



METEOROLOGY PANEL



Servicio de información cuantitativa sobre concentración de cenizas volcánicas (QVA)

Presentada al Taller NAM/CAR/SAM PANS-MET por
Karen Shelton-Mur (Estados Unidos FAA)





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La siguiente presentación se basa en la presentación realizada en la reunión APAC MET-SG/27 por Nicole Ranger (Centro de Avisos de Cenizas Volcánicas Wellington, Nueva Zelanda)

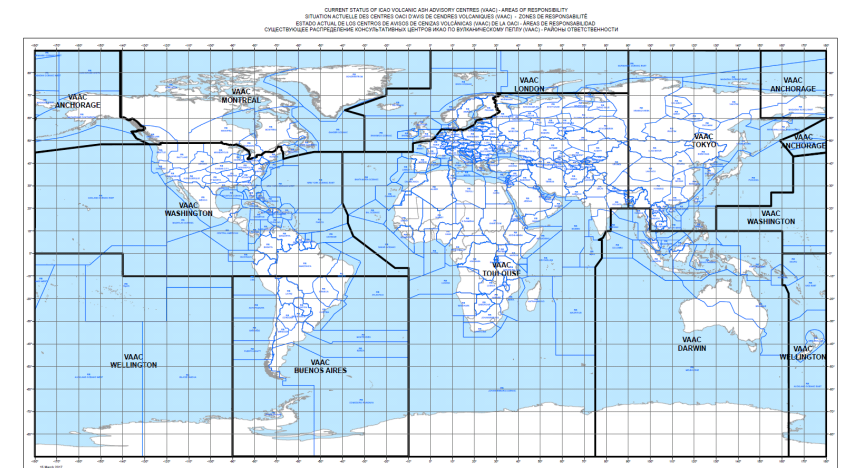


INTRODUCCIÓN DEL SERVICIO DE INFORMACIÓN QVA PROPUESTA DE ENMIENDA 81 al AL ANEXO 3 Y PANS-MET

- Las cenizas volcánicas representan un peligro importante para la aviación; particularmente a las aeronaves en vuelo.
- La Organización de Aviación Civil Internacional (OACI) designó 9 centros como Centros de Aviso de Cenizas Volcánicas (VAAC) en la década de 1990.
- Los VAAC actualmente emiten VAA/VAG (OBS/EST VA y FCST +6, +12, +18 h)
- Esta información es cualitativa, ya que los avisos no incluyen información sobre la **cantidad** de ceniza que se espera en un lugar determinado.



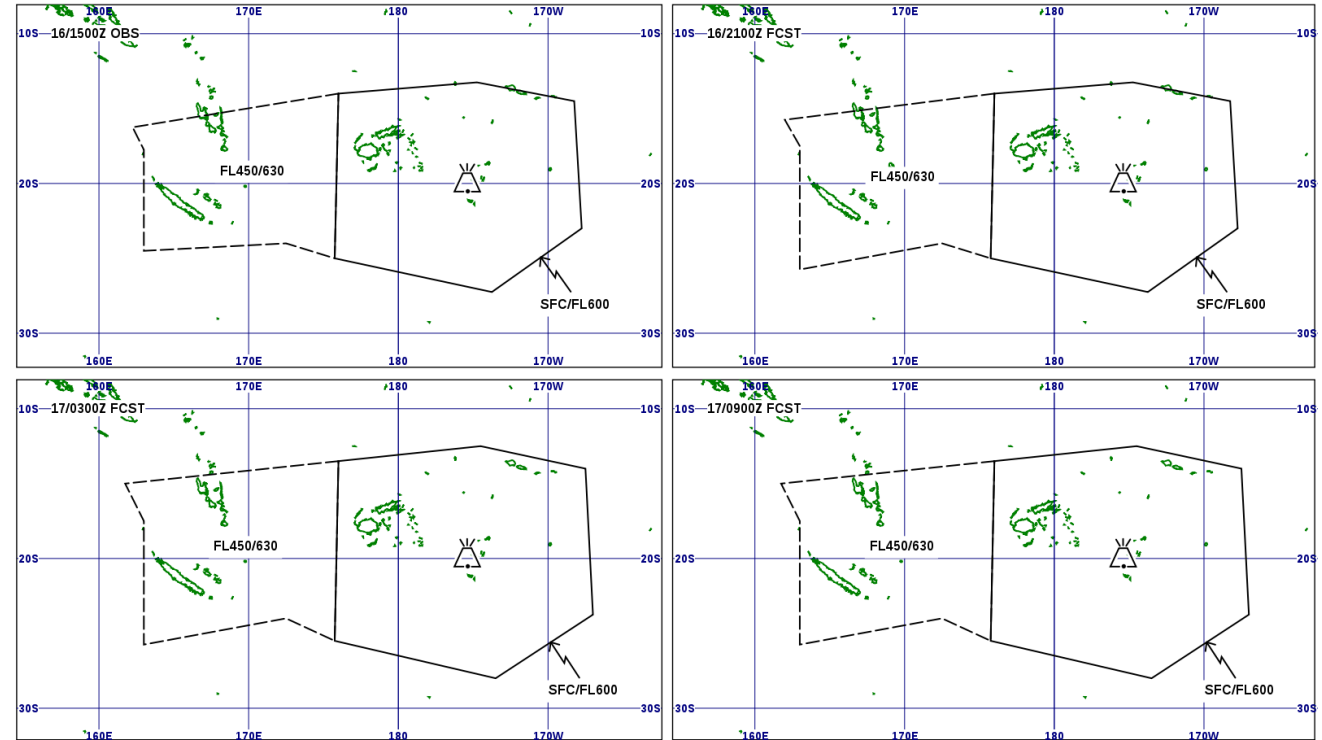
*Hunga Tonga-Hunga Ha'apai eruption, 20 December
Photo from aircraft and included in VONA from TMS*





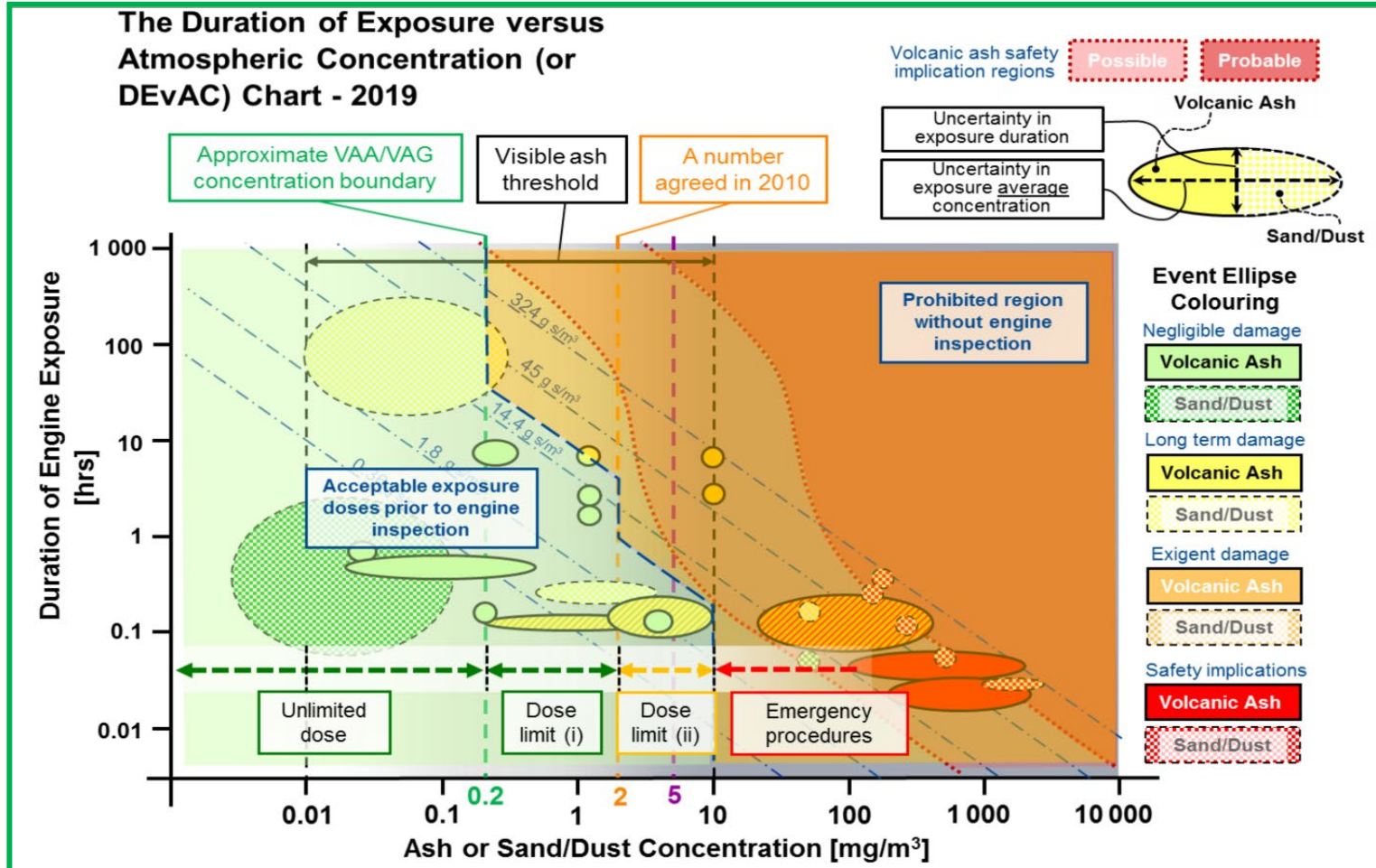
Ejemplos de avisos y gráficos actuales sobre cenizas volcánicas

FVPS01 NZKL 161500
 VA ADVISORY
 DTG: 20220116/1500Z
 VAAC: WELLINGTON
 VOLCANO: HUNGA TONGA-HUNGA HA'APAI 243040
 PSN: S2032 W17523
 AREA: TONGA
 SUMMIT ELEV: 114M
 ADVISORY NR: 2022/27
 INFO SOURCE: SATELLITE IMAGERY
 AVIATION COLOUR CODE: RED
 ERUPTION DETAILS: ERUPTION AT 20220115/0400Z LARGE ERUPTION
 OBS VA DTG: 16/1500Z
 OBS VA CLD: SFC/FL600 S2715 W17345 - S2500 E17545 - S1400 E17600 - S1315 W17445 - S1430 W16815 - S2300 W16745 MOV S 05KT FL450/630 S2500 E17545 - S2400 E17230 - S2430 E16300 - S1745 E16300 - S1615 E16215 - S1400 E17600 MOV W 30KT
 FCST VA CLD +6 HR: 16/2100Z SFC/FL600 S2715 W17345 - S2500 E17545 - S1400 E17600 - S1315 W17445 - S1430 W16815 - S2300 W16745 FL450/630 S2500 E17545 - S2400 E17230 - S2545 E16300 - S1730 E16300 - S1545 E16200 - S1400 E17600
 FCST VA CLD +12 HR: 17/0300Z SFC/FL600 S2800 W17330 - S2530 E17545 - S1330 E17600 - S1230 W17430 - S1400 W16730 - S2345 W16700 FL450/630 S2530 E17545 - S2400 E17230 - S2545 E16300 - S1730 E16300 - S1500 E16145 - S1330 E17600
 FCST VA CLD +18 HR: 17/0900Z SFC/FL600 S2800 W17330 - S2530 E17545 - S1330 E17600 - S1230 W17430 - S1400 W16730 - S2345 W16700 FL450/630 S2530 E17545 - S2400 E17230 - S2545 E16300 - S1745 E16300 - S1730 E16300 - S1500 E16145 - S1330 E17600
 RMK: HIGH LEVEL VA EXTD W IN STRATOSPHERIC EASTERLIES. VA HEIGHT EST. SEE ALSO VAA FVAU01 ADMR ISSUED BY VAAC DARWIN WHICH DESCRIBES CONDITIONS TO THE WEST IN THE VAAC DARWIN AREA OF RESPONSIBILITY.
 NXT ADVISORY: NO LATER THAN 20220116/2100Z=



VOLCANIC ASH ADVISORY
 DTG: 20220116/1500Z
 VAAC: WELLINGTON
 VOLCANO: HUNGA TONGA-HUNGA HA'APAI 243040
 PSN: S2032 W17523
 AREA: TONGA

SUMMIT ELEV: 114M
 ADVISORY NR: 2022/27
 INFO SOURCE: SATELLITE IMAGERY
 AVIATION COLOUR CODE: RED
 ERUPTION DETAILS: ERUPTION AT 20220115/0400Z LARGE ERUPTION
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 NXT ADVISORY: NO LATER THAN 20220116/2100Z=

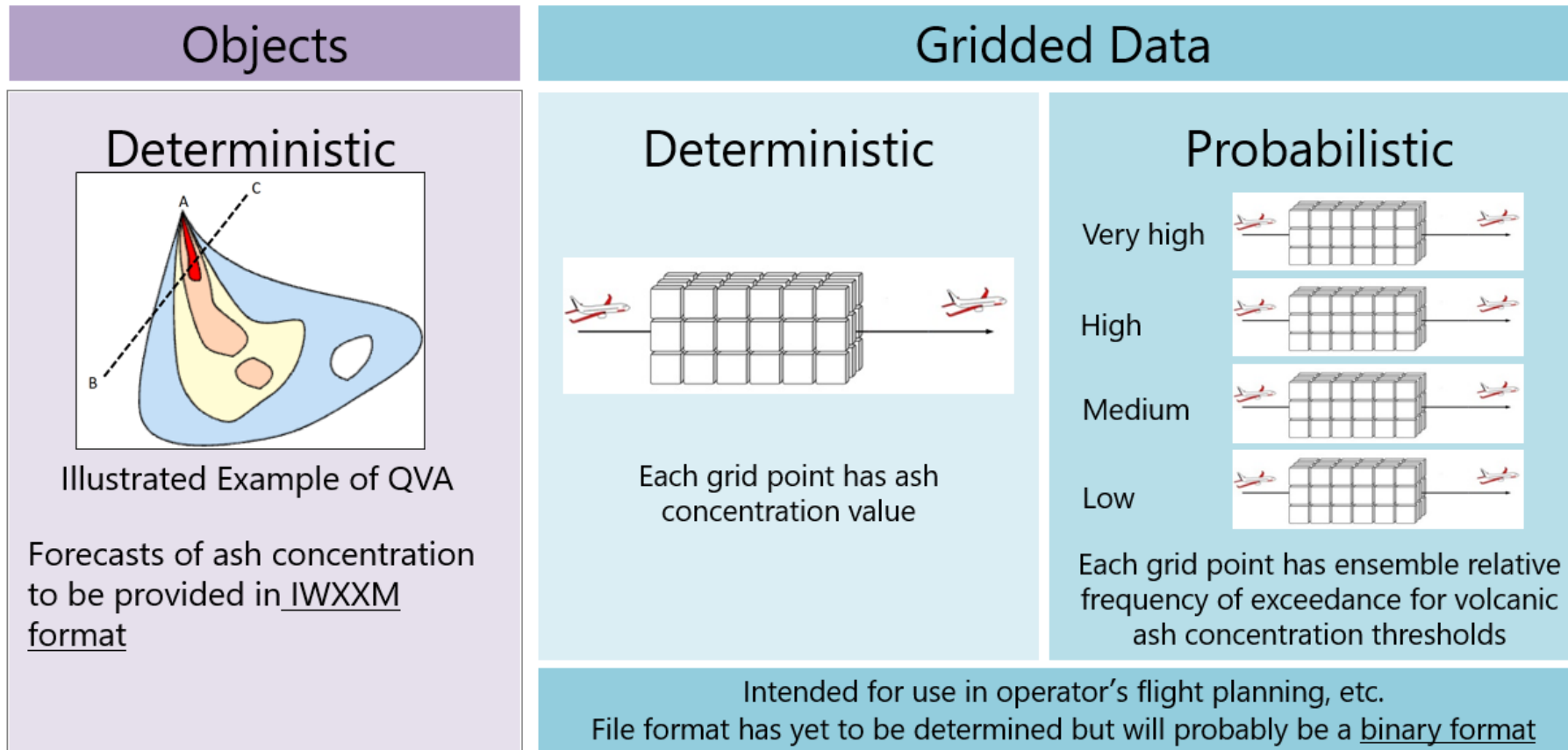


Dr. Rory Clarkson y Harry Simpson – Maximizar el uso del espacio aéreo durante las erupciones volcánicas: comparar la durabilidad del motor con la aparición de nubes de ceniza



Formato QVA

QVA information will be provided in two file formats





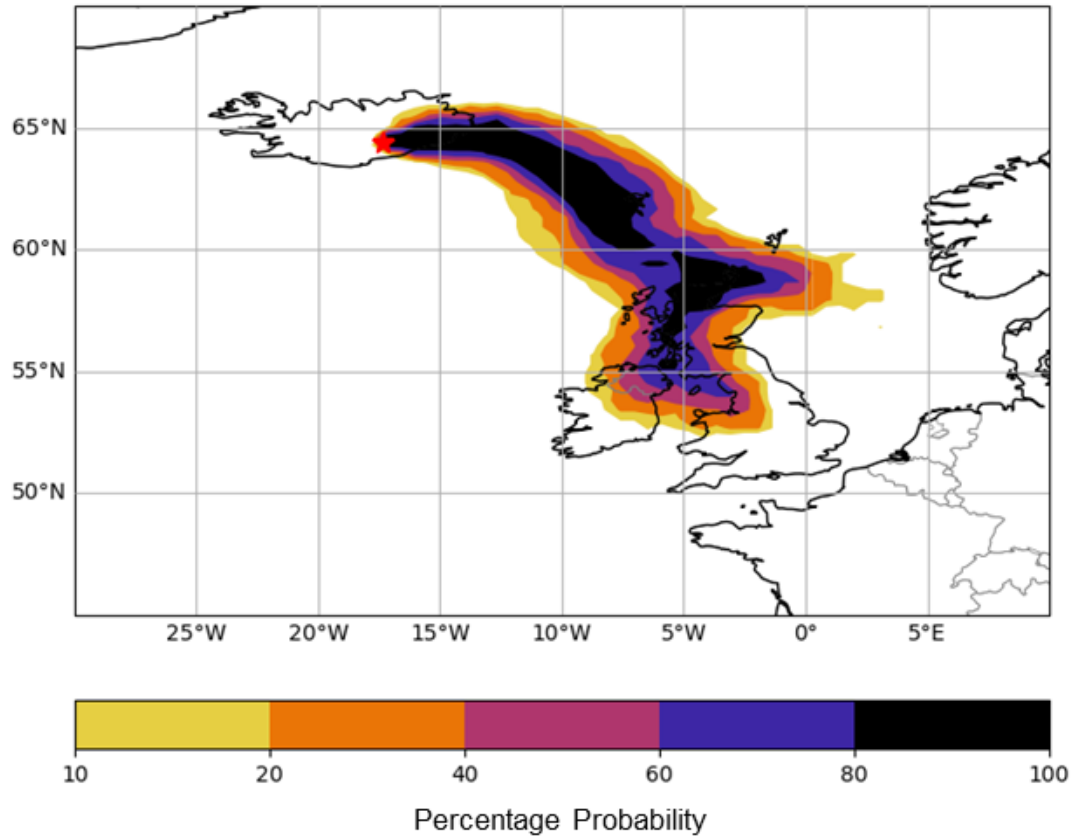
Umbrales y resolución QVA

	QVA Information	VAA/VAG
Concentration thresholds and ranges	Very high $\geq 10 \text{ mg/m}^3$ High ≥ 5 and $< 10 \text{ mg/m}^3$ Medium ≥ 2 and $< 5 \text{ mg/m}^3$ Low ≥ 0.2 and $< 2 \text{ mg/m}^3$ Very low $< 0.2 \text{ mg/m}^3$	N/A
Horizontal resolution	0.25 degrees lat/lon for gridded data	polygon vertices coordinates provided with 1-minute accuracy
Vertical resolution	5,000 ft (MSL to FL50, FL50 to FL100, ..., FL550 to FL600) for gridded data	N/A
Temporal resolution	3 hours (FT0, 3, 6, 9, 12, 15, 18, 21, 24)	6 hours (FT0, 6, 12, 18)
Update interval	at least every 6 hours	at least every 6 hours
Probabilistic forecast	ensemble relative frequency of exceedance for volcanic ash concentration thresholds	N/A
Format	Objects: IWXXM format Gridded data: TBD (probably in a binary format)	Text message, IWXXM format, PNG format
VA clouds for which information is issued	Significant VA clouds	All VA clouds

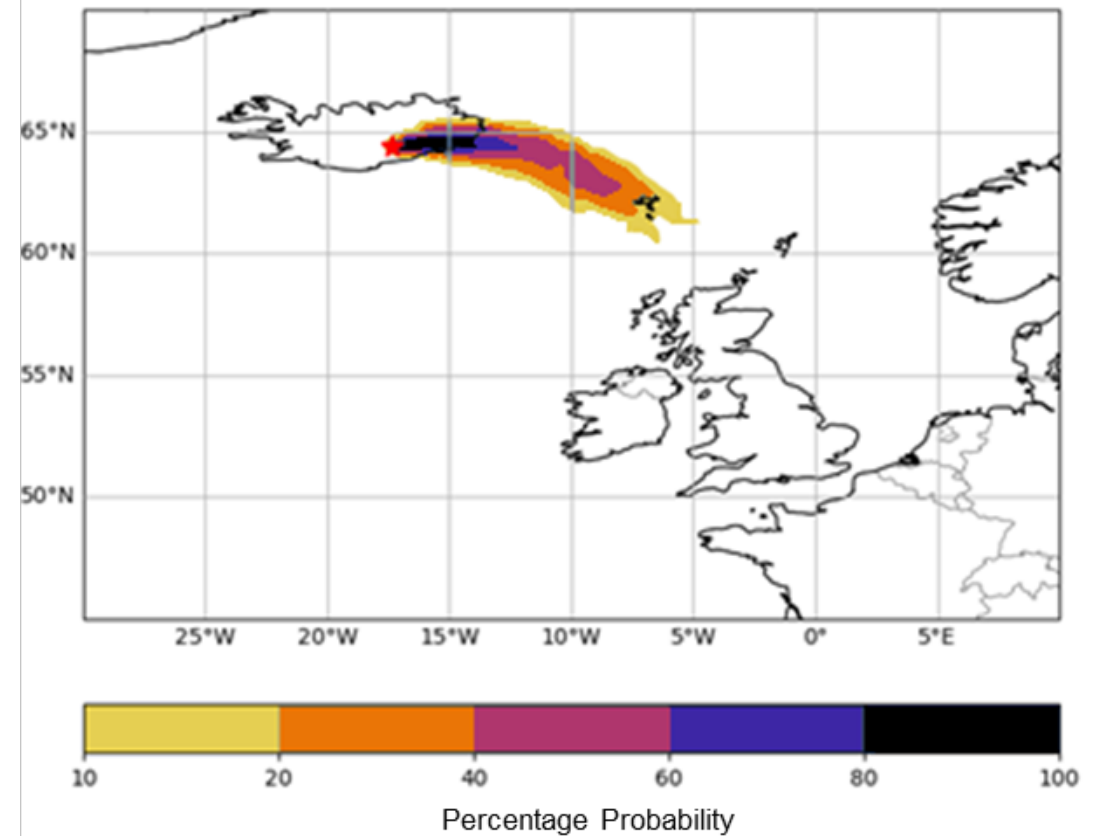


La probabilidad de exceder 0,2 mg/m³ y 2,0 mg/m³ para el nivel FL250-FL300.

Probability of exceeding 0.2mg/m³
From FL250 to FL300
Valid 18:00UTC 05/08/2022



Probability of exceeding 2mg/m³
From FL250 to FL300
Valid 18:00UTC 05/08/2022





Ilustraciones visuales de objetos QVA IWXXM

Colour legend: White = $< 0.2 \text{mg/m}^3$, Blue = $\geq 0.2 \text{mg/m}^3$, Yellow = $\geq 2 \text{mg/m}^3$, Orange = $\geq 5 \text{mg/m}^3$, Red = $\geq 10 \text{mg/m}^3$.
 Note that colours were randomly chosen and do not infer any visualization guidelines.

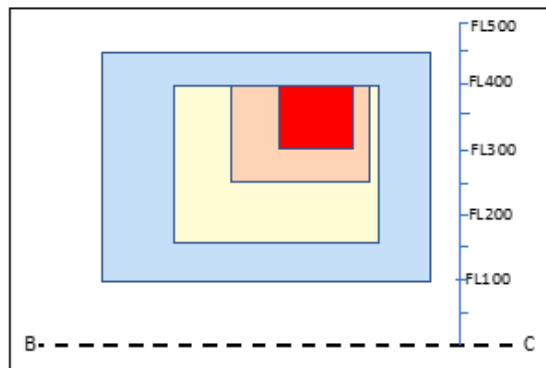
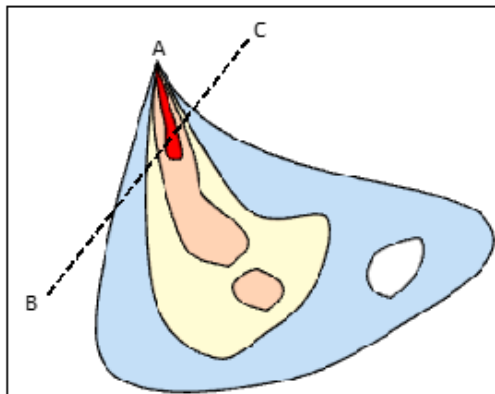


Figure 1 (left). IWXXM objects showing all QVA thresholds depicted in the horizontal from a fictitious volcano located at A. The vertical depiction along line B-C is shown in Figure 2 (right).

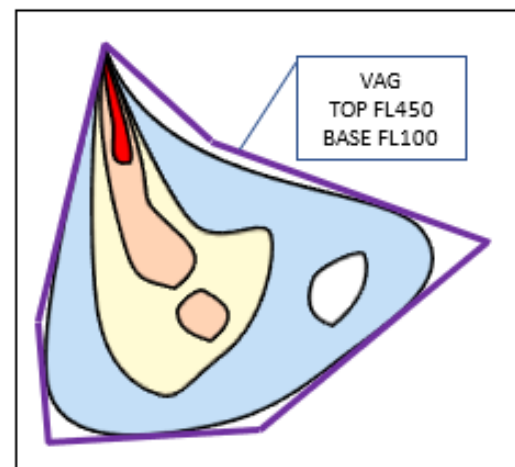


Figure 7. Same as Figure 1 but overlaid with the VAG (purple polygon).

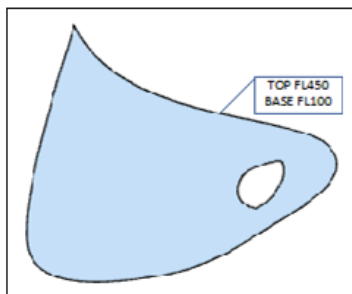


Figure 3.

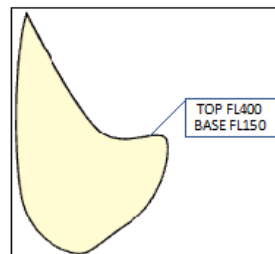


Figure 4.

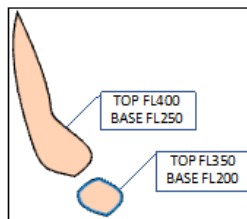


Figure 5.

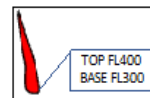


Figure 6.

Figures 3 through 6 depict the individual IWXXM objects from Figure 1. Figure 3 is IWXXM object $\geq 0.2 \text{mg/m}^3$ (the "hole" is ash $< 0.2 \text{mg/m}^3$). Figure 4 is IWXXM object $\geq 2 \text{mg/m}^3$. Figure 5 is IWXXM object $\geq 5 \text{mg/m}^3$. Figure 6 is IWXXM object $\geq 10 \text{mg/m}^3$.



Nubes de ceniza volcánica “significativas”

- Durante la **initial operating capability** (IOC), se proporcionará información QVA para las nubes de cenizas volcánicas "significativas", definidas en el Anexo 3 como "una nube de cenizas que plantea un impacto generalizado para las operaciones de aeronaves y la navegación aérea". Ver Anexo 3, Capítulo 3, párrafo 3.5.2 Nota 2 (página B-52 de la Carta a los Estados).
- VAAC aún está determinando cómo se definirá el “impacto generalizado”, pero puede incluir:
 - una nube de ceniza con una cierta extensión vertical
 - una nube de ceniza dentro (o que se espera que se mueva dentro) de una cierta distancia de un aeropuerto
 - Impacto de las cenizas en las operaciones de aviación.
- Todos los VAAC acordarán directrices sobre el impacto generalizado, en consulta con los usuarios.



Distribución de Datos

- VAAC proporcionará una API compatible con SWIM para permitir el acceso a los datos.
- Los servicios de “publicación y suscripción” (AMQP) se adaptan a la naturaleza irregular de las erupciones volcánicas y se espera que se utilicen.
- Se espera que el servicio QVA de cada VAAC ofrezca las mismas capacidades y características.

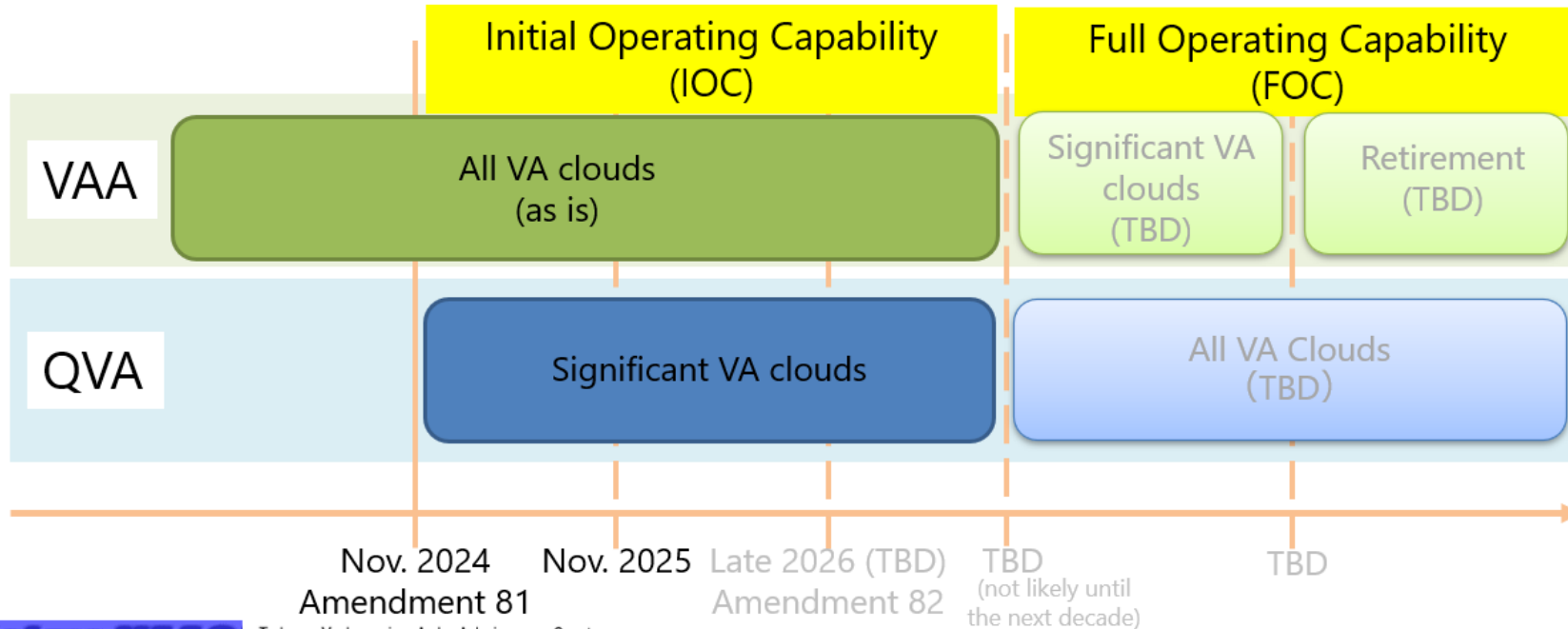


Cronograma de implementación

QVA implementation to be stipulated through ICAO Amendment Process of Annex 3

Date	Stipulated by	SARP	VAACs to implement QVA	Remarks
Nov. 2024	Amdt. 81	Recommendation	VAACs in a position to do so	Applicability date of Amdt. 81
Nov. 2025	Amdt. 81	Recommendation	All VAACs	
Late 2026 (TBD)	Amdt. 82	Standard	All VAACs	Applicability date of <u>Amdt. 82</u>

VA clouds for which VAA and/or QVA is issued







Usando QVA

- Se espera que se desarrolle material educativo para el usuario que proporcione a la tripulación de vuelo y a otros usuarios información sobre las sutilezas, usos y limitaciones de la información QVA.
- La información QVA probablemente tendrá su mayor utilidad con eventos de nubes de cenizas que tienen una nube de cenizas ampliamente dispersa con niveles de concentración de cenizas en su mayoría más bajos.
- La información probabilística QVA está destinada a ser utilizada en los sistemas de planificación de vuelos y de apoyo a las decisiones del operador. Los operadores utilizarán información probabilística QVA junto con su programa de gestión de seguridad para optimizar el espacio aéreo y planificar rutas más eficientes durante eventos importantes de nubes de cenizas volcánicas.
- La mayor parte del material de esta presentación está extraído de un folleto que describe el servicio de información de QVA y que está disponible para cualquier persona interesada.

METP WG-MOG/20 IAVW – SN/04 Appendix



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Quantitative Volcanic Ash (QVA) Concentration Information

First edition – 13 September 2022 (corrected 15 December 2022)

1 Introduction

This document describes the quantitative volcanic ash (QVA) concentration information (hereafter referred to as 'QVA information') that is planned to be provided by volcanic ash advisory centres (VAAC) as part of the International Civil Aviation Organization's (ICAO) International Airways Volcano Watch (IAVW). It is the first in a series of information "flyers" on QVA information.

Over the past two decades there were many requests by representatives of the IAVW, through various ICAO and World Meteorological Organization fora, for aircraft and engine manufacturers to provide information on the susceptibility of aircraft and their engines to volcanic ash. The specific desire was for ash concentration thresholds to be identified that did not pose a safety concern but could improve route efficiency. This need has led to the development of QVA information.

QVA information offers operators the opportunity to move away from traditional discernible/visible ash criteria and instead use certified engine susceptibility for flight route planning and inflight replanning. Visible ash is what an observer or flight crew member sees with their eyes. The lower limit of visible ash ranges from approximately 0.01 mg/m³ to 10 mg/m³, depending on many factors such as time of day, sky background, position of the sun to the observer (pilot) as well as the angle the ash cloud is viewed (e.g., viewed from the side). Discernible ash is what a satellite or other remote sensing instrument detects. Discernible ash from satellites has been used by the VAACs to define the observed area in the volcanic ash advisories (VAA) in both text and graphic form (VAG) over the past two decades. The lower limit of discernible ash from satellites is approximately 0.1 mg/m³ to 0.2 mg/m³, depending on the satellite and other factors.

QVA information will begin with an initial operating capability (IOC) that is planned to be implemented in three phases in the mid-2020s.

2 Initial operating capability (IOC)

The IOC for QVA will provide forecasts of ash concentration in two data formats for significant eruptions.

2.1 Format

QVA information will be provided in two file formats. Objects will be provided in ICAO's Meteorological Information Exchange Model (IWXXM) format. Gridded data will be provided in a file format which has yet to be determined but will probably be a binary format. The IWXXM format contains a subset of the entire gridded data file set.



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Muchas Gracias por escuchar

