under MET/S to coordinate on the next steps to promote integration and expansion of SIGMET coordination activities among States/Administration. Currently, there are various initiatives and projects in the APAC region working on regional SIGMET Coordination. In 2019, Conclusion MET SG/23-5 has endorsed the "APAC Regional guidance for the alignment of cross-FIR-boundary SIGMET information" as a reference for States and Organizations to be included in the Appendix L of APAC Regional SIGMET Guide.

1.2 In section 16 of the Appendix L of SIGMET Guide, it mentioned that the subjectivity inherited from weather forecasting would affect harmonization of SIGMET information and setting objective criteria for SIGMET issuance can enable consistency in SIGMET information. However, it also acknowledged that there is no one-size-fits-all guidance. Issuance criteria generally vary from region to region given that each region has its own unique weather, climate characteristics and challenges. In view of the above discussions, the HKO has organized a SIGMET Coordination cum user requirements workshop (the Workshop hereafter) in late June 2021 to seek user's views on the above issues.

## 2. DISCUSSION

SIGMET Coordination cum user requirements workshop

2.1 The Workshop was held virtually on 28 to 30 June 2021 at 04 to 07UTC using Microsoft Teams. 120 participants registered for the workshop with 87 from the meteorological community (including aviation forecasters, MWOs managers, etc) and 31 from the user community (including pilots, air traffic controllers, airline operators, etc). A total of 33 MWOs participated in the workshop. Representatives from the ICAO and the World Meteorological Organization (WMO) also joined.

2.2 The objectives of the workshop were:

- To better understand user requirements on en-route hazardous weather
- To collect user requirements via conducting online interactive survey and panel discussions
- To share forecast and warning practice of various hazardous weather
- To enhance mutual understanding between different MWOs

2.3 The Workshop began with invited talks by the ICAO, the WMO, and users including pilots, air traffic controllers and airline operators, setting the scene on the requirement and needs for SIGMET. An online interactive survey on the user requirements and issuance of SIGMET was then conducted. The survey was specifically designed in such a way that questions with similar context would be directed to both the users and MWOs so as to allow a direct comparison between the user requirements and the current SIGMET practices by MWOs. A total of 75 responses were received from the survey, with 26 from SIGMET users and 49 from MWOs.

2.4 To enhance mutual understanding among MWOs, 12 MWOs were invited to share their local forecasting and SIGMET coordination practices on Day 2 and Day 3 of the Workshop. Towards the end of the Workshop, a panel discussion was held to consolidate the findings and facilitate further discussion. Invited panellists were from Australia, Hong Kong China and Singapore.

2.5 The full report of the workshop was attached in the Appendix.

Outcome of the workshop

2.6 The interactive survey results brought some insights on what constitute SIGMET Coordination consensus. A comparison between the user perspective and MWO practice on the maximum acceptable difference between SIGMETs across FIRs was summarized in Table 1 of 2.5.1.1 of the Workshop report. It is noted that users appreciate potential difference in SIGMETs across FIR boundaries and do not require the contents to be exactly the same to be considered as acceptable. However, for the SIGMET issuance criteria, there was a larger gap between the user preference (Table 2 of 2.5.2.1 of the Workshop report) and the practices adopted by MWOs.

2.7 After the workshop, a feedback survey was conducted. There were a total of 25 respondents to the survey. 96% respondents rated the usefulness of the Workshop as Good/Excellent. All the respondents (100%) rated the online survey session and invited talks as Good/Excellent, some found the invited talks useful and suggested to increase the number of speakers and topics in future workshops. Around 85% respondents suggested similar workshops be hosted every 6 to 12 months. Overall speaking, the participants found the outcome of the Workshop useful.

2.8 Towards the end of the Panel discussion, it was concluded that the Workshop had successfully brought the MWOs and the users together. It also commented that through continual

dialogue with the users and neighbouring MWOs, mutual understanding can be enhanced for more harmonized SIGMET issuance to improve the SIGMET service in the APAC region.

2.9 In view of the discussion above, the meeting is invited to consider formulating the following Decision for the ad hoc group on SIGMET Coordination under MET/S WG:

***Decision MET SG/25/x: Further guidance on SIGMET Coordination in response to MWOs and users' expectations***

That, the MET SG supports continual dialogue between neighbouring MWOs and also between MWOs and end users to enhance mutual understanding and suggest MET/S to

(a) consider the outcome of the Workshop
(b) consider lessons learnt from SIGMET coordination activities in the Region
(c) discuss the need for further guidance to MWOs on SIGMET Coordination in response to MWOs and users' expectations.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to

a) Note the information contained in this paper,

b) Consider the outcome of the workshop,

c) Consider the Decision proposed in 2.9, and

d) Discuss any relevant matters as appropriate.

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Appendix: Full report for the SIGMET Coordination cum user requirements workshop

# REPORT ON

# SIGMET COORDINATION CUM USER REQUIREMENTS WORKSHOP

(Virtual meeting, 28 – 30 June 2021)

Hosted by

Hong Kong Observatory, Hong Kong, China

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# 1. INTRODUCTION

## 1.1 Background

1.1.1 The Amendment 79 to ICAO Annex 3 (effective since 5 November 2020) introduced the recommendation that meteorological watch offices (MWOs) should coordinate SIGMET with neighbouring MWOs. Prior to the Amendment, in response to Conclusion APANPIRG/26/62 on "Cross-border MET collaboration and Coordination", a number of SIGMET coordination arrangements had been ongoing in the region.

1.1.2 Hong Kong Observatory (HKO) hosted an online SIGMET (Significant Meteorological Information) Coordination cum User Requirements Workshop virtually on 28 to 30 June 2021. The Workshop was held from 0400 to 0700 UTC (with a 30 min break) daily virtually with the Microsoft Teams platform. This workshop aimed to facilitate SIGMET coordination through better alignment in SIGMET issuance practices among the MWOs and better understanding of user requirements, so as to improve SIGMET services to better support the aviation community in the region.

1.1.3 The specific objectives of the workshop include:

- To better understand user requirements on en-route hazardous weather
- To collect user requirements via conducting online interactive survey and panel discussions
- To share forecast and warning practice of various hazardous weather
- To enhance mutual understanding between different MWOs

## 1.2 Attendance

1.2.1 One hundred and twenty (120) participants registered for the workshop with eighty-seven (87) came from the meteorological community (including aviation forecasters, MWOs managers, etc). A list of the participating MWOs is attached in Appendix I. Another thirty-one (31) came from the user community (including pilots, air traffic controllers, airline operators, etc), one each from the International Civil Aviation Organization (ICAO) and World Meteorological Organization (WMO).

## 1.3 Program schedule

1.3.1 The Workshop was opened by Dr. CHENG Cho Ming, the Director of the Hong Kong Observatory (HKO). He welcomed the participants and reviewed the work of HKO on supporting SIGMET coordination in the APAC region since WMO launched the Pilot Project in 2015. Besides, he highlighted the uniqueness of the Workshop by bringing the users and the MWOs together

for facilitating SIGMET coordination and improving the SIGMET service. He thanked the invited speakers, panel members and presenters and wished the Workshop a success in contributing to harmonized SIGMET provision.

1.3.2 The first day of the Workshop included invited talks by ICAO, WMO, and users including pilots, air traffic controllers and airline operators. An interactive online survey on the user requirement and issuance of SIGMET was also conducted. The second day reviewed the survey results by comparing user requirements with MWO practices, then six MWOs were arranged to share their local forecasting and SIGMET coordination practice. The third day continued with the second part of MWO sharing and a panel discussion on the summary and insights from the Workshop.

1.3.3 The full program of the Workshop is attached in Appendix II.

## 2. OUTCOME FROM THE WORKSHOP

2.1 Summary of invited talks

2.1.1 Mr. Peter Dunda, ICAO APAC Regional Officer (MET), delivered a talk on "SIGMET service and its coordination – current status and future". He introduced the Recommendation 2/9 in 2014 Meteorology Divisional Meeting on the implementation of a regional advisory system for selected en-route hazardous meteorological conditions, the Conclusion APANPIRG/26/62 on "Cross-border MET collaboration and Coordination" and the Recommendation of SIGMET Coordination in 3.4.4 of ICAO Annex 3, in order to ensure the provision of harmonized SIGMET. He also introduced various SIGMET coordination activities in the APAC region and the guidelines on SIGMET Coordination in the Asia/Pacific Regional SIGMET guide.

2.1.2 Captain Henry Chan from the Hong Kong Airline Pilots Association (HKALPA) delivered a talk on "Pilot requirements on SIGMET service". He shared that SIGMETs were not able to obtain easily in the past, but with the introduction of electronic flight bag (EFB, HKO MyFlightWx app), SIGMETs affecting the flight path would be highlighted and shown visually to the pilots. He looked forward to the production of 4D SIGMETs and the real-time updates of SIGMETs in EFB via Wi-Fi uplink.

2.1.3 Mr. Anfernee Poon, the Project Officer of the Hong Kong Civil Aviation Department (HKCAD), delivered a talk on "ATC requirements on SIGMET service". He introduced the HKO Hazardous Weather Monitor Webpage, which displayed the real-time convective and non-convective SIGMETs on a GIS platform. In addition, he introduced the webpage of Significant Convection Monitoring and Forecast, which assisted the calculation of airport departure and arrival rate. He also demonstrated the ATC mode of operations and explained their future requirements.

2.1.4 Mr. Kelvin Poon, the Flight Dispatch Manager of Cathay Pacific Airways Ltd. and Captain James Toye, the Line Operations Manager of Cathay Pacific Airways Ltd., delivered a talk on "Airline requirements on SIGMET service". From airline operations perspective, they showed some flight tracking tools and explained how SIGMET was used in pre-dispatch, after dispatch and during flight operations. They also shared their experience of volcanic ash (VA) avoidance using VA SIGMETs and VA advisories, and pointed out their future SIGMET requirements.

2.1.5 Ms. Stéphanie Wigniolle, Scientific Officer from Services for Aviation, Services Department at WMO, delivered a talk on "International efforts on enhancing and coordinating SIGMET service". She shared that several initiatives on bilateral or multilateral coordination activities were launched to address the long-standing deficiencies of the global SIGMET service (including the lack of SIGMET and SIGMET inconsistencies across FIR (flight information region) boundaries). Besides, she also pointed out some key points for success in SIGMET coordination and the challenges that needed to be overcome.

2.2 Online survey on the user requirement and SIGMET issuance

2.2.1 An online interactive survey was conducted on the first day of the workshop using Surveysparrow. The survey focused on the user requirements of SIGMET service and MWOs usual practices on SIGMET issuance. The targeted participants were pilots, air traffic controllers, operational centre personnel and representatives from meteorological watch office (MWOs).

2.2.2 The survey covered the following hazardous weather phenomenon in relation to SIGMET:

- Part A: Background information
- Part B: WS SIGMET (Significant Convection)
- Part C: WS SIGMET (Turbulence)
- Part D: WS SIGMET (Icing)
- Part E: WC SIGMET (Tropical Cyclone TC)
- Part F: WV SIGMET (Volcanic Ash VA)

2.2.3 The survey was specifically designed in such a way that questions with similar context would be directed to both the user and MWO so as to allow a direct comparison between the user requirement and the current SIGMET practices by MWO. Note that this survey only address certain common issues observed from past SIGMET coordination experiences in the APAC region.

2.2.4 There were a total of seventy-five (75) respondents, with twenty-six (26) from SIGMET users and forty-nine (49) from MWOs. The detailed responses for each of the questions in the survey can be found in Appendix III.

2.2.5 Summary of the survey results

A) For WS SIGMET on Significant Convection,

- The majority of user and MWO responded that they interpret / formulate cloud top height in WS SIGMET as the “Maximum cloud top height of the CB (Cumulonimbus) area”. This suggests that user and MWO personnel erred more “on-the-safe-side” when using the cloud top height information in operations. Take note that 18% of the users and 28% of the MWOs took the information as the “average cloud top height of the CB area”.

- During en-route phase, 50% of the users prefers to receive a 30nm x 30nm ($0.5^o$ x $0.5^o$) sized WS SIGMET while 43% of the MWOs usually issue WS SIGMET of 60nm x 60 nm ($1.0^o$ x $1.0^o$) size. This suggests that most user demand more precise WS SIGMET.

- During terminal phase, user and MWO both prefers 30nm x 30nm to 60nm x 60nm sized WS SIGMET. It was found that more MWO would issue finer resolution of 30nm x 30nm sized SIGMET for the terminal area or airspace near aerodrome (31%) compared to that issued for en-route phase (4%).

- 46% of the users consider a gap of around 60nm (1.0°) between CB area a suitable distance for two separate SIGMETs while MWO adopts various practices - ranging from 60nm to 120nm as a gap. Only 6% of the MWOs would issue two separate SIGMETs with a small gap of 30nm.

- In respect of WS SIGMET on CB clouds across a FIR boundary, 61% of the users consider a cloud top height difference of less than 4000ft (< 40FL) be acceptable. Similar figure (65%) are found in MWO. For movement speed and direction, around half of the users surveyed accepts a speed difference of 10 kt (58%) and a direction difference of 45 degrees (50%). While similar percentage of MWOs (51%) consider a direction difference of 45 degrees as acceptable, around half of MWOs (50% ) consider the speed should agree to within 5kt.

B) For WS SIGMET on turbulence, MWOs who do not commonly issue severe turbulence SIGMETs are grouped as N/A. For the rest, it is found that:

- 42% of the users consider the effective horizontal extent of a turbulence report (PIREP/AMDAR) as 30nm while MWOs interpret it with a large spread of 30 nm to 90 nm.

- 38% and 31% of the users respectively consider the effective vertical extent of a turbulence report (PIREP/AMDAR) as 2000ft and 4000ft. 31% of the MWOs interpret it as 4000ft.

- In general, MWOs consider the effective extent of a turbulence report with a larger horizontal and vertical extent than the user's interpretation. This may suggest that MWOs erred more on the safe side.

- 54% of the users consider a difference of 2000ft in the respective height level in two SIGMETs regarding a turbulence phenomenon across a FIR boundary acceptable. MWOs have a large spread in this respect in their practices. This may suggest that additional guidance in the coordination of turbulence SIGMETs is required.

C) For WS SIGMET on icing, MWOs who do not commonly issue severe icing SIGMETs are grouped as N/A. For the rest, it is found that:

- 50% of the users consider the effective horizontal extent of an icing report (PIREP/AMDAR) as 60nm while there is a large spread in MWOs' interpretation, from 30 nm to 120 nm.

- 42% of the users consider the effective vertical extent of an icing report (PIREP/AMDAR) as 4000ft. Around 29% of the MWOs share the same view.

- 62% of the users prefer the size of a severe icing area in WS SIGMET to start from a size of 30nm x 30nm to 60nm x 60nm ($0.5^o$ x $0.5^o$ to $1.0^o$ x $1.0^o$) while 45% of the MWOs issue an area of 60nm x 60nm ($1.0^o$ x $1.0^o$) for severe Icing SIGMET.

- 42% of the users consider a difference of 2000ft in the respective height level in two SIGMETs regarding an icing phenomenon across FIR boundary acceptable. MWOs allows for a larger difference of 4000ft (27%), but only 31% of the users would consider this acceptable.

D) For WC SIGMET on tropical cyclone,

- 58% of the users prefer a WC SIGMET to be issued around 12 hours before a TC enters the FIR., i.e. the majority of the users prefers an early alert when significant weather is approaching the FIR. However, 39% of the MWOs issue SIGMET around 6 hours ahead and 31% of the MWOs only issue SIGMET when a TC enters the FIR.

- When two CB clouds associated with a TC inside a FIR, both user and MWO (~70%) prefer to issue a WC SIGMET with one CB cloud plus a WS SIGMET for the other CB cloud. This reveals that user prefers simpler SIGMETs that can be easily interpreted, rather than a complicated WC SIGMET.

- As for the way of describing the forecast element of WC SIGMET, it is found that both options, “forecast movement and speed” and “forecast position at validity end time”, are more or less equally used by MWOs and accepted by the users.

E) For WV SIGMET on volcanic ash,

- For the illustrative example of ash cloud crossing a FIR boundary, around 70% of the users prefer a forecast VA SIGMET with ash cloud inside one’s FIR boundary with an estimated time of ash cloud entering the FIR as the validity start time. This suggests that an estimated time crossing the FIR boundary derived from the volcanic ash advisory might be necessary.

2.3 <u>Sharing of local forecasting and SIGMET Coordination by MWOs</u>

2.3.1 To enhance mutual understanding between MWOs on the local forecast practices and SIGMET coordination, two sharing sessions by MWOs were arranged on Day 2 and 3. Twelve (12) MWOs (Cambodia, Guangzhou, Hong Kong, Sanya, Indonesia Jakarta, Indonesia Ujung Pandang, Maldives, Philippines, Singapore, Sri Lanka, Thailand, Vietnam) presented in the workshop.

2.3.2 In the presentations, MWOs shared their forecasting experiences and forecast products for issuing SIGMETs. They also shared their experiences in SIGMET coordination in the various groups, discussed the related issues and provided suggestions.

2.3.3 For the presentation materials, please access the link below. Consents have been granted by the presenters to share their presentation files with the participants.

Link (Username and Passcode protected):
http://sigmet.hko.gov.hk/ops-sigcoord/workshop-202106/Presentations.zip

## 2.4 Panel discussion

2.4.1 A panel discussion on SIGMET coordination practices was conducted towards the end of the workshop to consolidate the findings and facilitate further discussion. Panellists from Australia, Hong Kong China and Singapore were invited.

2.4.2 The panellists discussed the survey findings and pointed out the importance of understanding the gap between the user requirements and the MWO practices. They also pointed out the benefits of seeking a common practice on SIGMET issuance among the MWOs in the region, on top of the guidelines set out in ICAO Annex 3. In view of the diverse practices across the region, the guidelines should not be interpreted strictly to allow MWOs flexibility during the course of coordination.

2.4.3 The panel also pointed out one of the key points from the survey, namely, the temporal and spatial resolution in SIGMET issuance. There could be different requirements for flight routes under various air traffic condition (e.g. an arrival route near the aerodrome vs an oceanic route).

2.4.4 The panel also discussed the importance of improving the timeliness of the coordination, mutual understanding of operational practices, sharing of aircraft reports, sharing of forecast experience during regular review meetings among MWOs. Most of these could be achieved only via frequent communications between neighbouring MWO.

2.4.5 In addition, the panel also briefly discussed on the future SIGMET service, including promoting the tactical use of SIGMET and from areal information to trajectory-based information, the latter of which would be manifested in the SWIM environment with SIGMET in IWXXM format.

2.4.6 The panel concluded that continual dialogue with neighbouring MWOs and users would be the key for delivering aviation meteorological services that could suite for the fast-changing aviation environment.

2.5 Summary

2.5.1 Meaning of "Consensus"

2.5.1.1 As discussed in the Guidelines for operational SIGMET Coordination (Appendix L of ICAO Asia/Pacific Regional SIGMET Guide), to facilitate SIGMET coordination, a common understanding of what constitutes consensus should be established. Results of the online survey on this aspect, as summarized in Table 1 below, may elucidate some insight on this.

Table 1 Maximum acceptable difference between SIGMETs across FIRs

| | **User perspective** | **MWO practice** |
|---|---|---|
| **WS SIGMET – Significant Convection** | | |
| • Cloud top height | <4000 ft (65%) | <4000 ft (61%) |
| • Movement speed | <10 kt (58%) | <5 kt (49%) |
| • Movement direction | <45 degree (50%) | <45 degree (51%) |
| **WS SIGMET – turbulence** | | |
| • Height level | <2000 ft (54%) | Spread between 1000 – 5000 ft (18% each) |
| **WS SIGMET – icing** | | |
| • Height level | <2000 ft (42%) | <4000 ft (27%) |

2.5.1.2 It is of interest to note that users appreciate the potential difference in SIGMETs across FIR boundaries and do not require the contents to be exactly the same for them to be considered as acceptable. For WS SIGMET on significant convection, the practice generally adopted by MWOs (namely a cloud top height difference of less than 4000 ft, speed and direction of movement of 5-10 kt and 45 degree respectively) agree with the users or are even more stringent. For WS SIGMET for turbulence and icing, however, the users generally expect a height difference of less 2000 ft, generally more stringent than MWOs. Given that the vertical extent of turbulence is more difficult to identify with the existing meteorological equipment, the larger difference in value accepted by MWOs might in fact better reflect the uncertainty. Some user education might be required to understand the forecast uncertainty associated with different weather phenomena.

2.5.2 Issuance criteria

2.5.2.1 SIGMET coordination could be facilitated through better alignment in SIGMET issuance practices among the MWOs. Apart from subjectivity in the assessment of the weather situation, other factors such as climate characteristics, local considerations such as number of aircraft movement, size of the FIR, user requirements, etc would also affect the SIGMET issuance practices. The presentations by the MWOs and the results of the online survey, as summarized

in Table 2, would hopefully contribute toward narrowing the gap between different MWO practices and user preference as well as shortening the time for coordination.

Table 2 User Preference on SIGMET issuance

| **Phenomenon** | **Issuance criteria** | **User preference** |
|---|---|---|
| **Significant Convection** | Minimum dimension in Terminal area | 30nm x 30nm (46%) |
| | Minimum dimension En-route | 30nm x 30nm (50%) |
| | Minimum gap between two SIGMET areas | 60 nm (46%) |
| **Turbulence** | Horizontal extent based on report | 30 nm (42%) |
| | Vertical extent based on report | 2000 ft (38%) |
| **Icing** | Horizontal extent based on report | 60 nm (50%) |
| | Vertical extent based on report | 4000 ft (42%) |
| | Minimum dimension of an icing area | 30nm x 30 nm (31%)<br>60nm x 60 nm (31%) |
| **Tropical cyclone** | Hours before a TC of tropical storm or above intensity enters the FIR | 12 hours (56%) |

2.5.2.2 It is noted from the survey that there is a large difference in the user preference and the practice adopted by MWOs in the treatment of pilot reports. Continual dialogue with the user community would be required to increase the mutual understanding.

2.5.2.3 Apart from the above, it is further noted from the online survey that while WC SIGMET allows for inclusion of multiple CB areas associated with TC, user prefers having the WC SIGMET to cover only the core CB area of the TC and the WC SIGMET to cover the other CB areas.

## 3. CONCLUSION

3.1 This workshop had successfully brought the MWOs and users together. User requirements from various user groups were presented in the invited talks, online survey and follow-up discussions. Analysis between the user requirements/understandings and current MWOs' practices revealed potential areas for improvement in SIGMET service in the region. Continual dialogue with the users and neighbouring MWOs to improve mutual understanding would be useful for maturing more detailed guidelines on SIGMET issuance and SIGMET coordination to improve the overall SIGMET quality in the region.

**Appendix I List of participating Meteorological Watch Offices (MWOs)**

| | ICAO location indicator | MWO location |
|---|---|---|
| 1 | YBRF | Brisbane |
| 2 | YMRF | Melbourne |
| 3 | YMMC | Melbourne (World met centre, bureau of meteorology) |
| 4 | VDPP | Phnom-Penh |
| 5 | ZBAA | Beijing |
| 6 | ZGGG | Guangzhou |
| 7 | ZJHK | Haikou |
| 8 | ZUUU | Chengdu |
| 9 | VHHH | Hong Kong |
| 10 | NFFN | Nadi |
| 11 | VECC | Kolkata |
| 12 | VOMM | Chennai |
| 13 | VIDP | Delhi |
| 14 | VABB | Mumbai |
| 15 | WIII | Jakarta |
| 16 | WAAA | Ujung Pandang |
| 17 | WMKK | Kota Kinabalu |
| 18 | WMKK | Kuala Lumpur |
| 19 | VRMM | Male |
| 20 | ZMUB | Ulaan Baatar |
| 21 | VYYY | Yangon |
| 22 | NZKL | New Zealand |
| 23 | NZKL | Auckland Oceanic East |
| 24 | AYPY | Port Moresby |
| 25 | RPLL | Manila |
| 26 | RKSI | Incheon |
| 27 | WSSS | Singapore |
| 28 | AGGH | Honiara |
| 29 | VCBI | Colombo |
| 30 | VTBS | Bangkok |
| 31 | PHFO | Honolulu |
| 32 | VVGL | Ho Chi Minh |
| 33 | VVGL | Hanoi |

**Appendix II: Full program of the workshop**

## SIGMET Coordination cum Users' Requirements Workshop
## (hosted by Hong Kong Observatory, Hong Kong, China)
## Date: 28-30 Jun 2021 (04Z to 07Z)

<table>
<tr><th>Time (UTC)</th><th>Day 1</th><th>Time (UTC)</th><th>Day 2</th><th>Time (UTC)</th><th>Day 3</th></tr>
<tr><td rowspan="2">0400-0415</td><td rowspan="2">Opening and Introduction</td><td rowspan="2">0400-0415</td><td rowspan="2">Opening remarks</td><td>0400-0405</td><td>Opening remarks</td></tr>
<tr><td>0405-0415</td><td>Sharing by Maldives MWO</td></tr>
<tr><td rowspan="2">0415-0430</td><td rowspan="2">ICAO invited talk<br>"SIGMET service and its coordination - current status and future"<br>by Mr. Peter Dunda, ICAO APAC Regional Officer (MET)</td><td rowspan="6">0415-0515</td><td rowspan="6">Review and discuss the survey results</td><td>0415-0425</td><td>Sharing by Philippines MWO</td></tr>
<tr><td>0425-0435</td><td>Sharing by Singapore MWO</td></tr>
<tr><td>0430-0445</td><td>Invited talk<br>"Pilot requirements on SIGMET service"<br>by Captain Henry Chan, HKALPA</td><td>0435-0445</td><td>Sharing by Sri Lanka MWO</td></tr>
<tr><td>0445-0500</td><td>Invited talk<br>"ATC requirements on SIGMET service"<br>by Mr. Anfernee Poon, Project Officer, Civil Aviation Department, Hong Kong, China</td><td>0445-0455</td><td>Sharing by Thailand MWO</td></tr>
<tr><td rowspan="2">0500-0515</td><td rowspan="2">Invited talk<br>"Airline requirements on SIGMET service"<br>by Mr. Kelvin Poon and Mr. James Toye, Line Operations Manager, Cathay Pacific</td><td>0455-0505</td><td>Sharing by Vietnam MWO</td></tr>
<tr><td>0505-0515</td><td>Q&A</td></tr>
<tr><td>0515-0545</td><td>Break</td><td>0515-0545</td><td>Break</td><td>0515-0545</td><td>Break</td></tr>
<tr><td rowspan="4">0545-0630</td><td rowspan="4">Interactive online survey on the user requirement and issuance of SIGMET</td><td>0545-0555</td><td>Sharing by Cambodia MWO</td><td rowspan="5">0545-0645</td><td rowspan="5">Panel discussion on SIGMET Coordination practices</td></tr>
<tr><td>0555-0605</td><td>Sharing by Guangzhou MWO</td></tr>
<tr><td>0605-0615</td><td>Sharing by Hong Kong MWO</td></tr>
<tr><td>0615-0625</td><td>Sharing by Sanya MWO</td></tr>
<tr><td rowspan="2">0630-0645</td><td rowspan="2">WMO invited talk<br>"International efforts on enhancing and coordinating SIGMET service"<br>by Ms. Stéphanie Wigniolle, Scientific Officer, Services for Aviation, Services Department, WMO</td><td>0625-0635</td><td>Sharing by Indonesia Jakarta MWO</td></tr>
<tr><td>0635-0645</td><td>Sharing by Indonesia Ujung Pandang MWO</td></tr>
<tr><td>0645-0700</td><td>Q&A</td><td>0645-0700</td><td>Q&A</td><td>0645-0700</td><td>Evaluation and Closing Remarks</td></tr>
</table>

*Panellists on Day 3 Panel discussion: Mr. Craig Ryan, Aviation Operations Delivery Lead, Bureau of Meteorology Australia; Dr. Li Ping Wah, Senior Scientific Officer, Hong Kong Observatory; and Mr. Wong Songhan, Acting Branch Head (Forecast Operations Department), Meteorological Service Singapore

**Appendix III:**

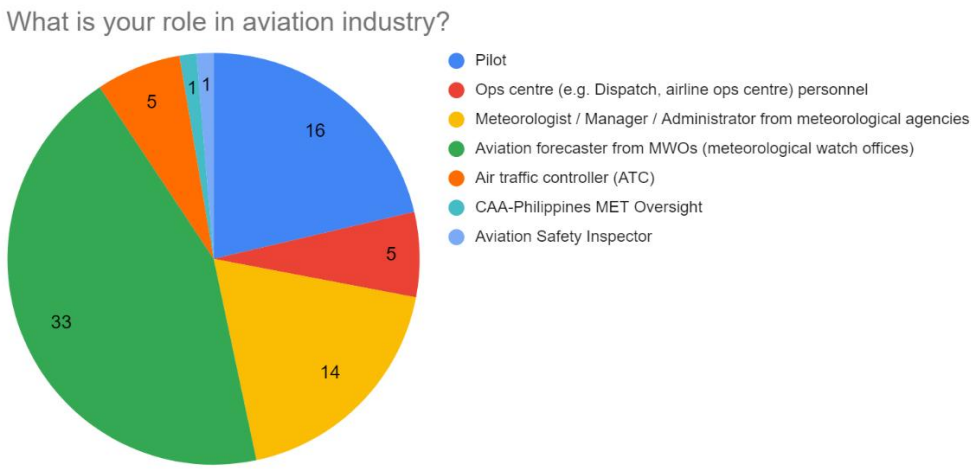
**Survey result on the user requirement and SIGMET issuance**

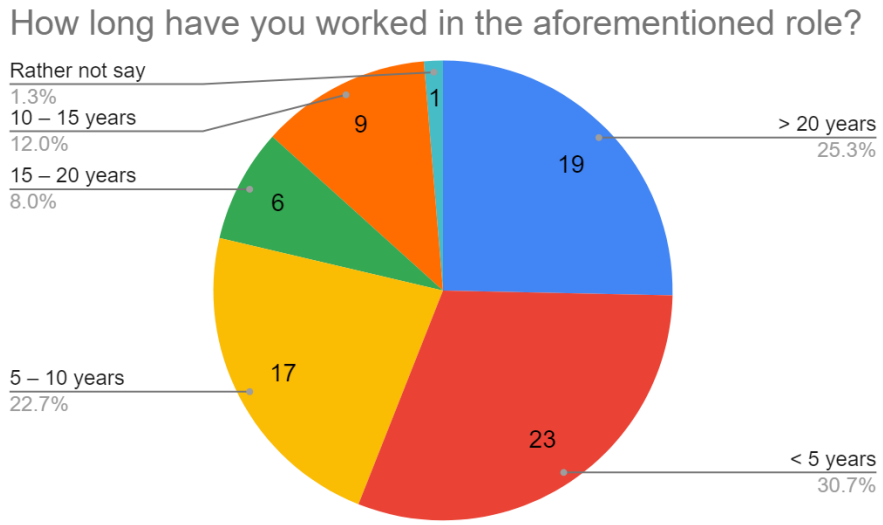
Part A: Background information

1) What is your role in aviation industry?
   A) Air traffic controller (ATC)
   B) Pilot
   C) Aviation forecaster from MWOs (meteorological watch offices)
   D) Meteorologist / Manager / Administrator from meteorological agencies
   E) Ops centre (e.g. Dispatch, airline ops centre) personnel
   F) Others (please specify):
   _____

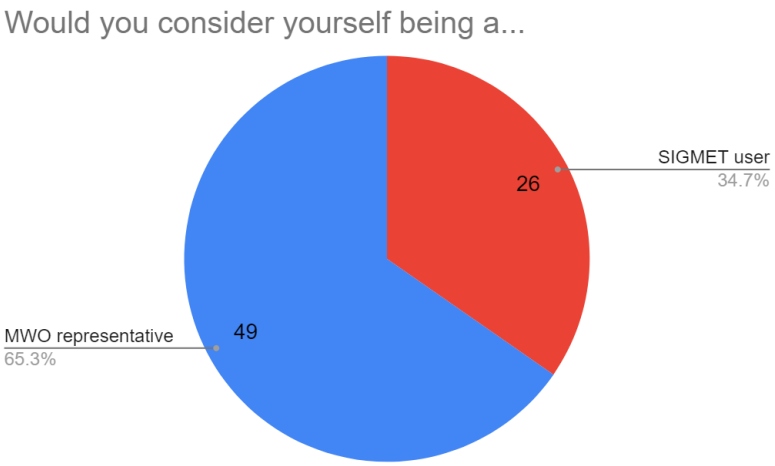
2) How long have you worked in the aforementioned role?
   A) < 5 years
   B) 5 – 10 years
   C) 10 – 15 years
   D) 15 – 20 years
   E) > 20 years
   F) Rather not say

3) What is your company/organisation?
   (Only used for statistics and would not be disclosed.)



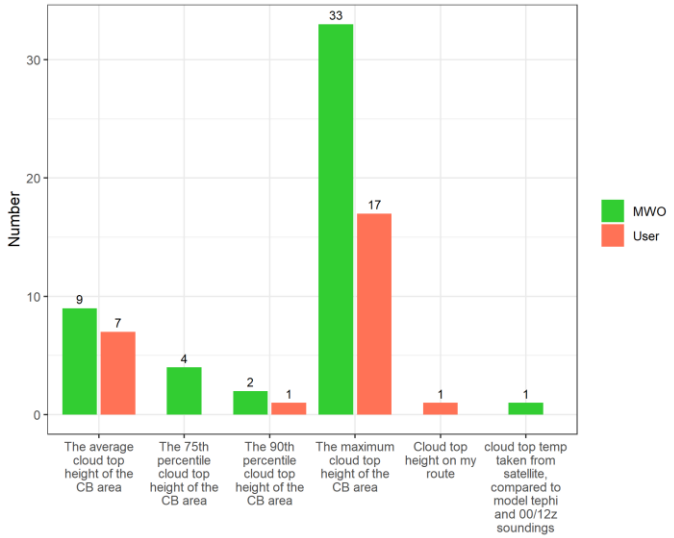



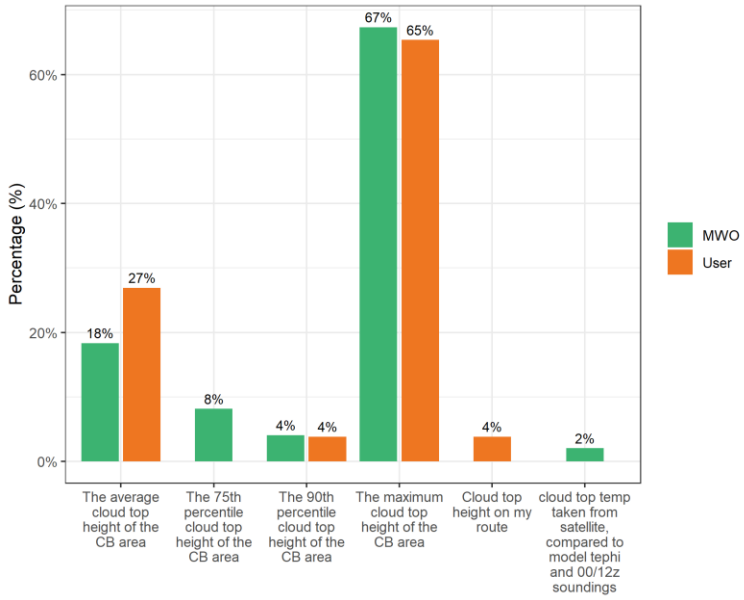
4) Would you consider yourself being a...
   A) SIGMET user: using SIGMET issued by MWOs during your operations
   B) MWO representative: how to issue SIGMET is more of your concern



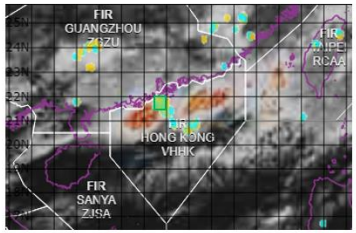
Part B: WS SIGMET (Significant Convection)

5) **User**: How do you interpret the cloud top height information in WS SIGMET during your operations?
**MWO**: Which cloud top height information is used in formulating your WS SIGMET?
   A) The average cloud top height of the CB area
   B) The 75th percentile cloud top height of the CB area
   C) The 90th percentile cloud top height of the CB area
   D) The maximum cloud top height of the CB area
   E) Others (please specify):
   _____

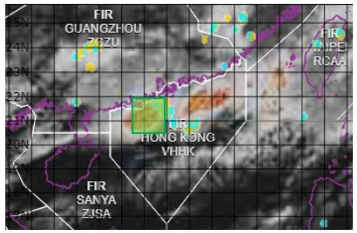


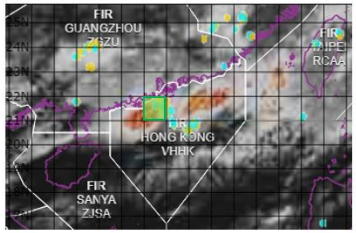
6) **User**: During en-route phase, what is the minimum size of a convection area that you would consider significant to your operations (e.g. flight diversion)?
**MWO**: For en-route airspace, how large a convection area would you consider to be significant and require issuing SIGMET?



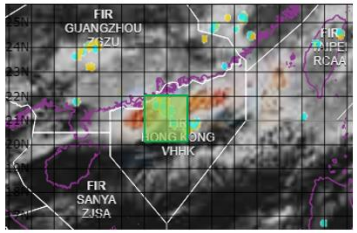

30 nm x 30 nm




90 nm x 90 nm



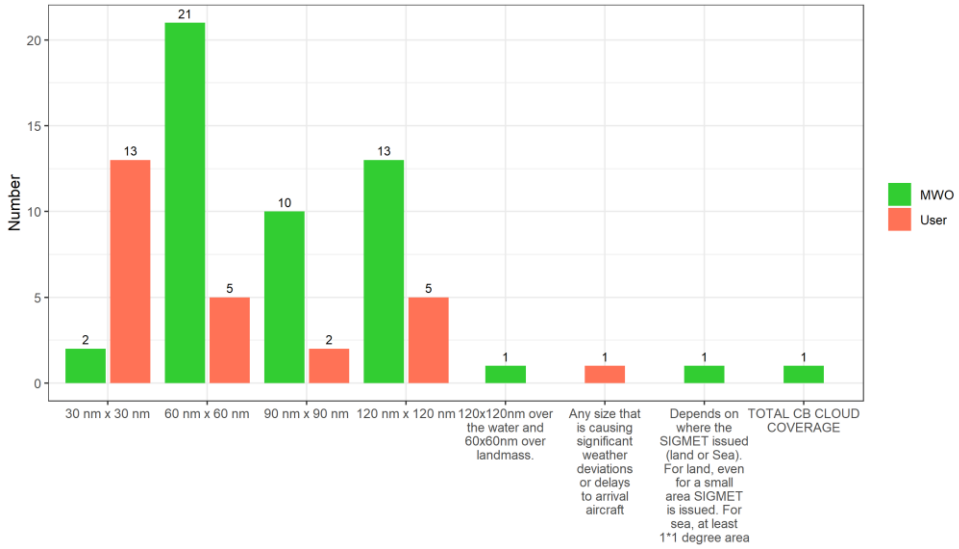

60 nm x 60 nm

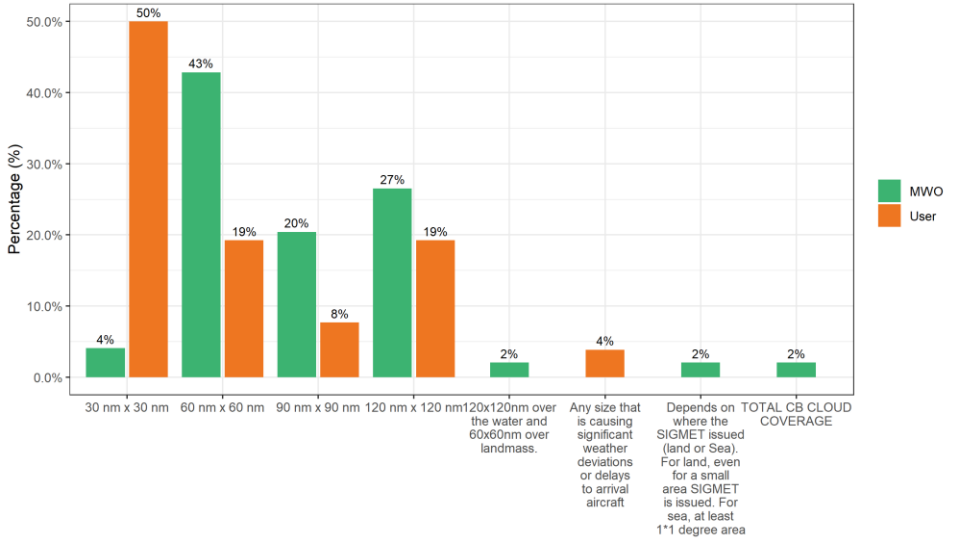



120 nm x 120 nm

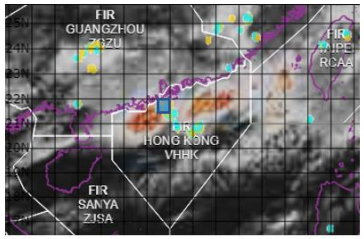
A) 30 nm x 30 nm
B) 60 nm x 60 nm
C) 90 nm x 90 nm
D) 120 nm x 120 nm
E) Others (please specify):

_____

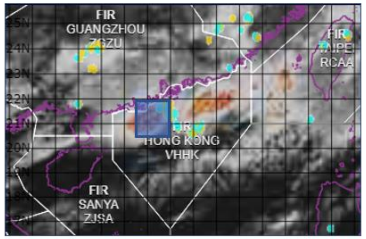


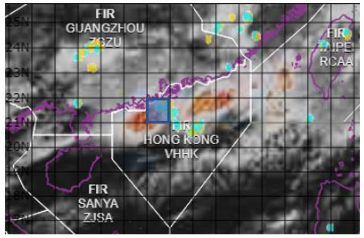
7) **User**: Within terminal area or airspace near aerodrome, what is the minimum size of the convection area that you would consider significant to your operations (e.g. flight diversion)?
**MWO**: Within terminal area or airspace near aerodrome, how large a convection area would you consider to be significant and require issuing SIGMET?



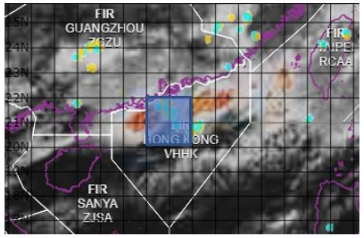

30 nm x 30 nm




90 nm x 90 nm

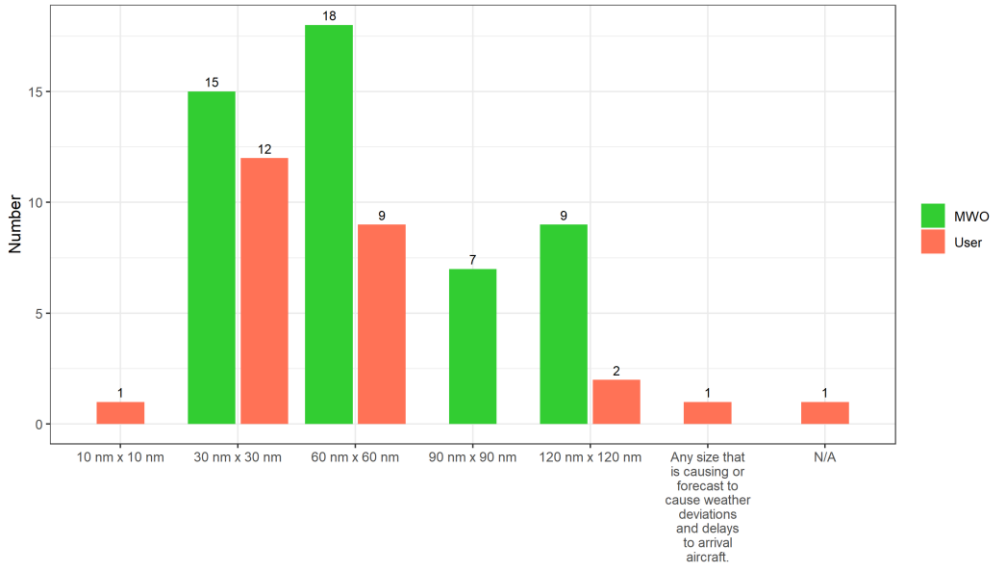


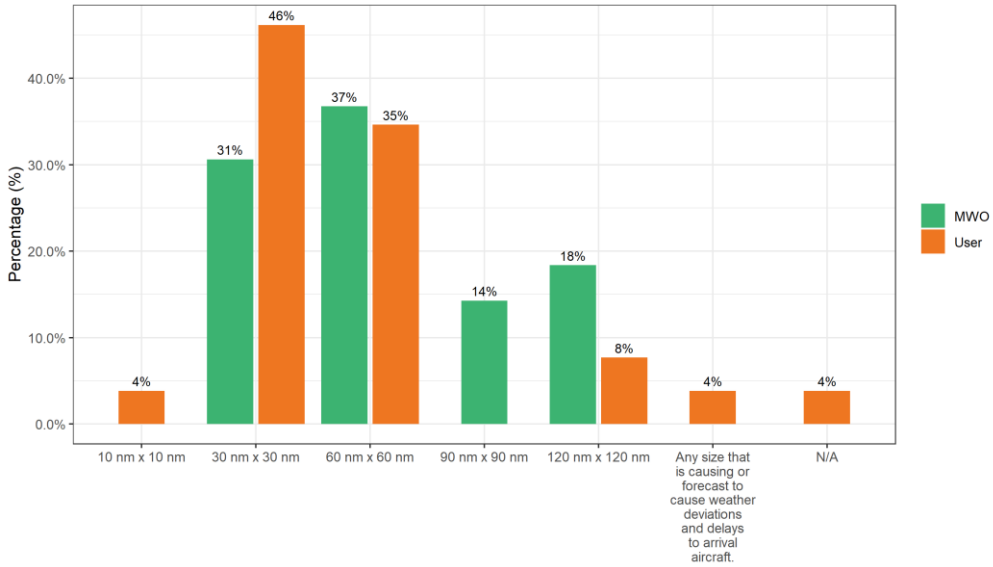

60 nm x 60 nm



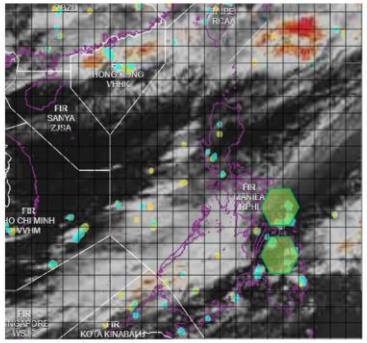

120 nm x 120 nm

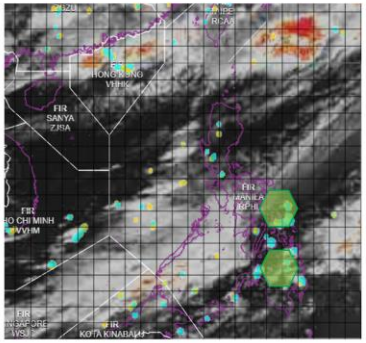
A) 30 nm x 30 nm
B) 60 nm x 60 nm
C) 90 nm x 90 nm
D) 120 nm x 120 nm
E) Others (please specify):
_____

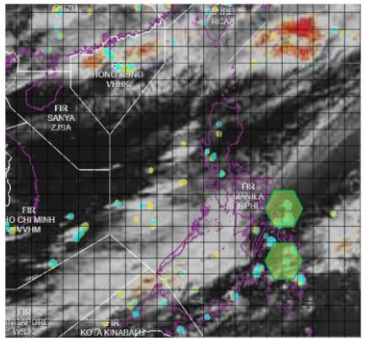


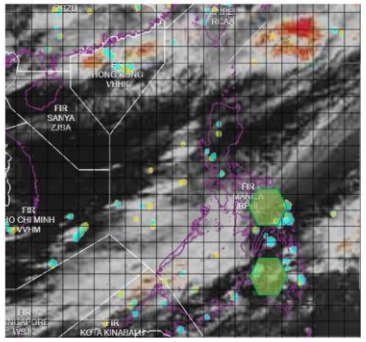



8) **User:** How large is the gap between two CB areas that you would consider significant that issuance of two separate SIGMETs are required?
**MWO:** How large is the gap between two CB areas that you would usually issue two separate SIGMETs?

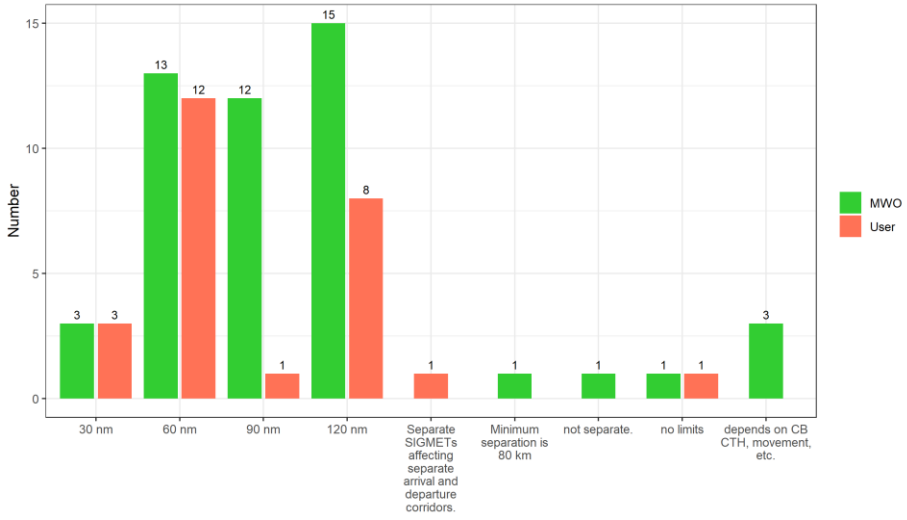


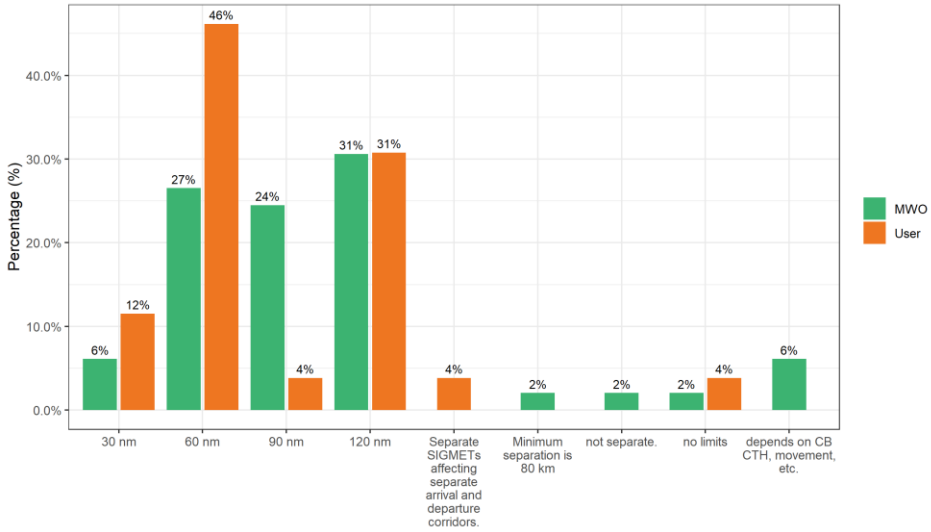




A) 30 nm
B) 60 nm
C) 90 nm
D) 120 nm
E) Others (please specify):
_____



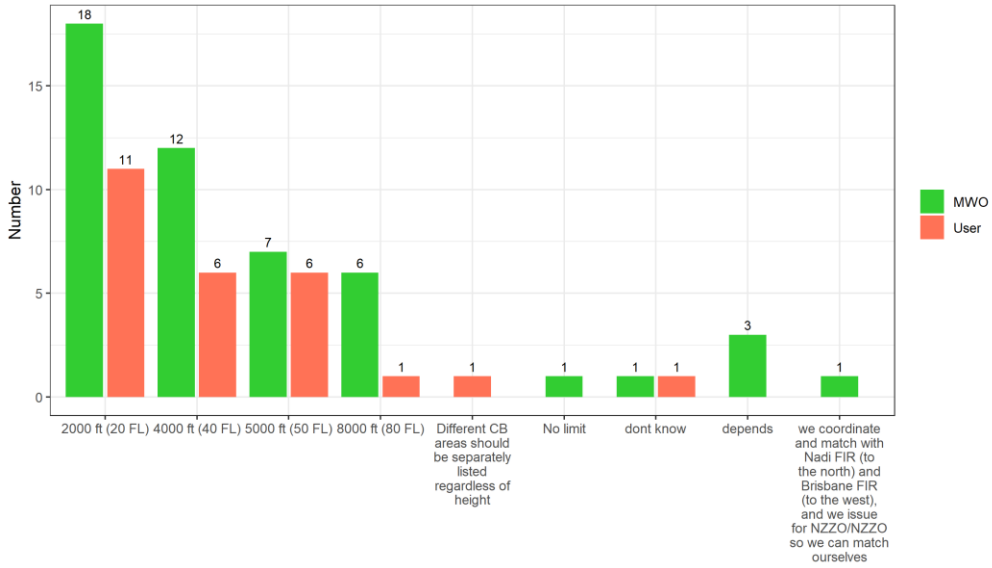



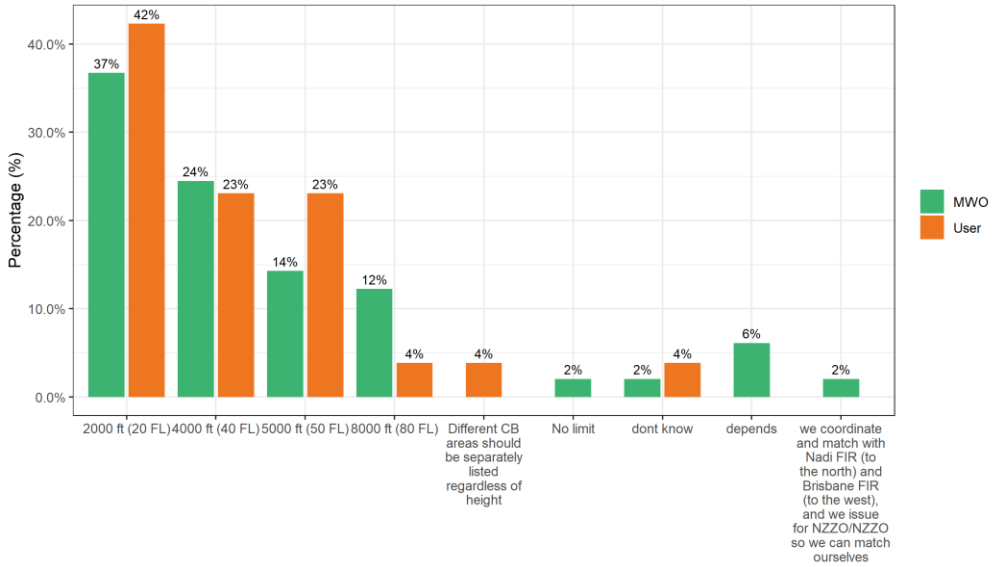

9) **User**: What is the allowance in difference in cloud top height of one CB area across the flight information region (FIR) boundary?

**MWO**: What is the usual difference in cloud top height of one CB area across FIR boundary when coordinating your SIGMET?

A) 2000 ft (20 FL)
B) 4000 ft (40 FL)
C) 5000 ft (50 FL)
D) 8000 ft (80 FL)
E) Others (please specify):

_____

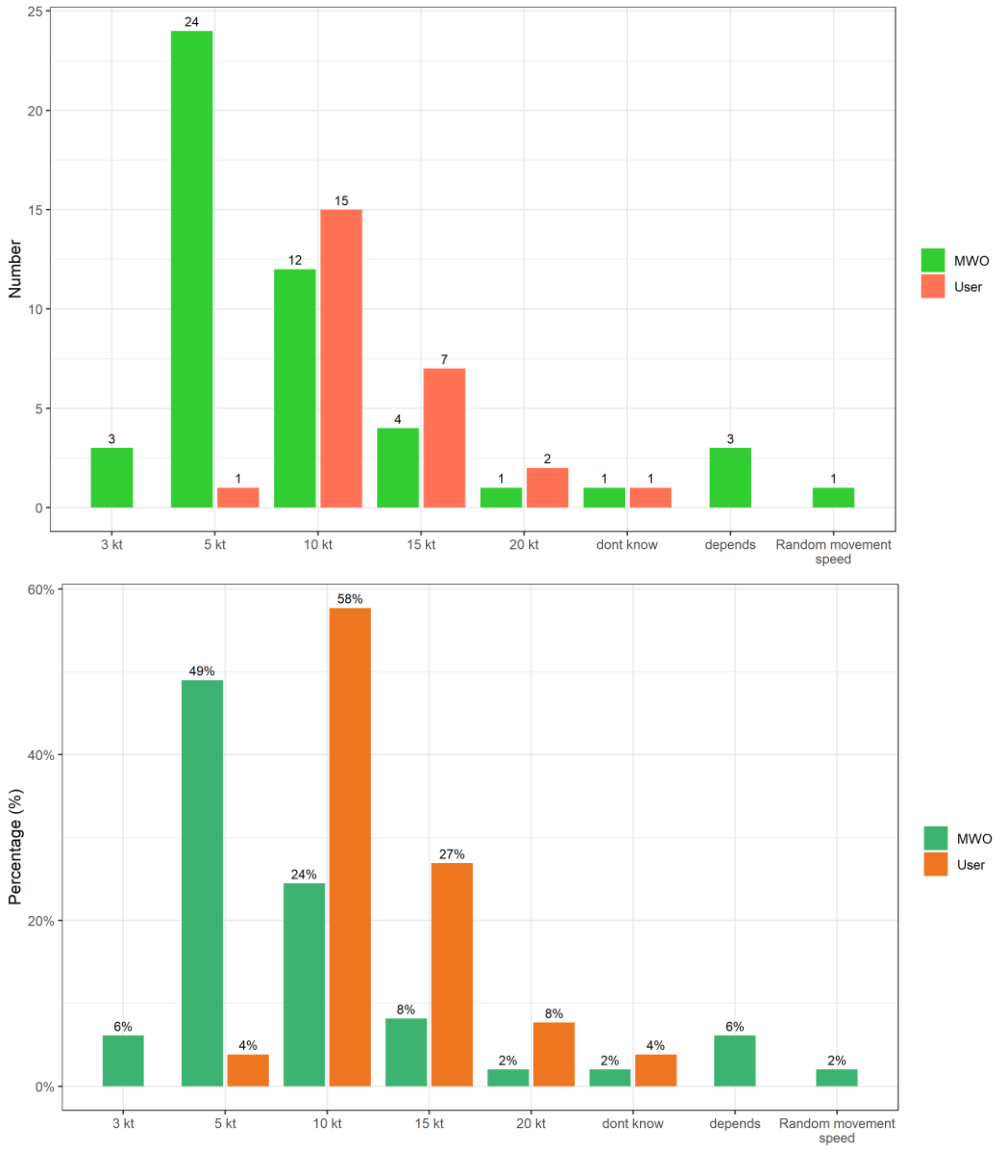


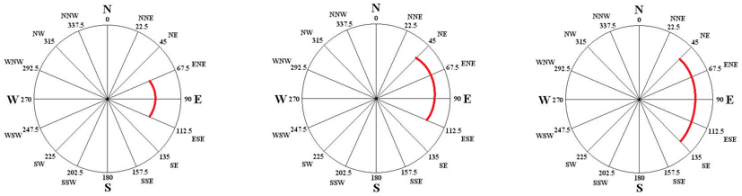
10) **User**: What is the allowance in difference in the movement speed of one CB area across the FIR boundary?
**MWO**: What is the usual difference in the movement speed of one CB area across FIR boundary when coordinating your SIGMET?

A) 5 kt
B) 10 kt
C) 15 kt
D) 20 kt
E) Others (please specify):

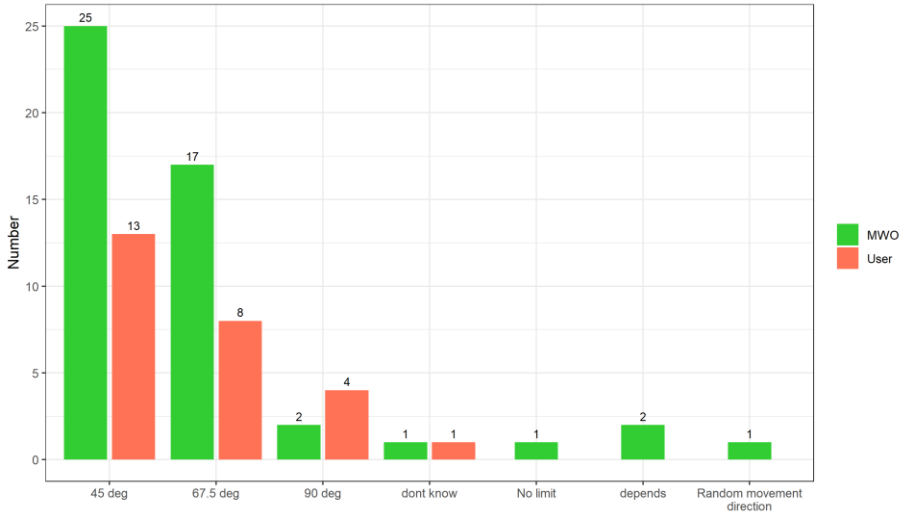
_____

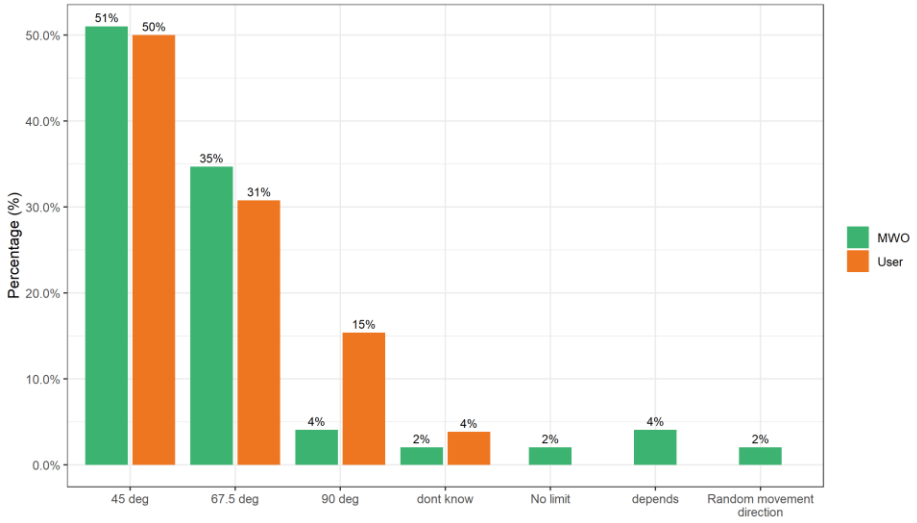


11) **User**: What is the allowance in difference in the movement direction of one CB area across the FIR boundary?
**MWO**: What is the usual difference in the movement direction of one CB area across FIR boundary when coordinating your SIGMET?



A) 45 deg
B) 67.5 deg
C) 90 deg
D) Others (please specify):
_____



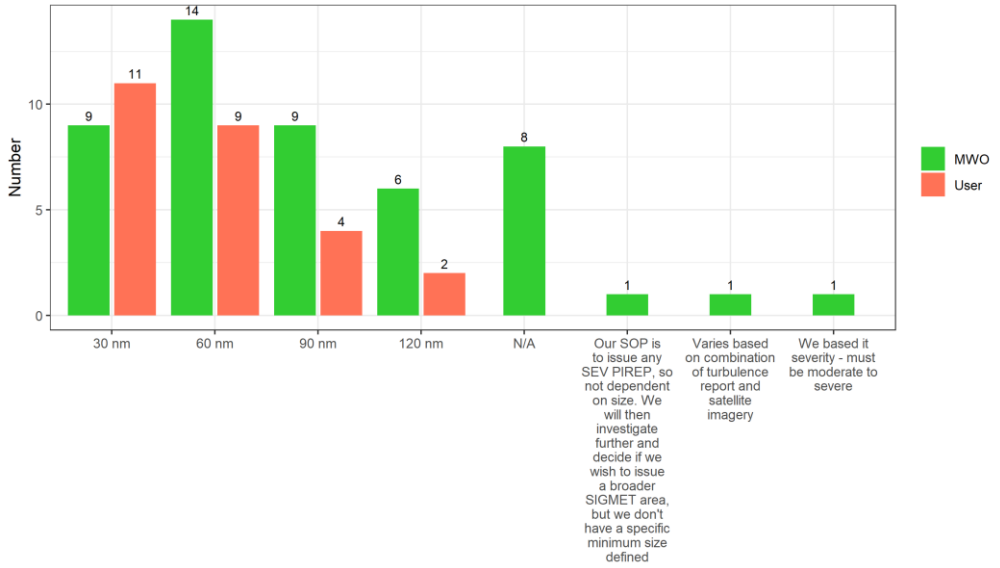



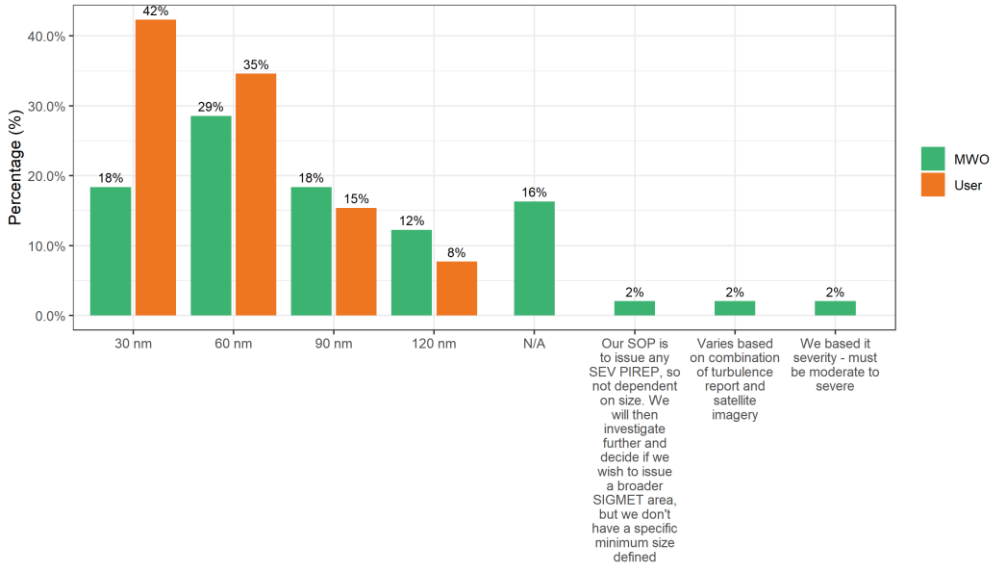

Part C: WS SIGMET (Turbulence)

12) **Both:** What would you see as the horizontal extent of the SIGMET warning area based purely on a turbulence report (e.g. PIREP/AMDAR)?

A) 30 nm
B) 60 nm
C) 90 nm
D) 120 nm
E) Others (please specify):

_____

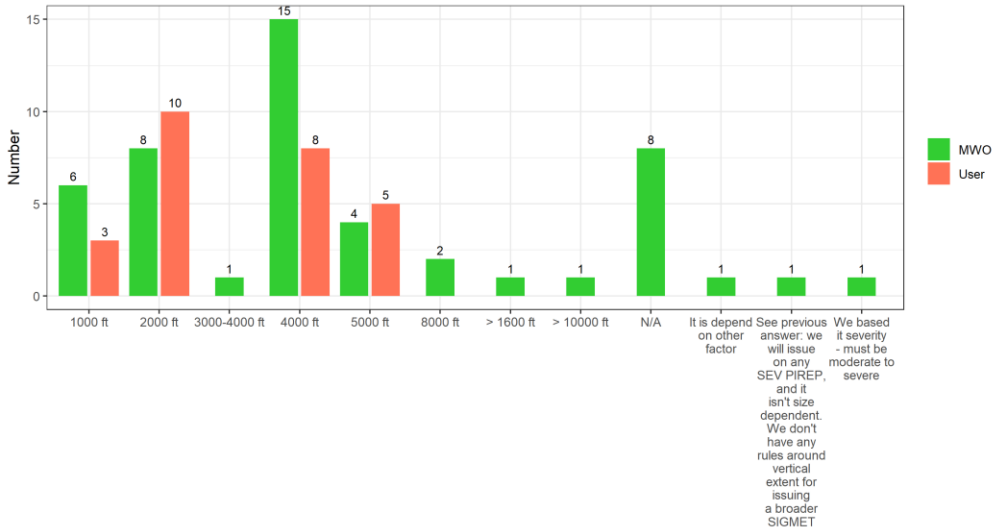


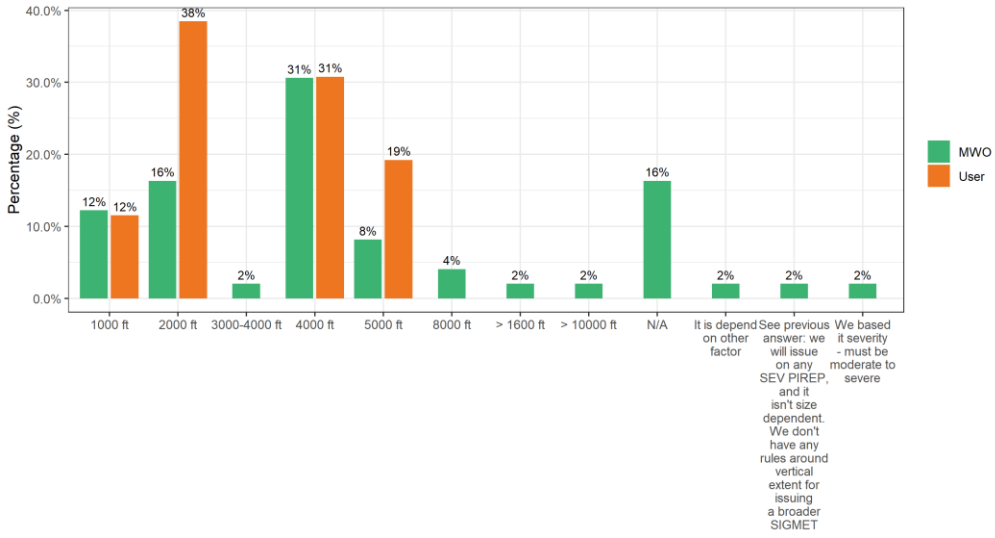



13) **Both:** What would you see as the vertical extent of the SIGMET warning area based purely on a turbulence report (e.g. PIREP/AMDAR)?

A) 1000 ft (10 FL)
B) 2000 ft (20 FL)
C) 4000 ft (40 FL)
D) 5000 ft (50 FL)
E) Others (please specify):

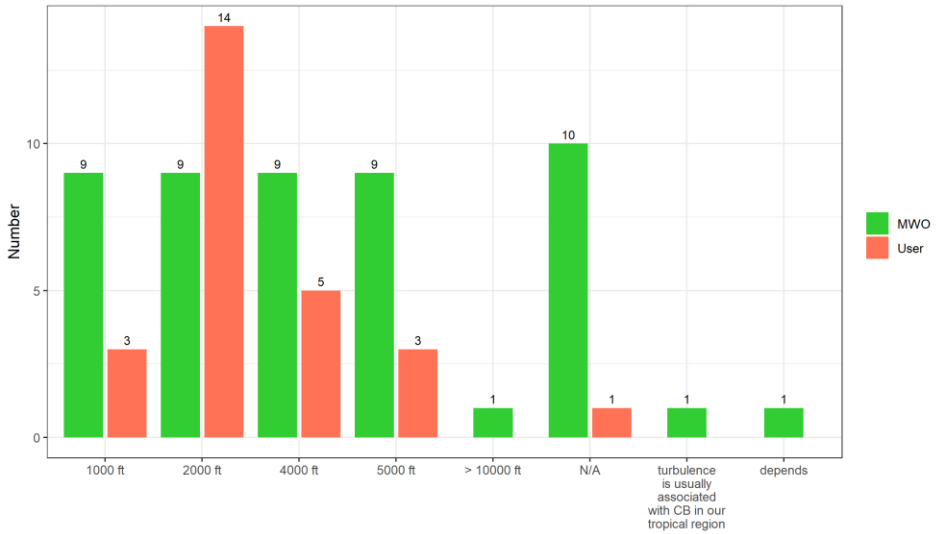
_____

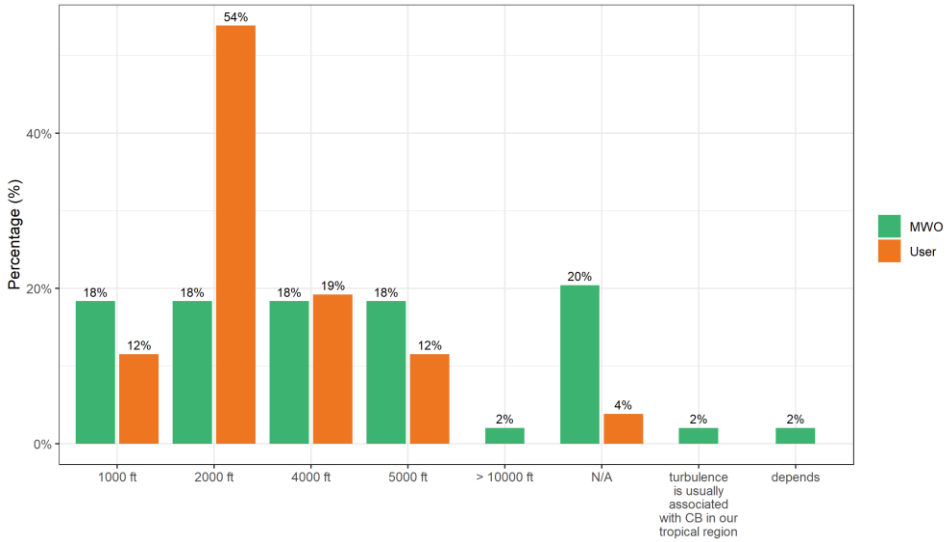


14) **User**: What is the allowance in height difference in turbulence SIGMETs across the FIR boundary?
**MWO**: What is the usual height difference in turbulence SIGMETs across FIR boundary when coordinating your SIGMET?

A) 1000 ft (10 FL)
B) 2000 ft (20 FL)
C) 4000 ft (40 FL)
D) 5000 ft (50 FL)
E) Others (please specify):
_____



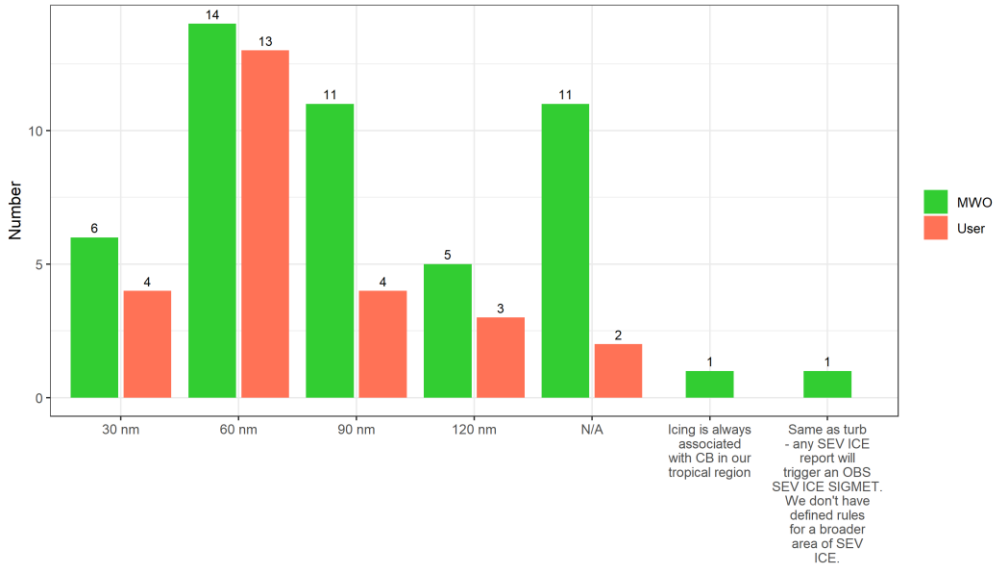



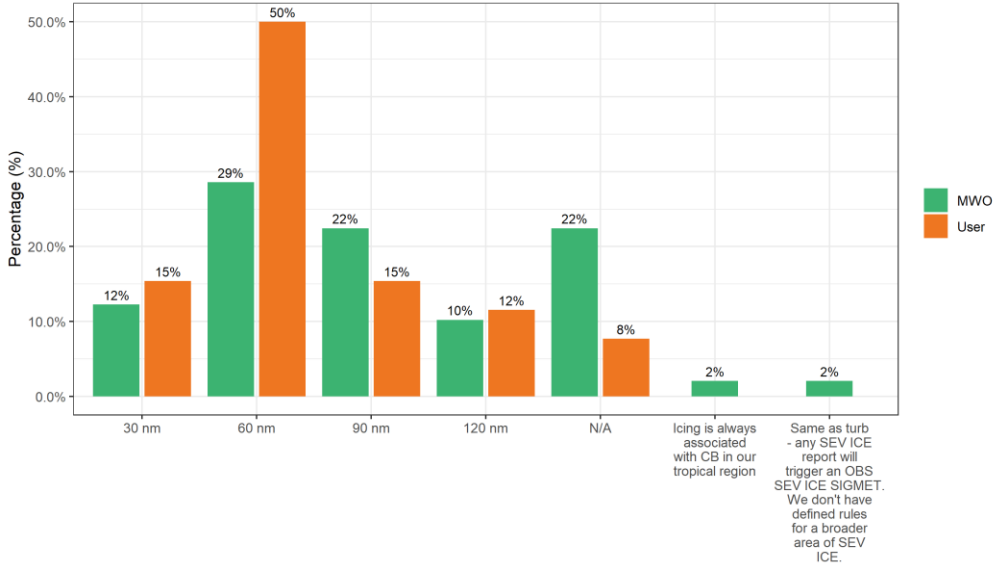
Part D: WS SIGMET (Icing)

15) **Both:** What would you see as the horizontal extent of the SIGMET warning area based purely on an icing report (e.g. PIREP/AMDAR)?

A) 30 nm
B) 60 nm
C) 90 nm
D) 120 nm
E) Others (please specify):

_____

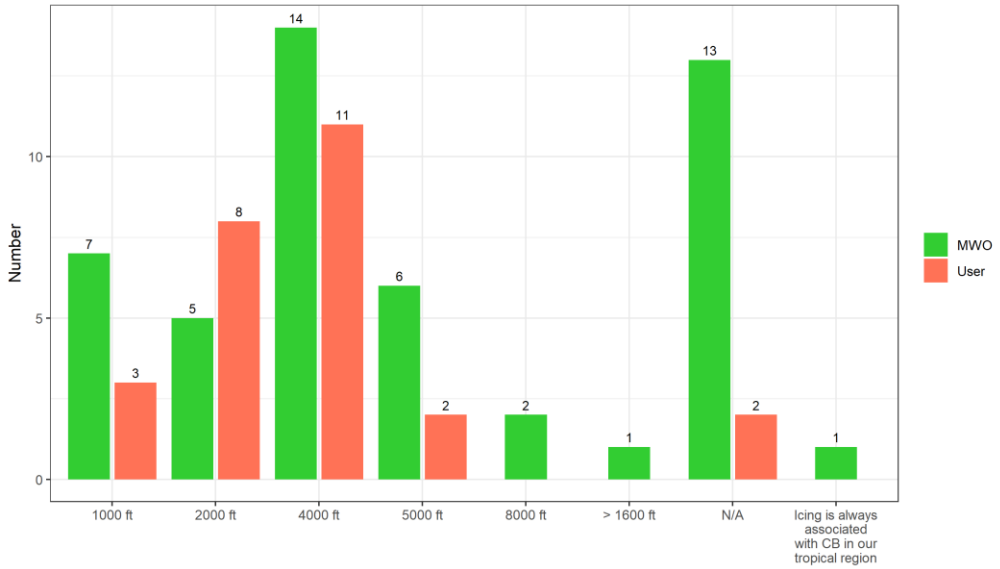


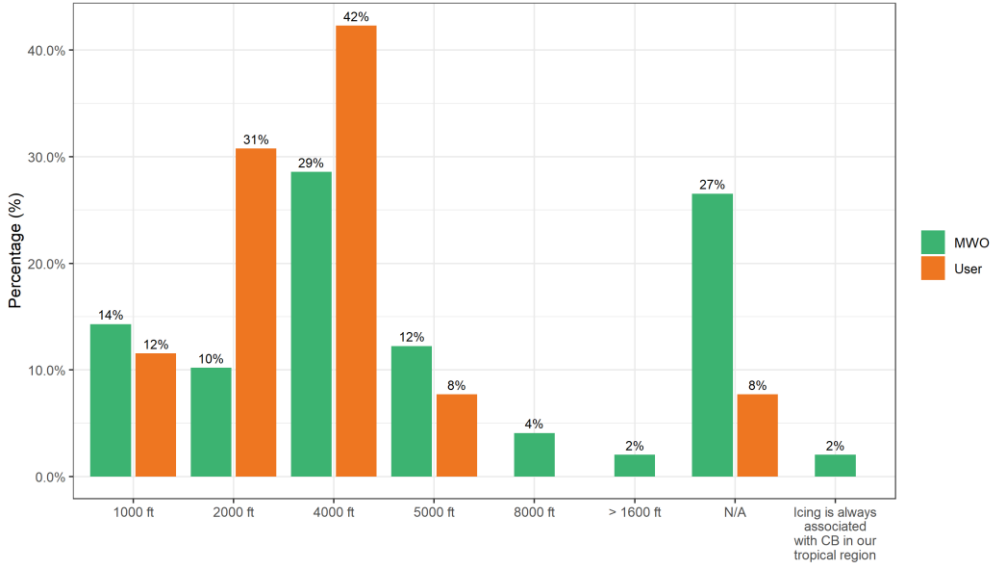



16) **Both:** What would you see as the vertical extent of the SIGMET warning area based purely on an icing report (e.g. PIREP/AMDAR)?

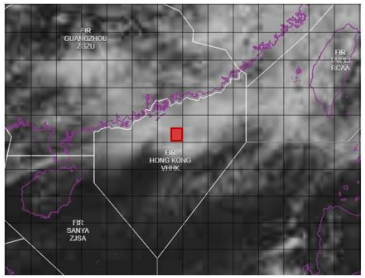
A) 1000 ft (10 FL)
B) 2000 ft (20 FL)
C) 4000 ft (40 FL)
D) 5000 ft (50 FL)
E) Others (please specify):

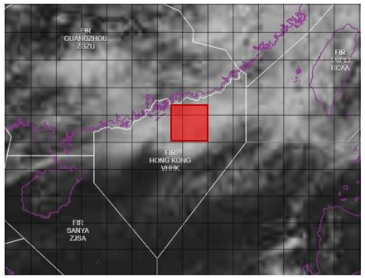
_____

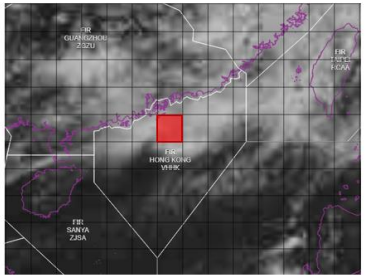


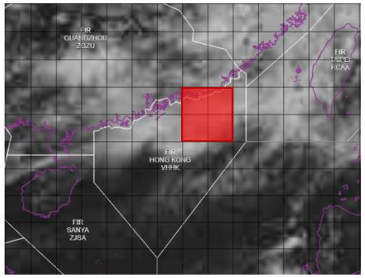



17) **User**: What is the size of an icing area (Severe) that you would consider significant to your operations?
**MWO**: What size of an icing area (Severe) would require you to issue SIGMET?


30 nm x 30 nm

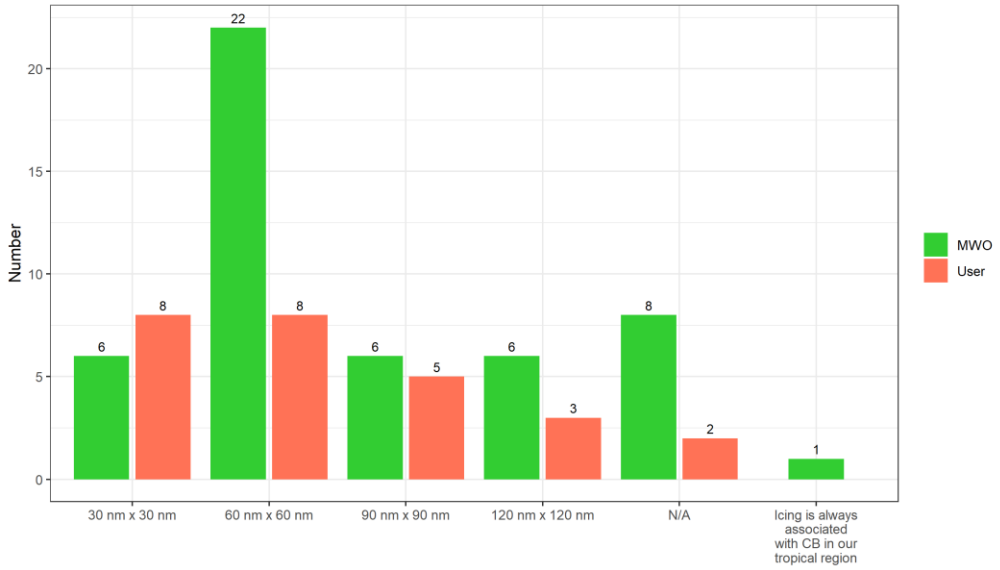

90 nm x 90 nm

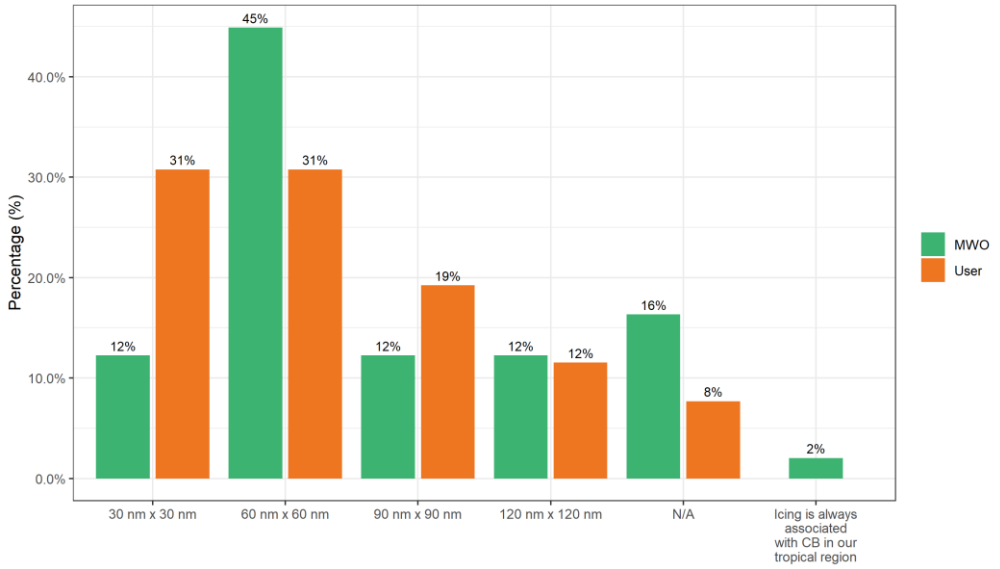

60 nm x 60 nm


120 nm x 120 nm

A) 30 nm x 30 nm
B) 60 nm x 60 nm
C) 90 nm x 90 nm
D) 120 nm x 120 nm
E) Others (please specify):

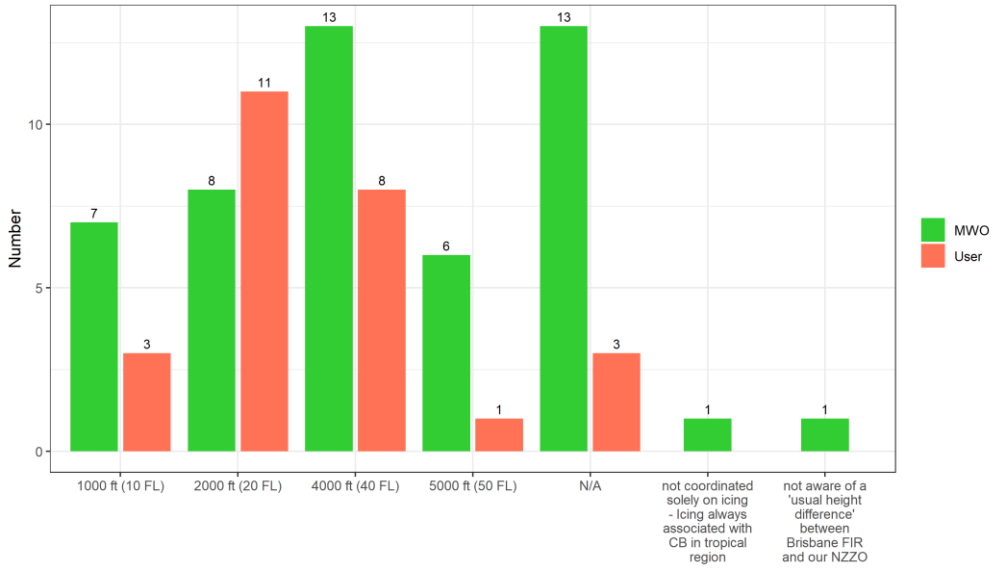
_____

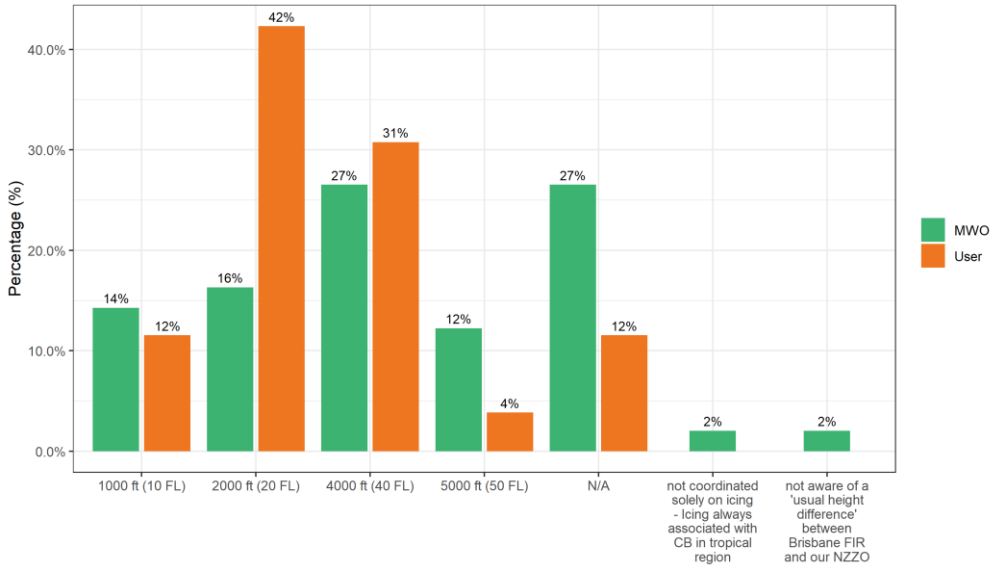


18) **User**: What is the allowance in height difference in icing SIGMETs across FIR?
**MWO**: What is the usual height difference in icing SIGMETs across FIR boundary when coordinating your SIGMET?

A) 1000 ft (10 FL)
B) 2000 ft (20 FL)
C) 4000 ft (40 FL)
D) 5000 ft (50 FL)
E) Others (please specify):
_____



Part E: WC SIGMET (Tropical Cyclone TC)

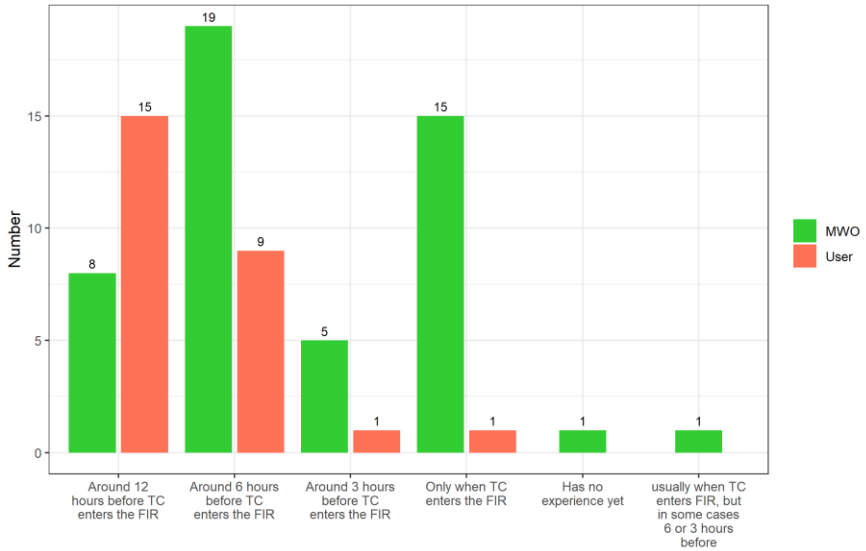
19) According to ICAO Annex 3, *"in the special case of SIGMET messages for tropical cyclones, these messages shall be issued as soon as practicable but not more than 12 hours before the commencement of the period of validity"*.

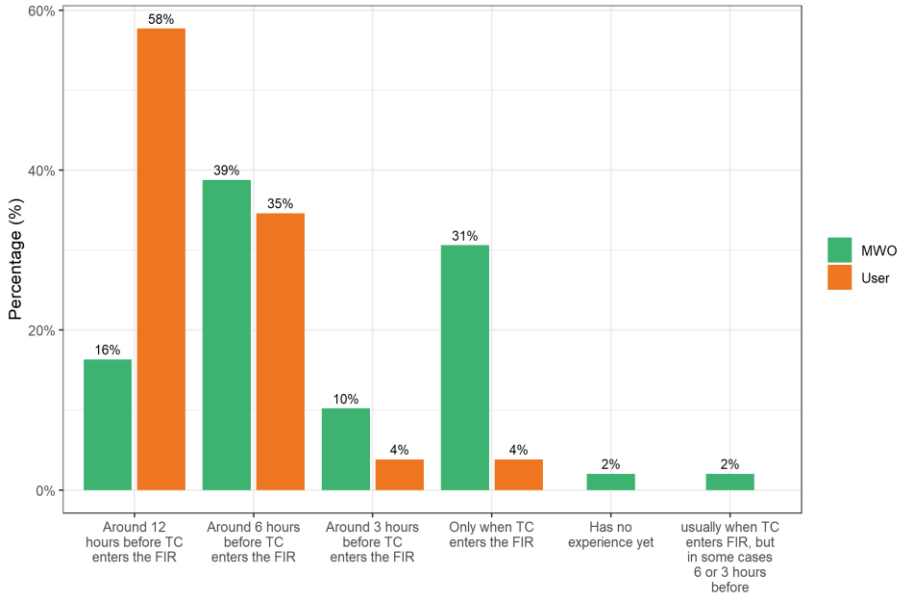
**User**: What is your preferred issuance time of a WC SIGMET for a TC approaching a FIR to facilitate smooth operations?

**MWO**: When would you usually issue a WC SIGMET for a TC approaching your FIR?

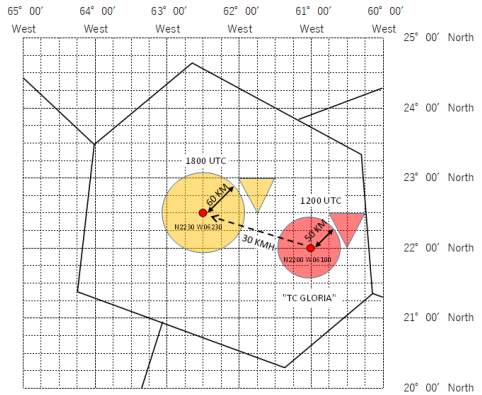
A) Around 12 hours before TC enters the FIR
B) Around 6 hours before TC enters the FIR
C) Around 3 hours before TC enters the FIR
D) Only when TC enters the FIR
E) Others (please specify):

_____




20) Considering the following example,



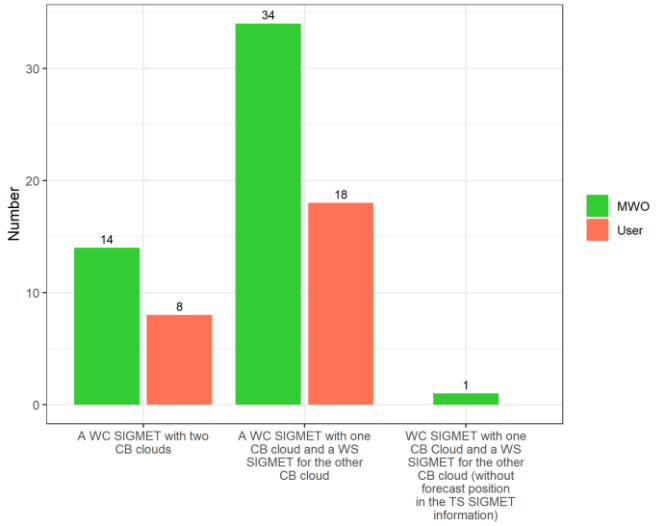

**User**: What is your preferred description of the two CB clouds inside a FIR that are related to one TC?

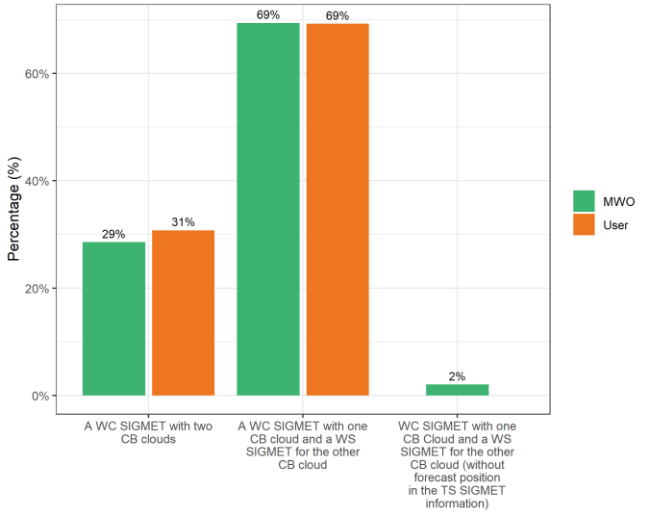
**MWO**: How would you usually describe the two CB clouds inside your FIR that are related to one TC?

A) YUDD SIGMET 3 VALID 251230/251830 YUSO-YUDD SHANLON FIR TC GLORIA PSN N22 W061 CB OBS AT 1200Z WI 050KM OF TC CENTRE TOP FL500 INTSF FCST AT 1800Z TC CENTRE PSN N2230 W06230 **CB WI 060KM OF TC CENTRE AND** *OBS AT 1220Z WI N2230 W06045 - N2230 W06015 - N2200 W06030 - N2230 W06045 TOP ABV FL500* ***FCST AT 1800Z WI N2300 W06200 - N2300 W06130 - N2230 W06145 - N2300 W06200***=

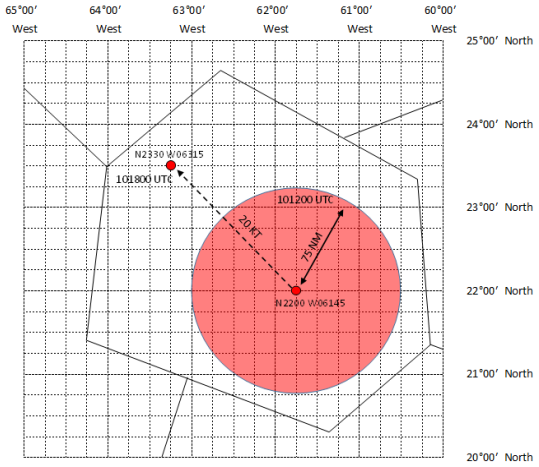
B) YUDD SIGMET 3 VALID 251230/251830 YUSO-YUDD SHANLON FIR TC GLORIA PSN N22 W061 CB OBS AT 1200Z WI 050KM OF TC CENTRE TOP FL500 INTSF FCST AT 1800Z TC CENTRE PSN N2230 W06300 **CB WI 060KM OF TC CENTRE**=
YUDD SIGMET 4 VALID 251230/25**1600** YUSO-YUDD SHANLON FIR EMBD TS *OBS AT 1220Z WI N2230 W06045 - N2230 W06015 - N2200 W06030 - N2230 W06045 TOP ABV FL500* ***FCST AT 1600Z WI N2245 W06130 - N2245 W06120 - N2230 W06125 - N2245 W06130***=

C) Others (please specify): _____




21) Considering the following example,




**User**: What is your preferred way of describing the forecast element of WC SIGMET?

**MWO**: How would you usually describe the forecast element in a WC SIGMET?

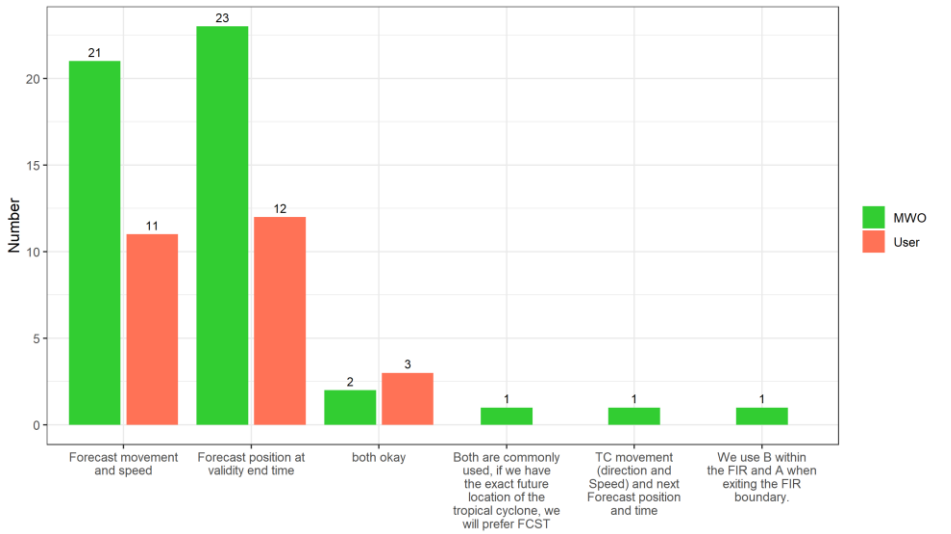
A) Forecast movement and speed

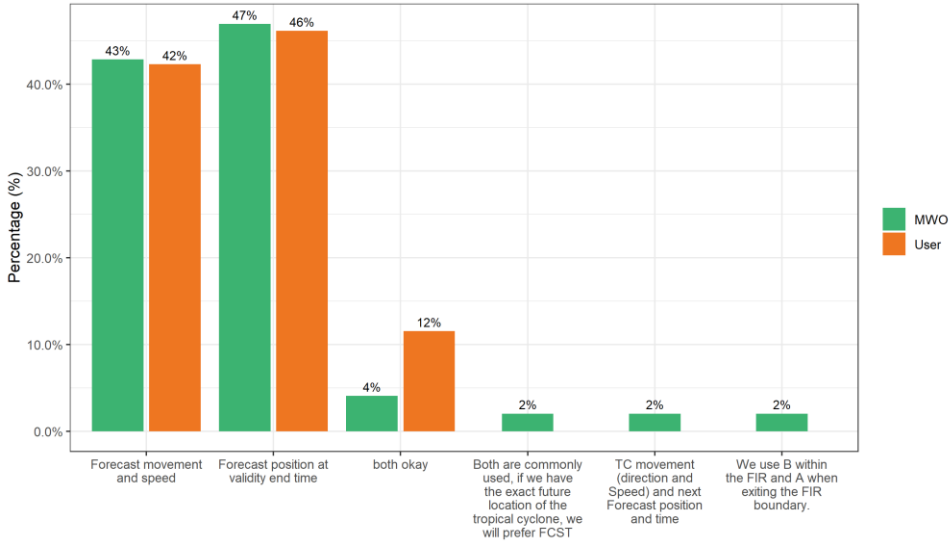
YUDD SIGMET 2 VALID 101200/101800 YUSO-YUDD SHANLON FIR TC GLORIA PSN N2200 W06145 CB OBS AT 1200Z WI 075NM OF TC CENTRE TOP BLW FL500 **MOV NW 20KT WKN**=

B) Forecast position at validity end time

YUDD SIGMET 2 VALID 101200/101800 YUSO-YUDD SHANLON FIR TC GLORIA PSN N2200 W06145 CB OBS AT 1200Z WI 075NM OF TC CENTRE TOP BLW FL500 WKN **FCST AT 1800Z TC CENTRE PSN N2330 W06315**=

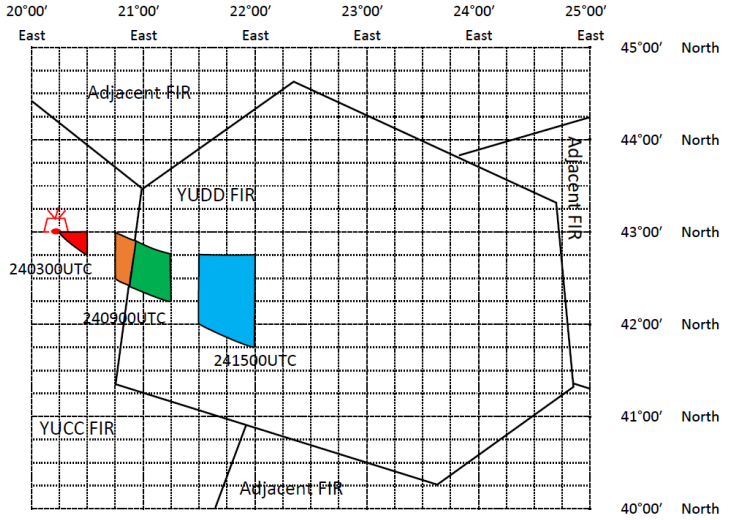
C) Others (please specify):_____



Part F: WV SIGMET (Volcanic ash)

22) Considering a volcanic ash advisory (VAA) indicating ash cloud crossing a FIR boundary, represented by the illustration below.




Both MWOs responsible for YUCC and YUDD FIRs will each issue a VA SIGMET based on the information contained within the advisory but only for the affected areas within the FIR they are responsible for.

The corresponding text products are as follows:

VA advisory (issued by VAAC):

VA ADVISORY
DTG: 20210324/0300Z
VAAC: DARWIN
VOLCANO: ASHVAL
PSN: N4300 E02015
AREA: INDONESIA
SUMMIT ELEV: 2329M
ADVISORY NR: 2021/1
INFO SOURCE: HIMAWARI-8, VONA
AVIATION COLOUR CODE: RED
ERUPTION DETAILS: VA OBS TO FL400 MOV ESE AT 24/0300Z
OBS VA DTG: 24/0300Z
OBS VA CLD: SFC/FL400 N4300 E02015 – N4300 E02030 – N4245 E02030 MOV ESE 10KT
**FCST VA CLD +6HR: SFC/FL400 N4300 E02045 – N4245 E02115 – N4215 E02115 – N4230 E02045**
FCST VA CLD +12HR: SFC/FL250 N4245 E02130 – N4245 E02200 - N4145 E02200 – N4200 E02130
FCST VA CLD +18HR: NO VA EXP
RMK: VA OBS MOV ESE ON LATEST VIS SAT IMAGERY; HEIGHT AND FCST BASED ON HIMAWARI-8, VONA AND MODEL GUIDANCE. VA EXPECTED TO DISSIPATE BY 24/2100Z.
NXT ADVISORY: NO LATER THAN 20210324/0900Z

**22 cont) User**: Which VA SIGMET issued by YUDD FIR would you prefer?

A) Forecast VA SIGMET including green and blue polygon with validity time 09Z/15Z as indicated by VAA

YUDD SIGMET 1 VALID 240900/241500 YUSO-
YUDD SHANLON FIR VA ERUPTION MT ASHVAL PSN
N4300 E02015 VA CLD FCST AT 0900Z WI N4255 E02055 – N4245 E02115 – N4215 E02115 – N4225 E02050 – N4255 E02055 SFC/FL400 NC FCST AT 1500Z WI N4245 E02130 – N4245 E02200 – N4145 E02200 – N4200 E02130 – N4245 E02130 SFC/FL250=

B) Forecast VA SIGMET including green and blue polygon with validity time 06Z/12Z with an estimated time of 06Z for ash cloud entering YUDD FIR

YUDD SIGMET 1 VALID 240600/241200 YUSO-
YUDD SHANLON FIR VA ERUPTION MT ASHVAL PSN
N4300 E02015 VA CLD FCST AT 0900Z WI N4255 E02055 – N4245 E02115 – N4215 E02115 – N4225 E02050 – N4255 E02055 SFC/FL400 NC FCST AT 1500Z WI N4245 E02130 – N4245 E02200 – N4145 E02200 – N4200 E02130 – N4245 E02130 SFC/FL250=

C) Only issue VA SIGMET when the ash cloud entering YUDD FIR

D) Others (please specify):_____