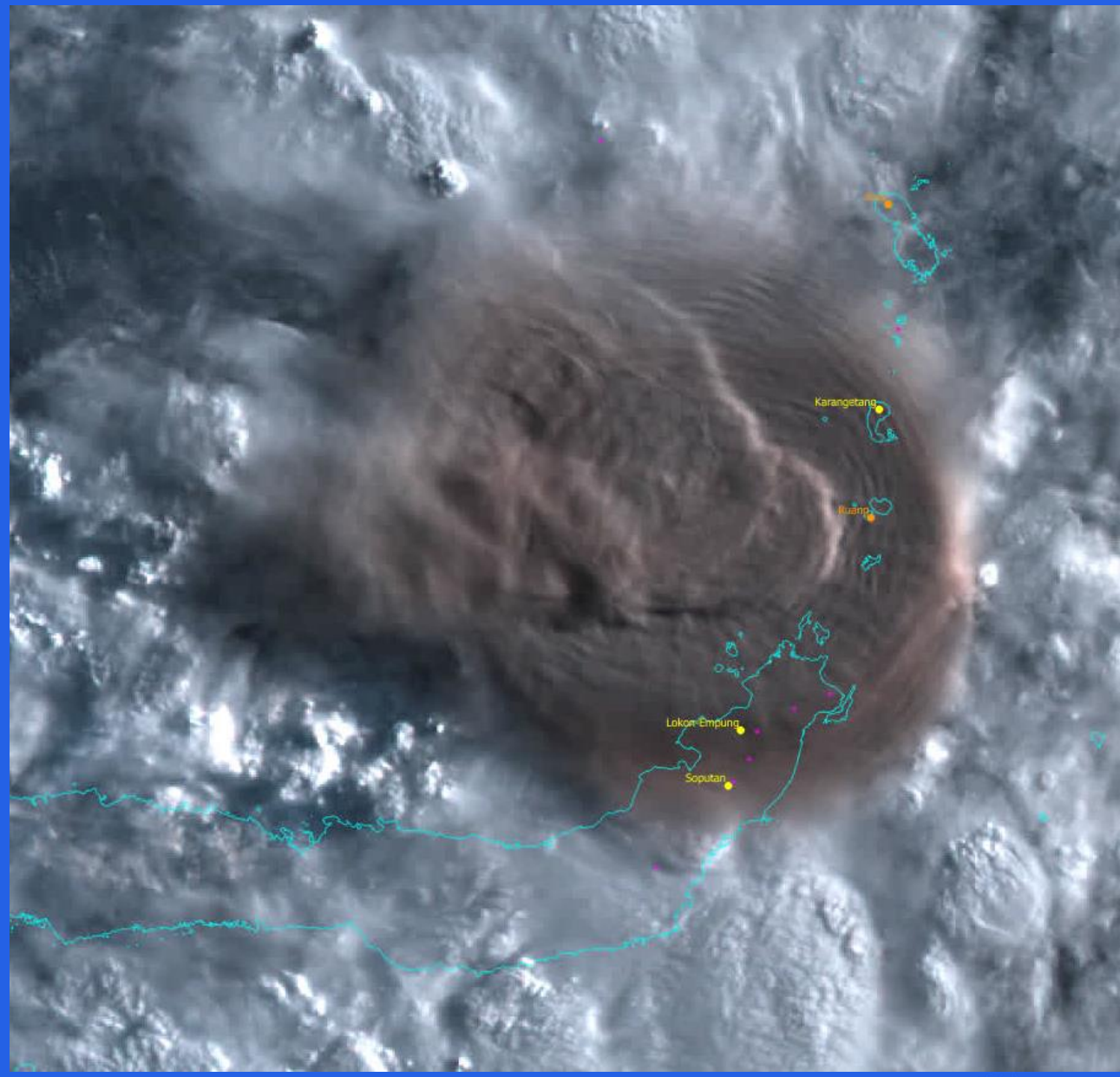
The Bureau of Meteorology

Proposed VAAC forecaster workflow for QVA Issuance

Dr Jarrad Denman

VAAC Darwin

Bureau of Meteorology, Australia



Proposed VAAC Forecaster workflow for QVA issuance

Overview

This presentation is intended to give aviation operators an overview of the VAACs current workflow and proposed workflow for the introduction of Quantitative Volcanic Ash (QVA) Concentration Information

The workflows are high-level, and further details will be discussed by the VAACs to ensure the consistency of the service.

The same information and analysis will go into preparing the current products and the new QVA data sets.

The 9 VAACs are working together to progress QVA including the discussion on dispersion modelling and research.

Proposed VAAC Forecaster workflow for QVA issuance

Current workflow

Information arrives about new volcanic activity

- VONA, satellite imagery, PIREP, etc

VAAC forecaster to assess the information and confirms sufficient evidence for volcanic ash advisory to be issued

First VAA is issued (within 20 minutes)

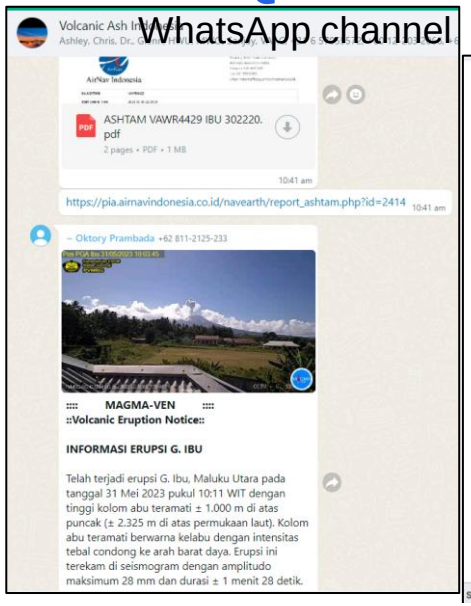
VAAC forecaster continues to reassess the situation

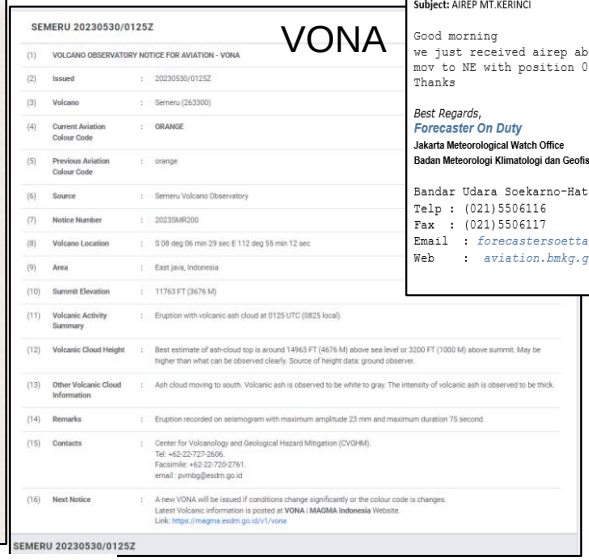
- Height, eruption start time, eruption end time, multiple sources, direction and movement speed

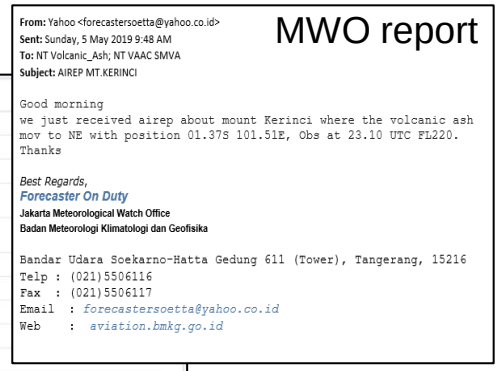
Runs dispersion models, prepares forecast

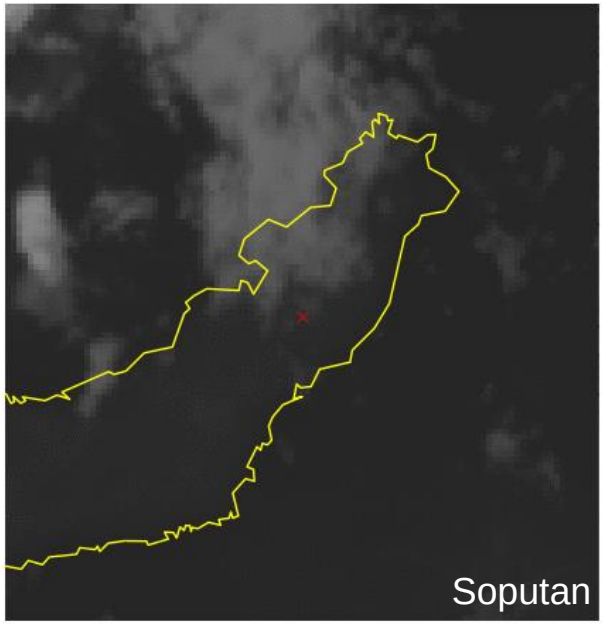
Second VAA is issued (within 55 minutes)

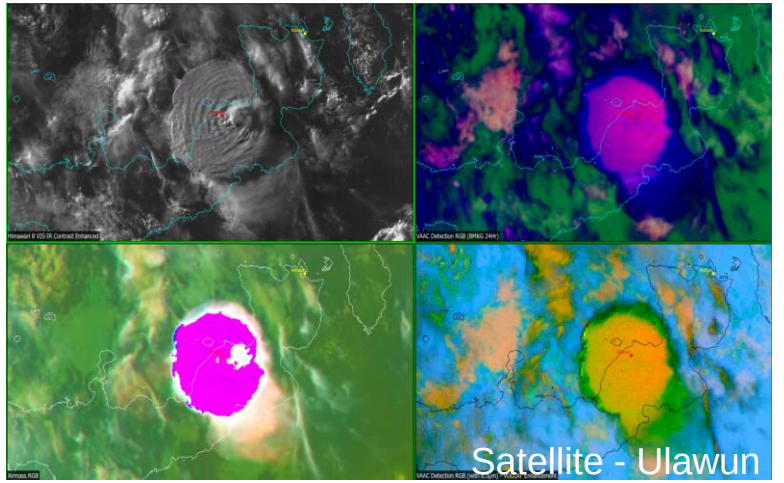
Continue to analyse and update until the event has ended





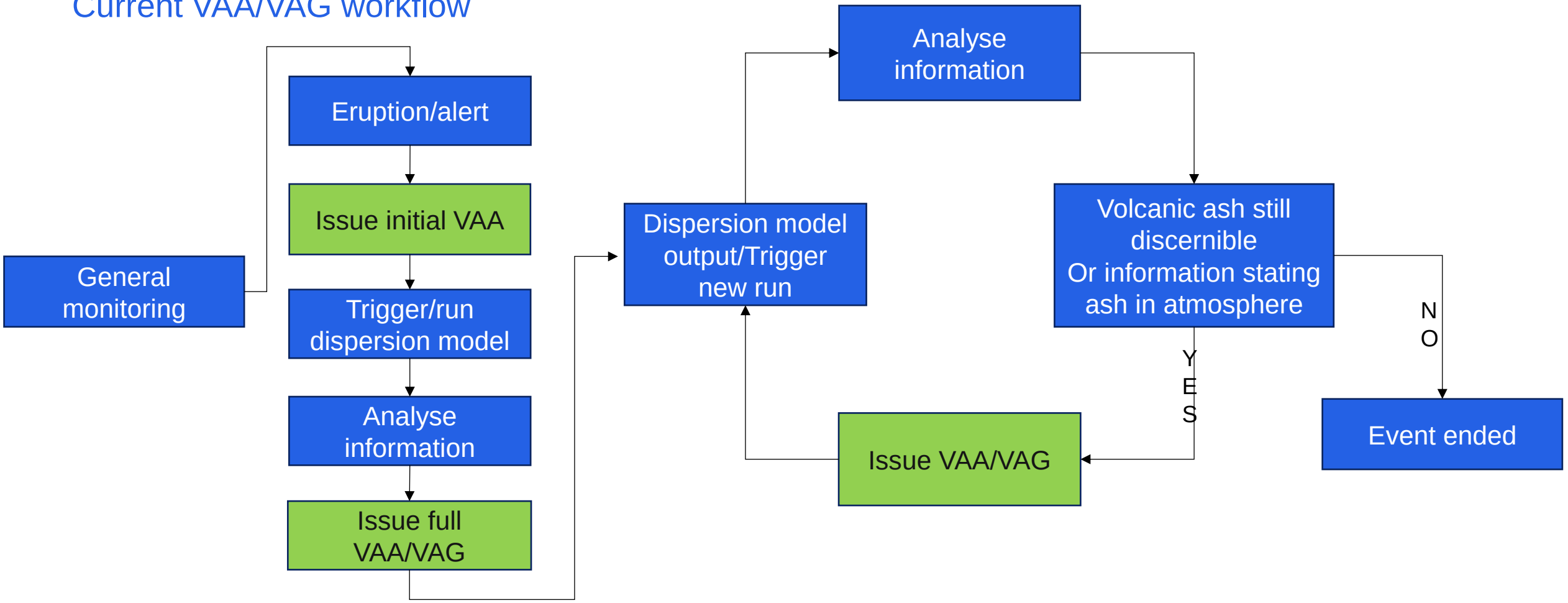






Proposed VAAC Forecaster workflow for QVA issuance

Current VAA/VAG workflow



Proposed VAAC Forecaster workflow for QVA issuance

Quantitative Volcanic Ash (QVA) Concentration Information

During the Initial Operational Capability (IOC), QVA will be issued for significant volcanic ash clouds

The VAACs need consistency to apply this and have guidance for the VAAC forecasters

Time is required to ascertain accurate eruption parameters

Time is required to determine if eruption is significant

Significant definition in Annex 3:

During the IOC, QVA information will be issued for significant volcanic ash clouds. Significant in this context means an ash cloud that poses a widespread impact to aircraft operations and air navigation. This is based on considerations[1] by the responsible VAAC of known or expected volcanic ash 'cloud'[2] spatial extent and persistence in the proximity of aerodromes and international airways.

[1] Informed by discussions and pre-agreement with relevant aviation users and, to ensure a consistency of approach, the other VAACs and SVOs.

[2] Based on satellite-derived mass-loading detection threshold of 0.2 gm-2 which, although not directly comparable to ash concentration, provides a recognized quantitative constraint (lower threshold) for satellite-based remotely sensed discernible ash.

Proposed VAAC Forecaster workflow for QVA issuance

Considerations

Accurate initial information of the eruption

Large events in clear conditions will provide the best outputs

Ability to accurately determine the eruption height and start/end time

Satellite retrieval, when available

VOLCANO OBSERVATORY NOTICE FOR AVIATION (VONA)
BADAN GEOLOGI - PUSAT VULKANOLOGI DAN MITIGASI BENCANA GEOLOGI
JL. DIPONEGORO 57 BANDUNG 40122 TELP: +62-22-7272606

(1)	**VOLCANO OBSERVATORY NOTICE FOR AVIATION - VONA**	
(2)	**Issued**	: 20180219/0213Z
(3)	**Volcano**	: Sinabung (261080)
(4)	**Current Aviation Colour Code**	: **RED**
(5)	**Previous Aviation Colour Code**	: orange
(6)	**Source**	: Sinabung Volcano Observatory
(7)	**Notice Number**	: 2018SIN89
(8)	**Volcano Location**	: N 03 deg 10 min 12 sec E 98 deg 23 min 31 sec
(9)	**Area**	: North Sumatra, Indonesia
(10)	**Summit Elevation**	: 7872 FT (2460 M)
(11)	**Volcanic Activity Summary**	: Eruption with ash clouds at 01:53 UTC (08:53 local time). The eruption lasted for 291 seconds
(12)	**Volcanic Cloud Height**	: 23872 FT (7460 M)
(13)	**Other Volcanic Cloud Information**	: Ash-cloud moving to southeast - east.
(14)	**Remarks**	: Seismic activity is characterized by the Deep Volcanic Earthquake, Low Frequency Earthquake, and Hybrid Earthquake. Hot clouds is observed through the East-Southeast slope and reaches a distance of 3500 meters from the summit and Hot clouds is observed through the south slope and reaches a distance of 4900 meters from the summit.
(15)	**Contacts**	: Ministry of Energy and Mineral Resources Geological Agency Center for Volcanology and Geological Hazard Mitigation (CVGHM) Tel: +62-22-727-2606 Facsimile: +62-22-720-2761 Email : magma@esdm.go.id, vsi@vsi.esdm.go.id, gunungapi@vsi.esdm.go.id
(16)	**Next Notice**	: A new VONA will be issued if conditions change significantly or the color code changes. Latest Volcanic Ash information is posted at VONA | MAGMA Indonesia Website Link : https://magma.vsi.esdm.go.id/vona/
(17)	**Reporter**	: Moh Nurul Asrori, A.Md.

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VONA

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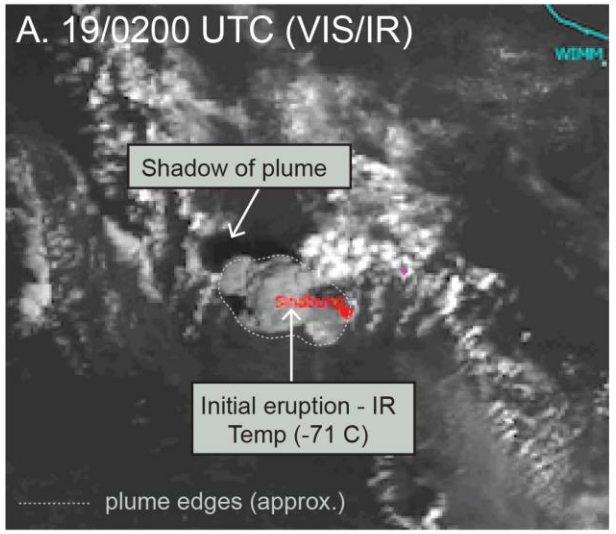

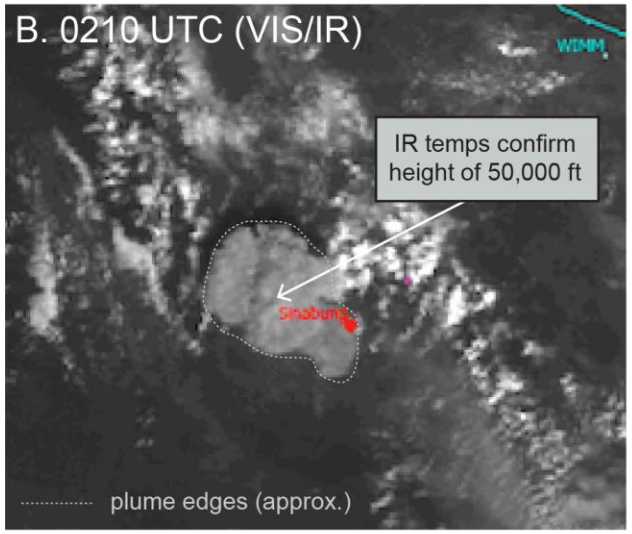

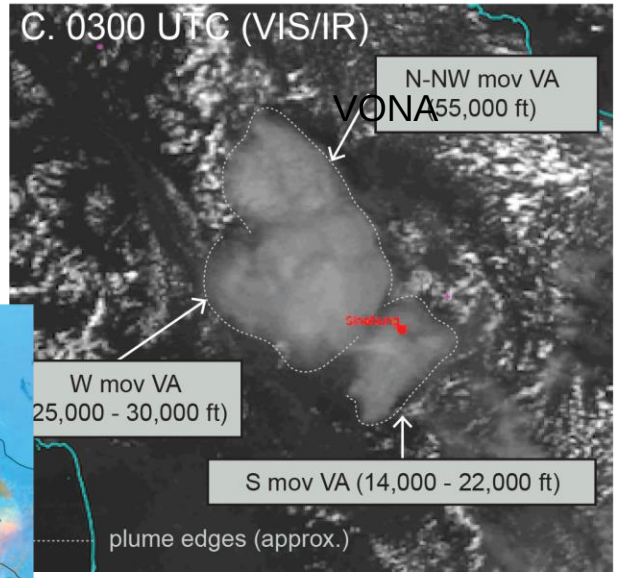

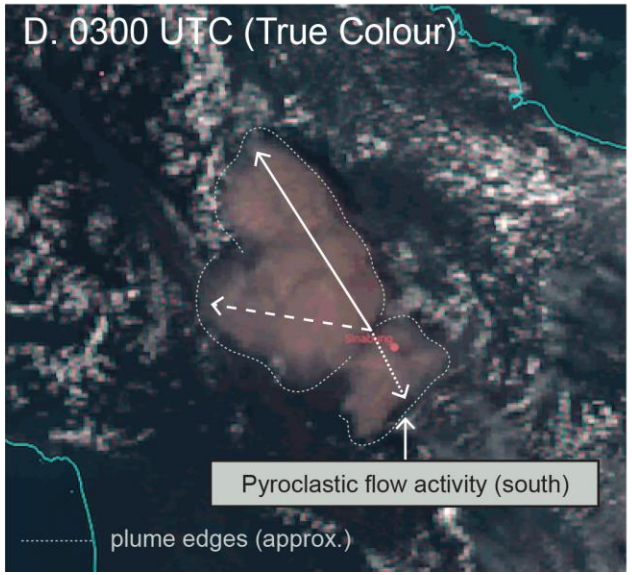

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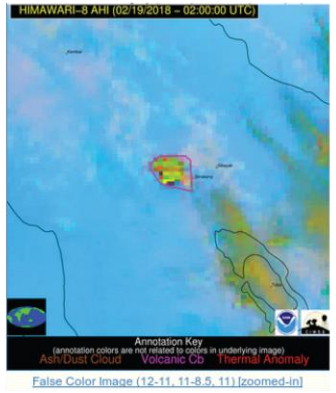

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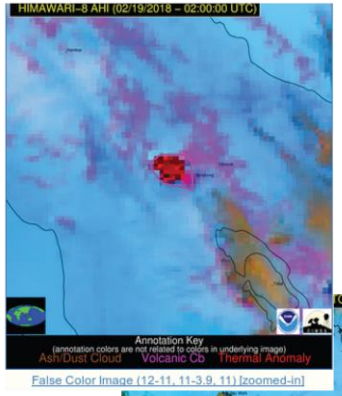

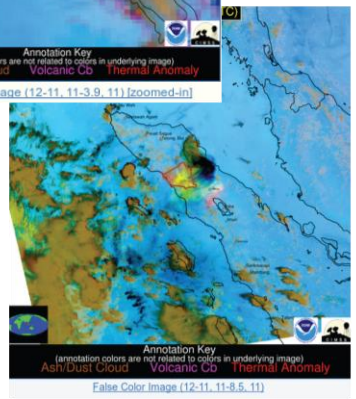

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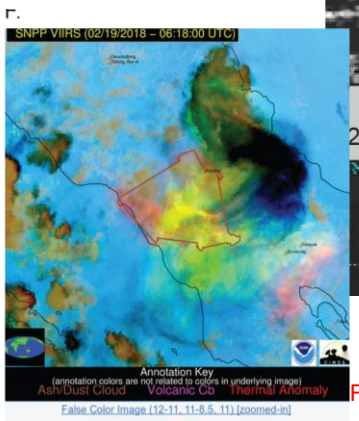


Proposed VAAC Forecaster workflow for QVA issuance

Considerations

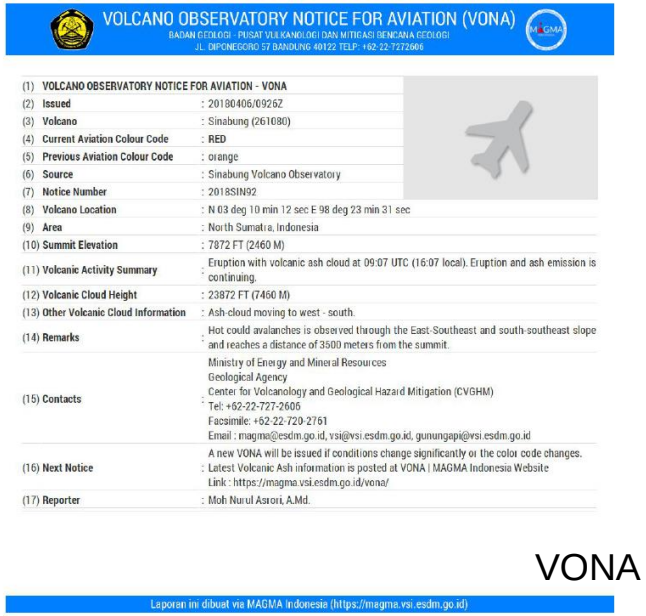
Similar challenges to forecast accuracy

Additional data sources will provide improved certainty:

- SVO information (VONA, webcam)
- Pilot reports will be extremely useful
- Use of probabilistic information

Dispersion modelling is always improving

9 VAACs each with research areas discussing cases



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(8)	Volcano Location	: N 03 deg 10 min 12 sec E 98 deg 23 min 31 sec
(9)	Area	: North Sumatra, Indonesia
(10)	Summit Elevation	: 7872 FT (2460 M)
(11)	Volcanic Activity Summary	: Eruption with volcanic ash cloud at 09:07 UTC (16:07 local). Eruption and ash emission is continuing.
(12)	Volcanic Cloud Height	: 23872 FT (7460 M)
(13)	Other Volcanic Cloud Information	: Ash-cloud moving to west - south.
(14)	Remarks	: Hot could avalanches is observed through the East-Southeast and south-southeast slope and reaches a distance of 3500 meters from the summit.
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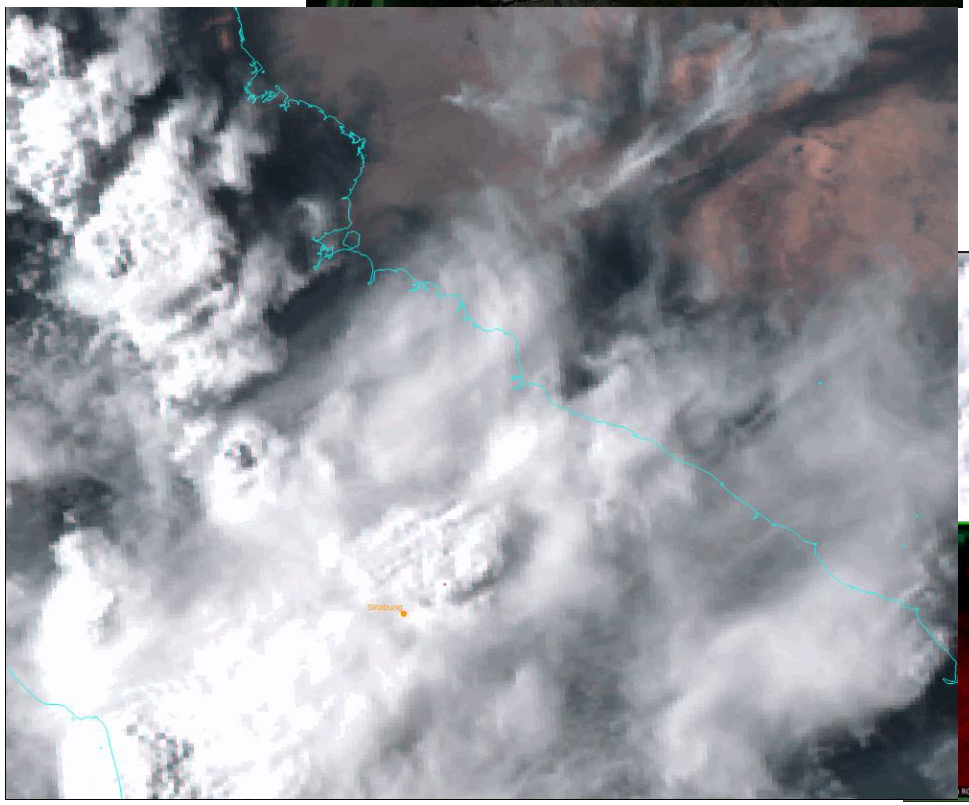
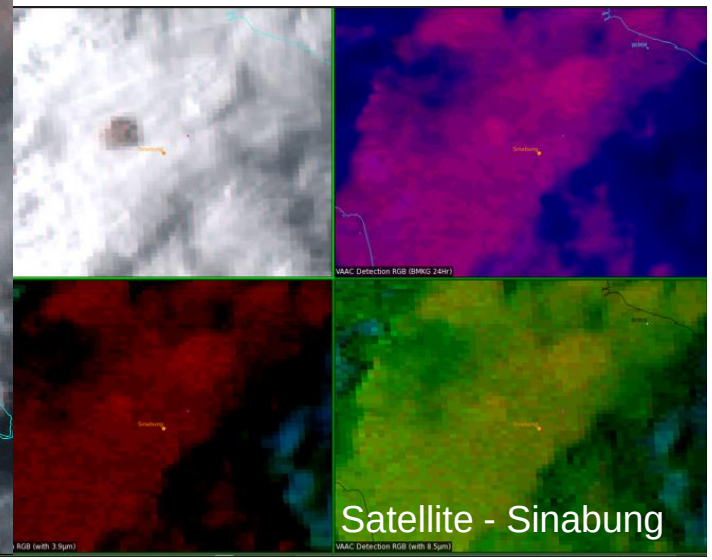
VONA





Proposed VAAC Forecaster workflow for QVA issuance

Considerations

VAAC forecaster would be in charge of quality control of the outgoing data

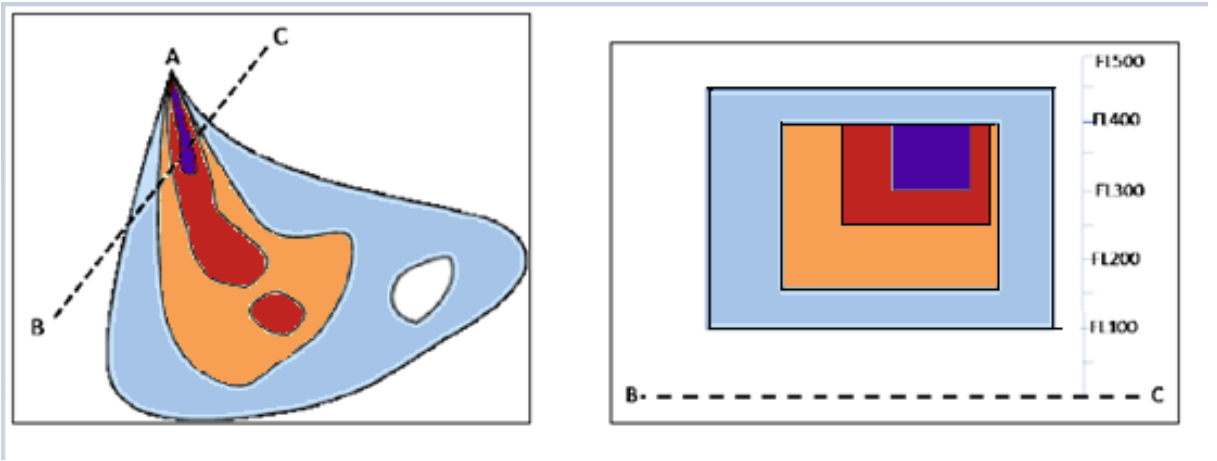
Quality control

- Rerun as eruption changes or poor parameterization
- Review VAA/VAG and QVA IWXXM
- Accept QVA IWXXM and gridded data
- Discard QVA IWXXM and gridded data

Alignment of current VAA/VAG with QVA IWXXM and gridded data

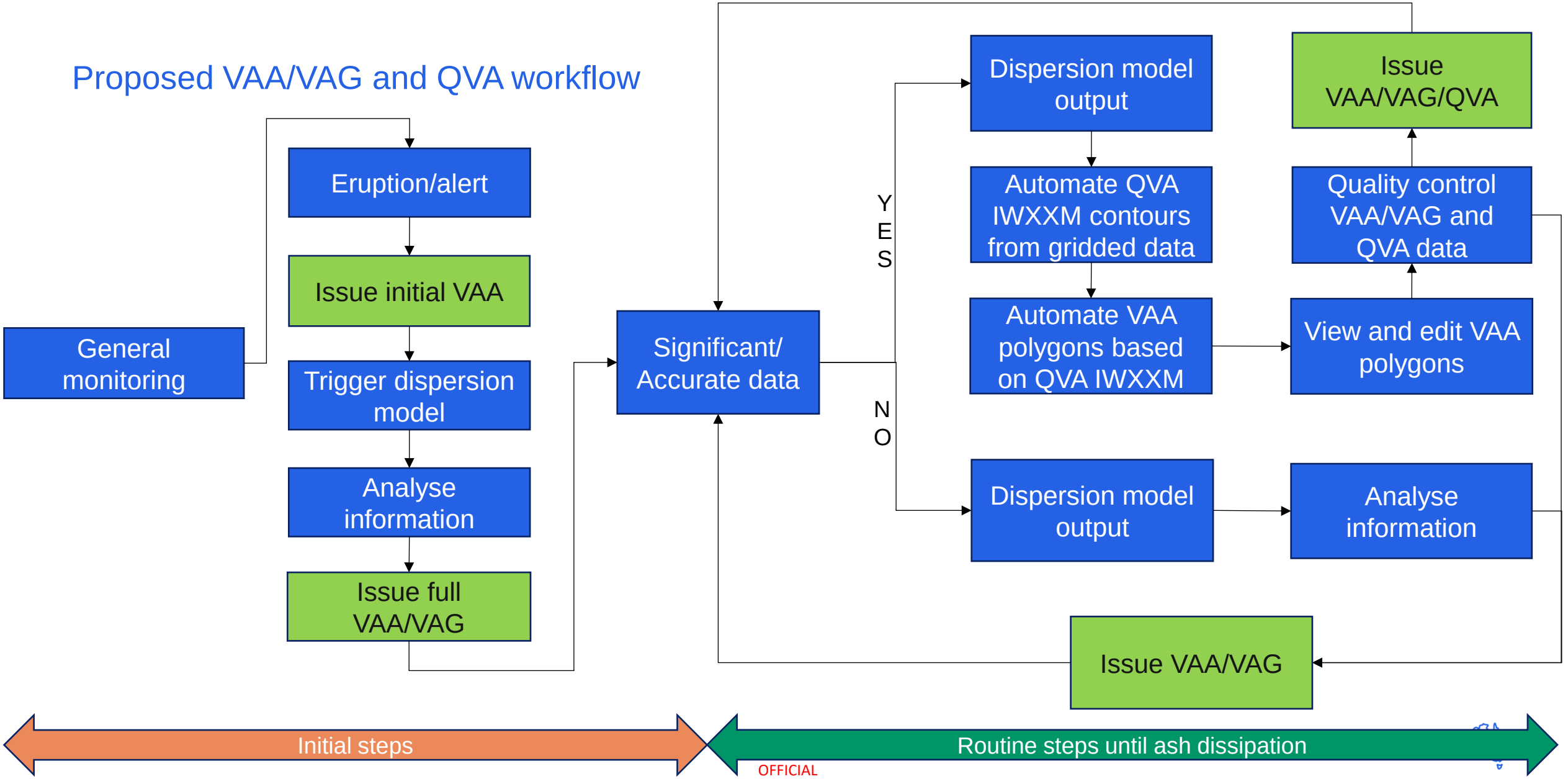
- VAA/VAG polygons will contain the 0.2 mg/m3 QVA IWXXM contour

Support to aviation customers



Proposed VAAC Forecaster workflow for QVA issuance

Proposed VAA/VAG and QVA workflow

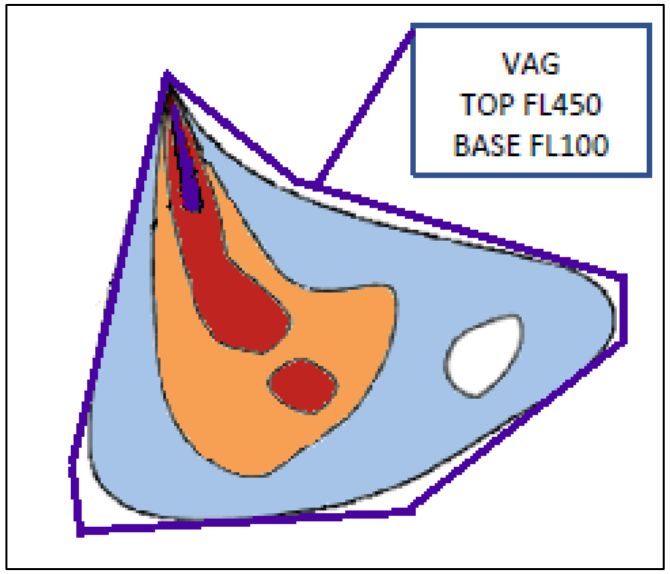


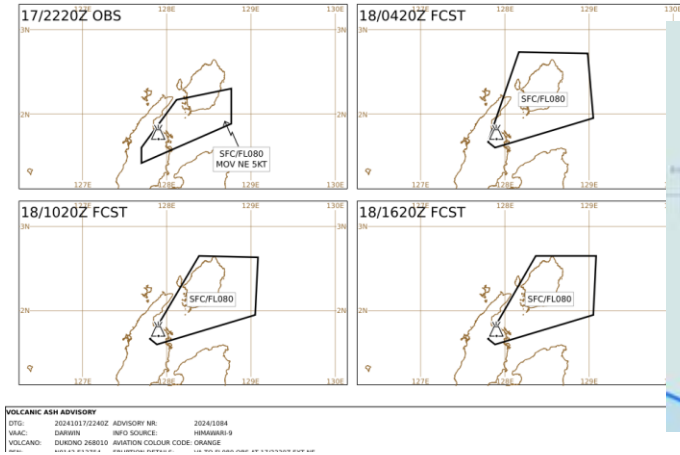
Proposed VAAC Forecaster workflow for QVA issuance

Aviation Perspective

As an eruption progresses, what would airlines expect to see:

- Initial VAA/VAG notification of the eruption
- Follow up VAA/VAG with a full forecast
- At least within 6 hours
- If significant
  - VAA/VAG will be issued (remark about QVA?)
  - QVA IWXXM, gridded data (deterministic and probabilistic) available through API
  - VAA/VAG polygons will enclose the lowest concentration in the QVA IWXXM file of 0.2 g/m3
  - WV SIGMET suggested to align with the VAA/VAG
- If not significant
  - VAA/VAG
  - WV SIGMET suggested to align with the VAA/VAG





7.1.4 **Recommendation.**— *SIGMET messages concerning volcanic ash cloud and tropical cyclones should be based on advisory information provided by VAACs and TCACs, respectively, designated by regional air navigation agreement.*

The Bureau of Meteorology

Thank you

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