WEATHER CLIMATE WATER
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Seventh meeting of the WMO-IUGG Volcanic Ash Scientific Advisory Group (VASAG/7)

Discussion topics

21 to 23 August 2017

USGS, Vancouver, WA, United States

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Greg Brock, Scientific Officer
AEM Division, WMO

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Opening session

Discussion lead: Larry and Andrew with Greg

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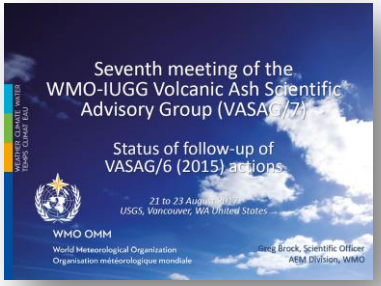
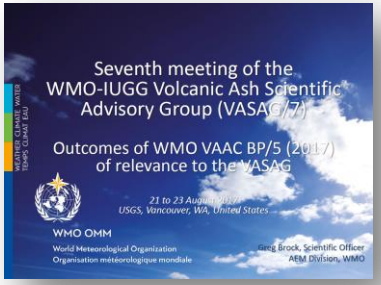
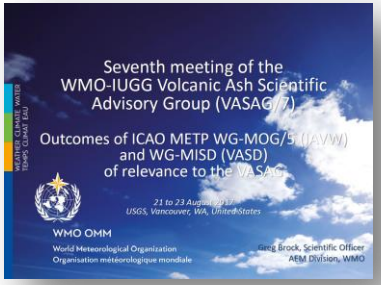
Opening session

- General discussion of IAVCEI-2017 outcomes
- Review status of follow-up to VASAG/6 actions
  - Link



- Review relevant outcomes of WMO VAAC BP/5, ICAO METP WG-MOG/5 (IAVW) and WG-MISD/3 (VASD)
  - Link 1
  - Link 2





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Source term characterization latest developments

Discussion lead: Larry with Sam

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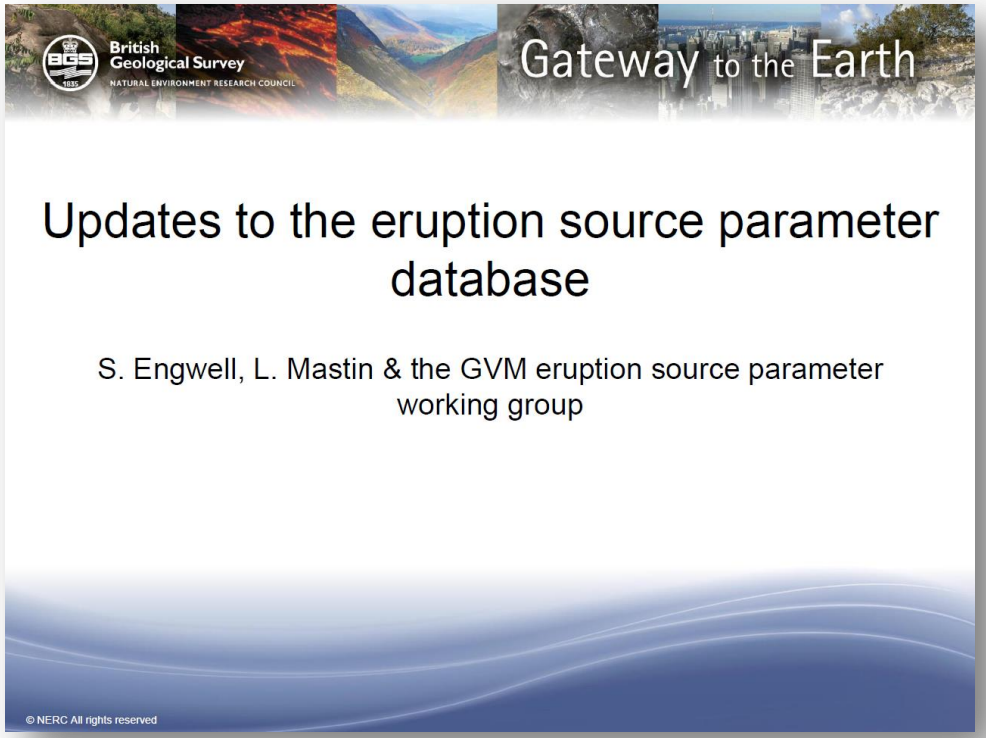
Source term characterization (1)

- See VASAG/7 (2017) presentation on:
  - Updates to the eruption source parameter database
  - Link



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Source term characterization (2)

- See VASAG/7 (2017) presentation on:
  - Dispersion model initialization
  - Link

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Remote sensing

Discussion lead: Andrew with Mike and Dave

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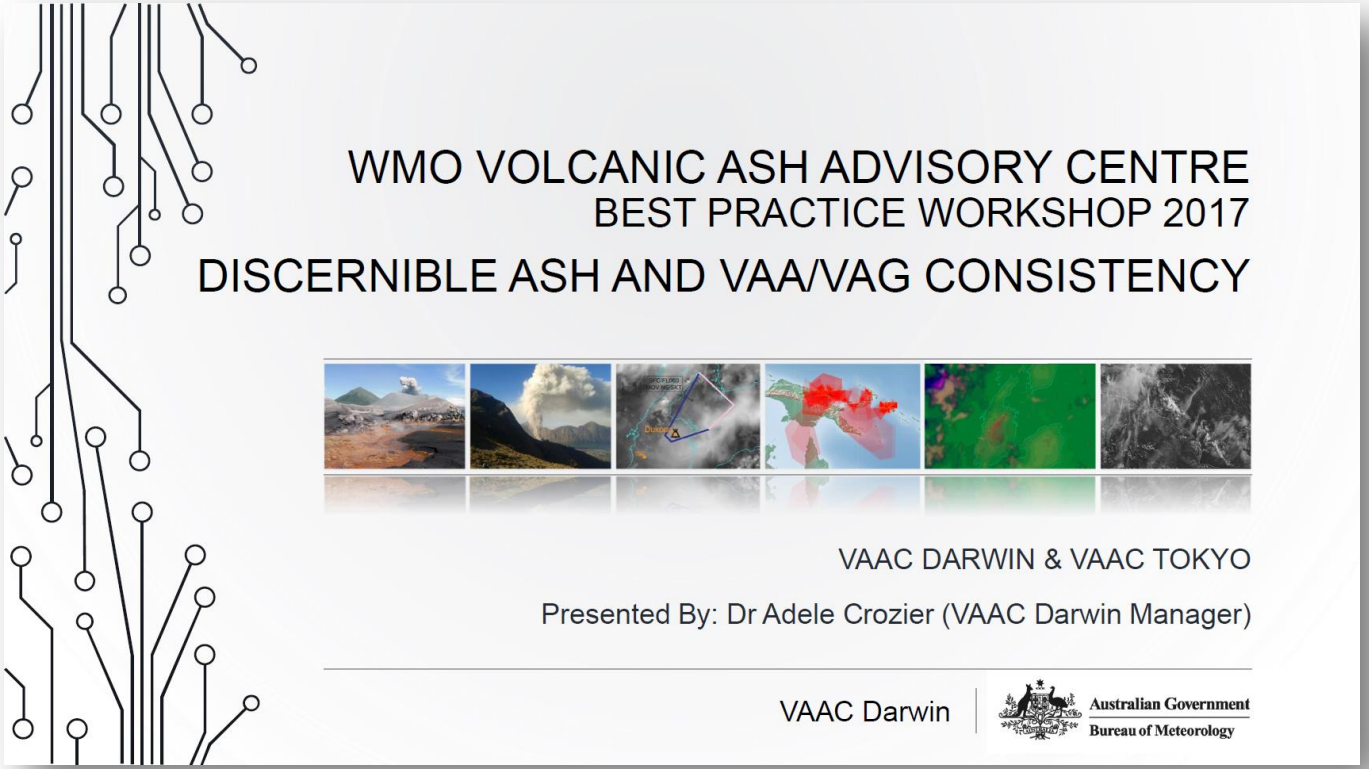
Remote sensing (1)

- See VAAC BP/5 (2017) presentation on:
  - Discernible ash strength of evidence checklists
  - Link



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Remote sensing (2)

- See VAAC BP/5 (2017) presentation on:
  - Satellite inter-comparison activities
  - Link

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Quantitative VA contamination information and long-range forecasts

Discussion lead: Larry with Augusto, Sara, Arnau, Claire and Ian

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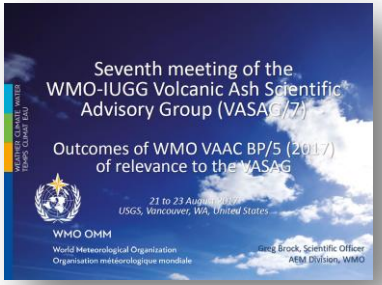
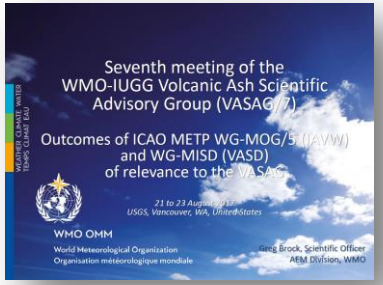
Quantitative VA contamination info[n] and long-range forecasts (1)

- Refer to outcomes of:
  - VAAC BP/5 (2017)
  - WG-MOG/5 (2017)





- Links to Rolls-Royce information:
  - Matching Engine Durability Against Ash Cloud Occurrence
  - VA Brief Summary
  - VA Limits Guidance

Quantitative VA contamination info[n] and long-range forecasts (2)

- Related considerations:
  - IVATF/3 (February 2012) Recommendation 3/11
    - *Recommended that work on developing modelled volcanic ash concentrations information for users be* **discontinued** *in view of (at the time) a lack of a global user requirement, the spread of uncertainties in volcanic ash observing and forecasting, and noting the scientific and operational progress in enhancing volcanic ash advisory centre (VAAC) best practices*
  - Inputs and Outputs (Ins and Outs) VAAC Modelling Workshop (November 2012)
    - VAAC BP/4 (2016) Outcome VW4-O-03
    - Next review in 2018

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Aviation colour codes
and
Aircraft encounters database

Discussion lead: Larry and Andrew
with Marianne, Dave and Yohko

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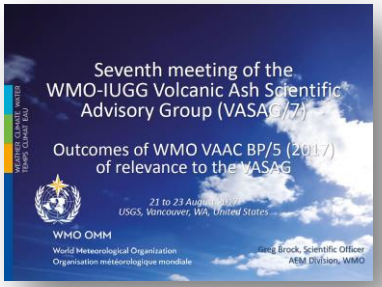
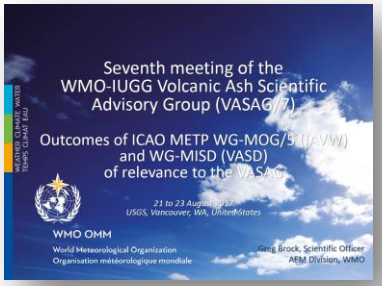
Aviation colour codes

- Refer to outcomes of:
  - VAAC BP/5 (2017)

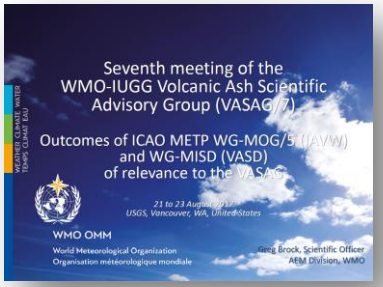


  - WG-MOG/5 (IAVW)

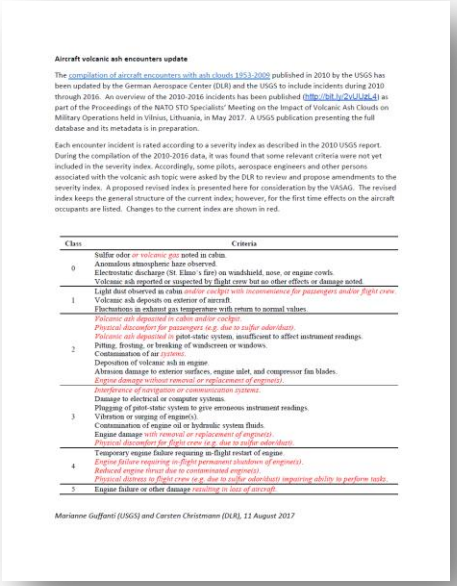


Aircraft encounters database (1)

- Refer to outcomes of:
  - WG-MOG/5 (2017)



- See VASAG/7 (2017) presentation on:
  - Aircraft VA encounter update
  - Link



Aircraft volcanic ash encounters update

The compilation of aircraft encounters with ash clouds 1953-2008 published in 2010 by the USGS has been updated by the German Aerospace Center (DLR) and the USGS to include incidents during 2010 through 2016. An overview of the 2010-2016 incidents has been published (http://bit.ly/2vUUqL4) as part of the Proceedings of the NATO STO Specialists' Meeting on the Impact of Volcanic Ash Clouds on Military Operations held in Vilnius, Lithuania, in May 2017. A USGS publication presenting the full database and its metadata is in preparation.

Each encounter incident is rated according to a severity index as described in the 2010 USGS report. During the compilation of the 2010-2016 data, it was found that some relevant criteria were not yet included in the severity index. Accordingly, some pilots, aerospace engineers and other persons associated with the volcanic ash topic were asked by the DLR to review and propose amendments to the severity index. A proposed revised index is presented here for consideration by the VASAG. The revised index keeps the general structure of the current index; however, for the first time effects on the aircraft occupants are listed. Changes to the current index are shown in red.

Class	Criteria
0	Sulfur odor *or volcanic gas* noted in cabin. Anomalous atmospheric haze observed. Electrostatic discharge (St. Elmo's fire) on windshield, nose, or engine cowls. Volcanic ash reported or suspected by flight crew but no other effects or damage noted.
1	Light dust observed in cabin *and/or cockpit with inconvenience for passengers and/or flight crew.* Volcanic ash deposits on exterior of aircraft. Fluctuations in exhaust gas temperature with return to normal values.
2	*Volcanic ash deposited in cabin and/or cockpit.* *Physical discomfort for passengers (e.g. due to sulfur odor/dust).* *Volcanic ash deposited in* pitot-static system, insufficient to affect instrument readings. Pitting, frosting, or breaking of windscreen or windows. Contamination of air *systems.* Deposition of volcanic ash in engine. Abrasion damage to exterior surfaces, engine inlet, and compressor fan blades. *Engine damage without removal or replacement of engine(s).*
3	*Interference of navigation or communication systems.* Damage to electrical or computer systems. Plugging of pitot-static system to give erroneous instrument readings. Vibration or surging of engine(s). Contamination of engine oil or hydraulic system fluids. Engine damage *with removal or replacement of engine(s).* *Physical discomfort for flight crew (e.g. due to sulfur odor/dust).*
4	Temporary engine failure requiring in-flight restart of engine. *Engine failure requiring in-flight permanent shutdown of engine(s).* *Reduced engine thrust due to contaminated engine(s).* *Physical distress to flight crew (e.g. due to sulfur odor/dust) impairing ability to perform tasks.*
5	Engine failure or other damage *resulting in loss of aircraft.*

Marianne Guffanti (USGS) and Carsten Christmann (DLR), 11 August 2017

Aircraft encounters database (2)

Class	Criteria
0	Sulfur odor *or volcanic gas* noted in cabin. Anomalous atmospheric haze observed. Electrostatic discharge (St. Elmo's fire) on windshield, nose, or engine cowls. Volcanic ash reported or suspected by flight crew but no other effects or damage noted.
1	Light dust observed in cabin *and/or cockpit with inconvenience for passengers and/or flight crew*. Volcanic ash deposits on exterior of aircraft. Fluctuations in exhaust gas temperature with return to normal values.
2	*Volcanic ash deposited in cabin and/or cockpit*. *Physical discomfort for passengers (e.g. due to sulfur odor/dust)*. *Volcanic ash deposited in* pitot-static system, insufficient to affect instrument readings. Pitting, frosting, or breaking of windscreen or windows. Contamination of air *systems*. Deposition of volcanic ash in engine. Abrasion damage to exterior surfaces, engine inlet, and compressor fan blades. *Engine damage without removal or replacement of engine(s)*.
3	*Interference of navigation or communication systems*. Damage to electrical or computer systems. Plugging of pitot-static system to give erroneous instrument readings. Vibration or surging of engine(s). Contamination of engine oil or hydraulic system fluids. Engine damage *with removal or replacement of engine(s)*. *Physical discomfort for flight crew (e.g. due to sulfur odor/dust)*.
4	Temporary engine failure requiring in-flight restart of engine. *Engine failure requiring in-flight permanent shutdown of engine(s)*. *Reduced engine thrust due to contaminated engine(s)*. *Physical distress to flight crew (e.g. due to sulfur odor/dust) impairing ability to perform tasks*.
5	Engine failure or other damage *resulting in loss of aircraft*.

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Changes to the current index are shown in *red*

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SO_2 and other toxic gases

Discussion lead: Andrew

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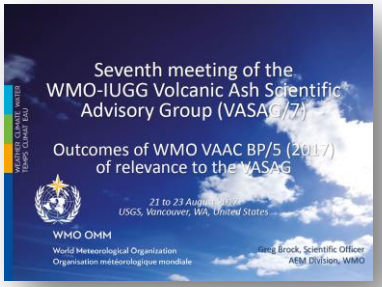
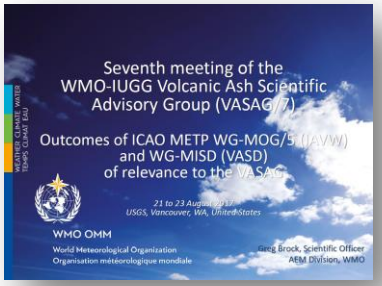
SO_2 and other toxic gases

- Refer to outcomes of:
  - VAAC BP/5 (2017)



  - WG-MISD/3 (VASD)



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Other IAVW-relevant developments, including the WMO GAW

Discussion lead: Andrew with Alexander and Matt

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Other IAVW-relevant developments, including the WMO GAW

- See VASAG/7 (2017) presentation on:
  - WMO GAW applications
  - Link [pending]

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Future events

Discussion lead: Larry and Andrew with Greg

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Future events

- See VASAG/7 (2017) presentation on:
  - WMO Aeronautical Meteorology Scientific Conference (AeroMetSci-2017)
  - Eighth WMO International Workshop on Volcanic Ash (IWVA/8)
  - Link

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VASAG terms of reference review and succession planning needs

Discussion lead: Larry and Andrew with Greg

CLOSED SESSION (VASAG members only)

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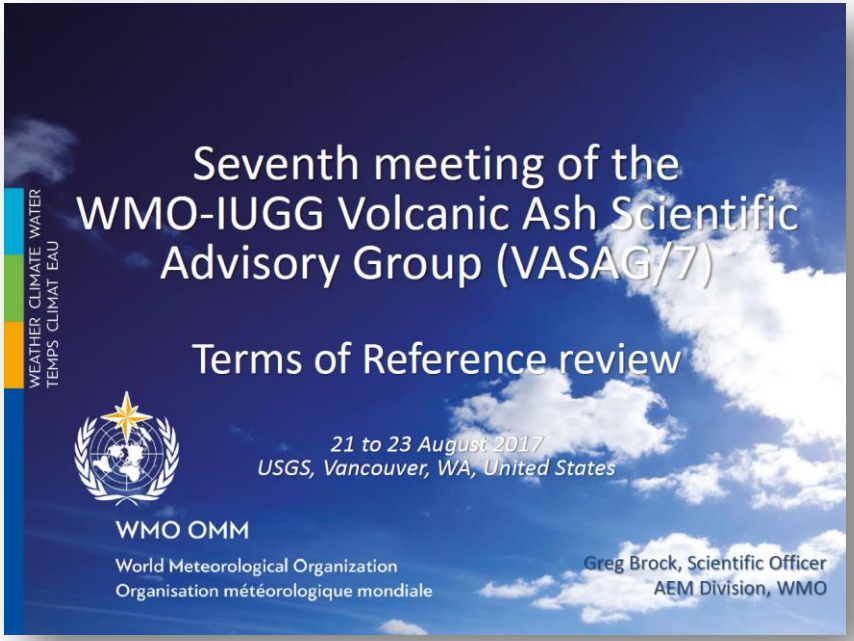
VASAG terms of reference review

- See VASAG/7 (2017) presentation on:
  - VASAG terms of reference
  - Link



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Closing session

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Closing session

- Review of actions arising from VASAG/7
  - See in-session DOC or PPT
- Next VASAG meeting
- Any other business

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Thank you
Merci

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