



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



Contribution of Toulouse VAAC to VOLCEX Exercises Case Study and Best Practices

Presented by : Philippe Héreil (Météo-France, Toulouse VAAC)

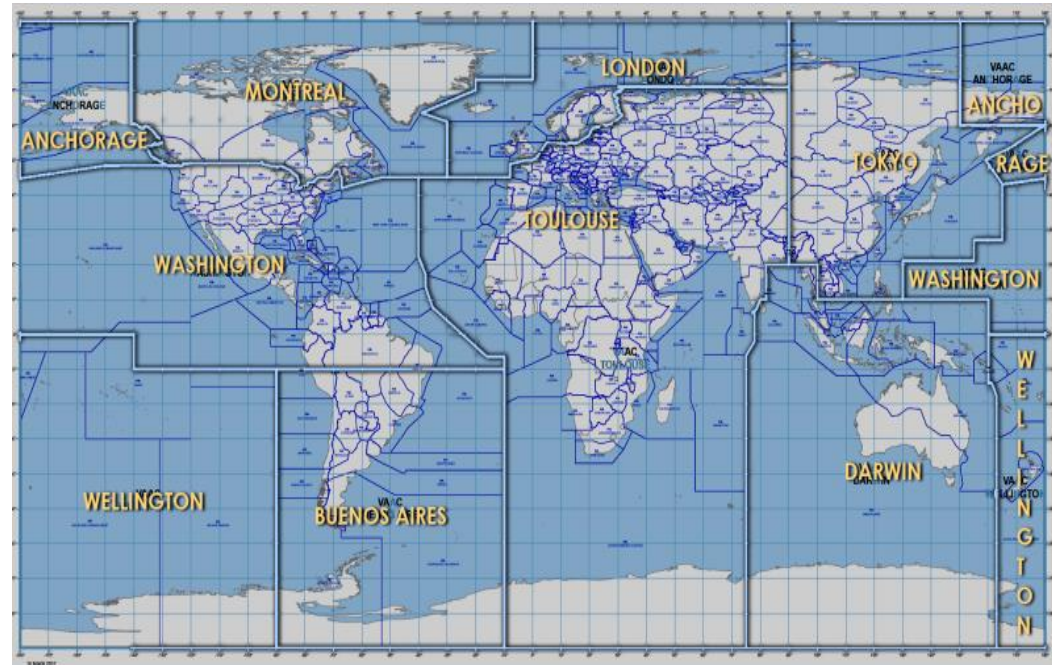


Content

- **Overview of the Toulouse VAAC**
- **Main volcanoes in the area of responsibility**
- **Contribution to the EUR VOLCEX19 Exercise**

Toulouse VAAC overview

- The Toulouse VAAC Toulouse is one of the 9 VAAC designated by ICAO to contribute to the International Airways Volcano Watch
- Large area of responsibility
- Hosted by Meteo-France
- Mutual back-up arrangement with London VAAC (periodic exercises)



Toulouse VAAC Organization

- Met Service for Aviation (En-route information) : 3 forecasters on duty in Toulouse Center, 24h /7 days (22 forecasters in the operations team, 12h shift)
 - 1 - LLSIGWX Charts over France /Space Weather
 - 2- Meteo Watch Office
 - 3- VAAC / SIGWX charts over Europe
- Every forecaster is multi-skilled, trained to VAAC operations
- Mutual back-up with London VAAC



Toulouse VAAC operations

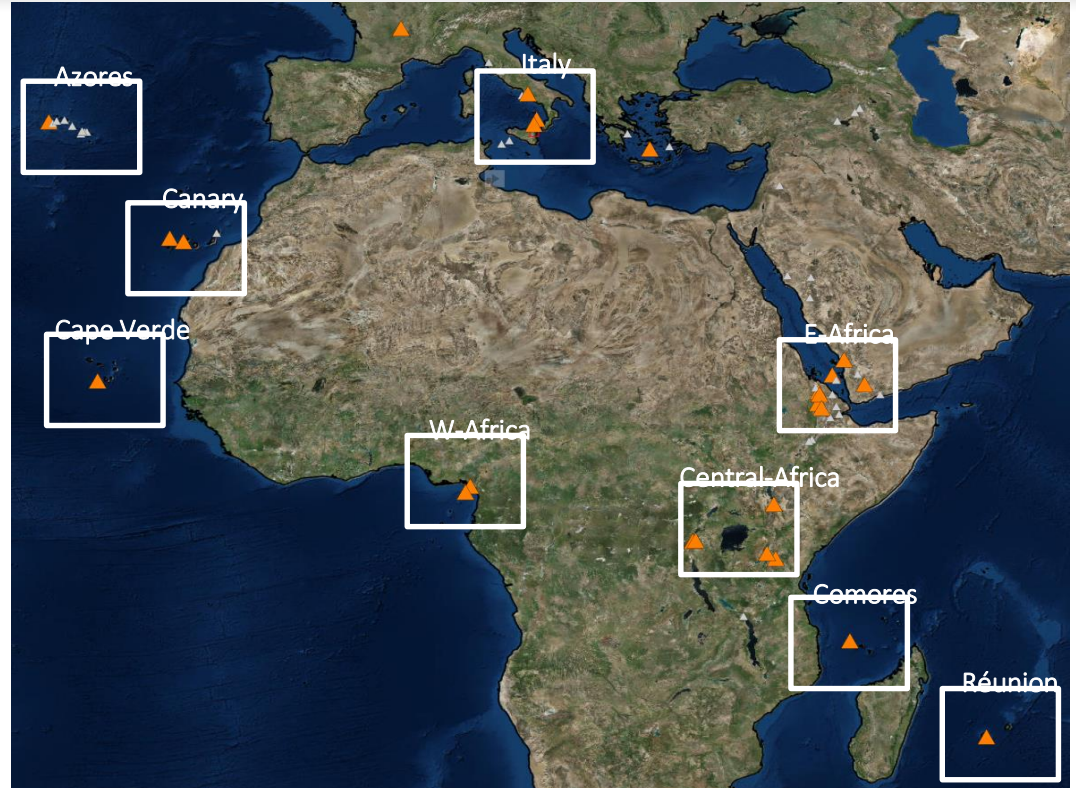
Volcano Watch and proactivity

- continuous notifications checking (VONA, AIREPs, NOTAMs, SIGMETs...)
- satellite imagery monitoring (MSG4, NOAA Ash probability...)
- advanced monitoring for Mt Etna and Mt Stromboli in Italy (webcam and real-time seismic signal)

Provision of information on VA to aviation users in near real time

- VA Advisories (VAA), VA Graphics (VAG) , concentration charts
- high responsiveness: respect of ICAO Key Performance Indices (KPI) - ex. 1st VAA must be issued within 20 min after notification of ash evidence by volcano observatories

Main active volcanoes in the AoR of Toulouse VAAC (from OPGC Clermont Ferrand)





Main active volcanoes in the AoR of Toulouse VAAC (from OPGC)

Country	Name	type	Activity - I	Activity - II	Last eruption	OBS
Congo	Nyiragongo	Strato / Néphéline	Lava lake	Lava flows SO2 plume	2002 – Ongoing - VEI 0/1	OVG
Congo	Nyamuragira	Shield / Basalt	SO2 plume Lava lake	Lava flows	2018 – Ongoing - VEI 0/1	OVG
Tanzania	OD-Lengai	Strato/ carbonatite	Lava flows spattering	Ash plume	2017– Ongoing - VEI 0/1 2007 – VEI 3	OVG
Ethiopia	Erta Ale	Shield / Basalt	Lava lake Lava flow	SO2 plume	1967– Ongoing - VEI 0	Faculty AA
Ethiopia	Dabbahu	Strato/ B-Trachyte	Ash plume	Pumice dome	2005 – VEI 3	Faculty AA
Ethiopia	Manda hararo	Shield / Basalt	Lava flow	SO2 plume	2009 – VEI 2 2007 – VEI 2	Faculty AA
Yemen	Jebel at Tair	Strato / B-Trachyte	Lava flow	SO2 plume Ash plume	2007 – VEI 3	Faculty AA
Cameroon	Cameroun	Strato/ Basalt	Lava flows	Ash plume	2000 – VEI 2	-



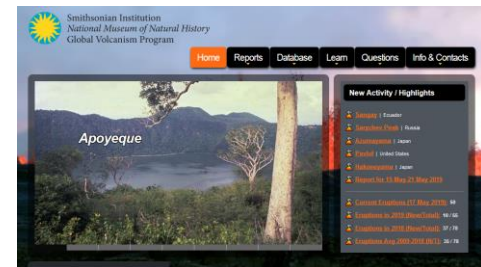
Main active volcanoes in the AoR of Toulouse VAAC (from OPGC)

Country	Name	type	Activity - I	Activity - II	Last eruption	OBS
Cape Verde	Fogo	Strato / Néphéline	Lava flow	Ash plume SO2 plume	2014 – VEI 3	OVCV
Italy	Etna	Strato / T-Basalt	Lava flow Lava fountain	Ash plume SO2 plume	2019 – VEI 2/3	INGV
Italy	Stromboli	Strato / T-Andesite	Ash plume SO2 plume	Lava flow Lava fountain	1934 – ongoing VEI 2/3	INGV
Comores	Karthala	Shield / Basalt	Lava flow	Ash plume SO2 plume	2005 – VEI 2 2007 – VEI 3	OVK-CNDRS
Réunion	Fournaise	Shield / Basalt	Lava flow	Lava fountain SO2 plume	2019 – VEI 0 2007 – VEI 1	OVPF

Volcano Database
GVP-Smithsonian



<https://volcano.si.edu/>





Close Collaboration with Volcano Observatories/Institutes : A key point for the VAACs

- Importance for VAACs to keep updated contacts with volcano observatories and institutes

Ongoing update of IAVW Handbook/part5 : Any information is welcome!

- Early notification of VAAC is a key point to provide users with real time information on ash contamination of the airspace.

Close cooperation with State Volcano Observatories (SVO) is sought
e.g. INGV for Italian Volcanoes

- Participation of Toulouse VAAC to ICAO Working Groups (MOG and MISD)
Elevation of VONA* to the range of an ICAO message. Work is undergoing to define a template.

*Volcano Observatory Notice to Aviation

Contribution of Toulouse VAAC to VOLCEX19 (20th Nov. 2019)

- Fictitious eruption of Mount Vesuvius (Italy), Past weather
- Exercise leader : Italy and Eurocontrol/NM
- ICAO, ECTRL crisis cell, 30 Airline operators, 31 ANSP, IATA, 13 airports
- Main goal: check that States comply to the EUR/NAT VA Contingency Plan



Eruption scenario for VOLCEX19 (20th Nov 2019)

- Volcano: **Mount Vesuvius (Italy)** Elevation 4203ft
- Eruption Start : **18 Nov 2019 06Z**, **Ash Release : 48 h**, Past weather conditions
- Dispersion model : MOCAGE Accident model with complete set of physical schemes : advection, wet/dry deposition, coupling with ARPEGE model 10 km fields
- Erupting column and emission rate : fixed for the run, unique size of particles
- Plume top : **50000 ft (15 km amsl)**, Uniform vertical distribution
- Ash concentration charts : provided from T0 to T0+72h, every 6h



VAAC Toulouse products delivered for VOLCEX19

Triggering : RED VONA from INGV (Volcano Obs.)

- VA Advisories / VA Graphics issued sequentially on 20th Nov
- VA Concentration charts posted on the VAAC Toulouse VAAC Web Portal
- Annotated satellite pictures

Additional specific provision:

- VA Concentration charts in kmz format (Google Earth) and pdf format

VA ADVISORY
STATUS: EXER

VAAC products : Volcanic Ash Advisory (VAA)

DTG: 20191120/0600Z

VAAC: TOULOUSE

VOLCANO: VESUVIUS 211020

PSN: N4049 E01425

AREA: ITALY

SUMMIT ELEV: 1281M

ADVISORY NR: 2019/3

INFO SOURCE: EXERCICE VOLCEX19 EXERCISE

AVIATION COLOUR CODE: RED

ERUPTION DETAILS: ERUPTION AT 20191118/0600Z EXERCISE VOLCEX19 EXERCISE

OBS VA DTG: 20/0600Z

OBS VA CLD: SFC/FL100FL100/390....FL390/550....

FCST VA CLD +6HR: 20/1200Z SFC/FL100FL100/390....FL390/550

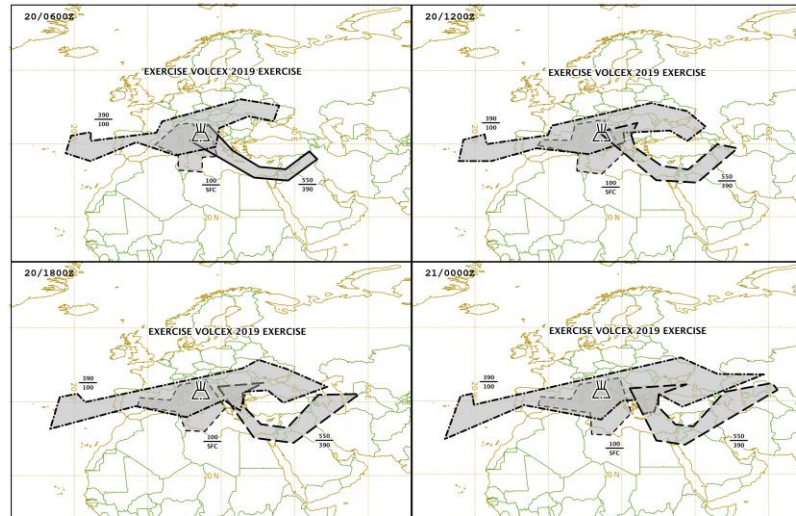
FCST VA CLD +12HR: 20/1800Z SFC/FL100FL100/390....FL390/550...

FCST VA CLD +18HR: 21/0000Z SFC/FL100FL100/390....FL390/550 ...

RMK: EXERCISE VOLCEX19 PLEASE DISREGARD. EXERCISE EXERCISE EXERCISE

NXT ADVISORY: NO LATER THAN 20191120/1200Z=

VAAC products : Volcanic Ash Graphics (VAG)



VOLCANIC ASH ADVISORY
 DTG:20191120/0600Z
 VAAC:Toulouse
 VOLCANO: VESUVIUS 211020
 AREA: ITALY
 SUMMIT ELEV: 1281M



ADVISORY NR: 2019/3
 INFO SOURCE:EXERCISE VOLCEX 2019 EXERCISE
 AVIATION COLOUR CODE:RED
 ERUPTION DETAILS: ERUPTION AT 20191118/0600Z EXERCISE VOLCEX 2019 EXERCISE
 RMK: EXERCISE VOLCEX 2019 PLEASE DISREGARD. EXERCISE EXERCISE EXERCISE
 NNT ADVISORY:NO LATER THAN 20191120/1200Z.

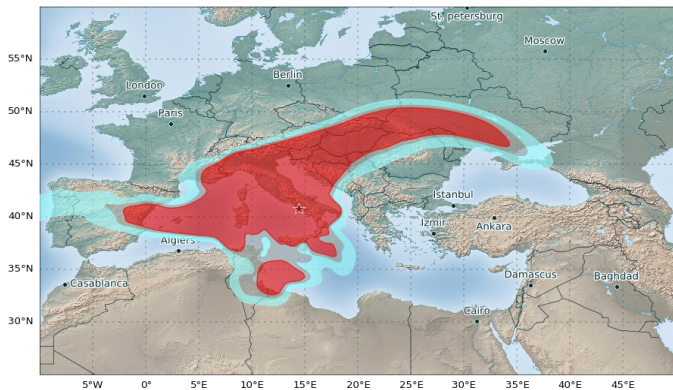
VAAC products : Ash concentration charts

volcex19 - ash concentration from SFC to FL200
 valid from 2019/11/20 06:00 UTC to 2019/11/20 12:00 UTC
EXERCISE !!! EXERCISE !!! EXERCISE !!!

This is a guidance product, supplemental to the official VAAC Toulouse Volcanic Ash Advisory and Volcanic Ash Graphic products.
 All concentrations are subject to a level of uncertainty relative to errors in the estimation of the eruption strength.



low medium high



0.2 ≤ C ≤ 2 mg/ m³

2 < C ≤ 4 mg/ m³

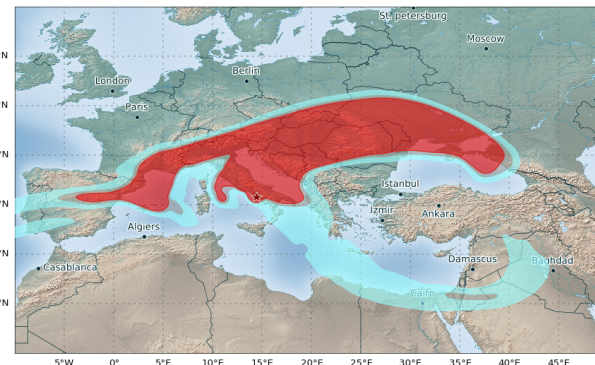
C > 4 mg/ m³

volcex19 - ash concentration from FL200 to FL350
 valid from 2019/11/20 06:00 UTC to 2019/11/20 12:00 UTC
EXERCISE !!! EXERCISE !!! EXERCISE !!!

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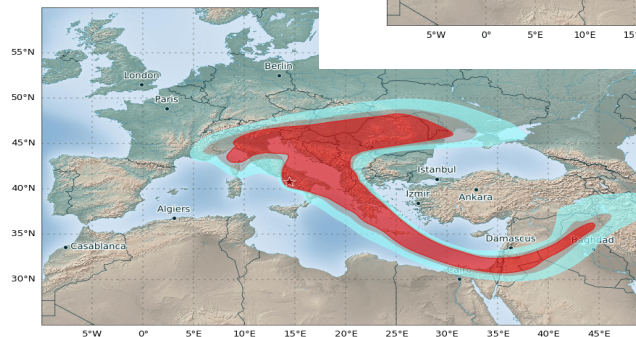
low medium high



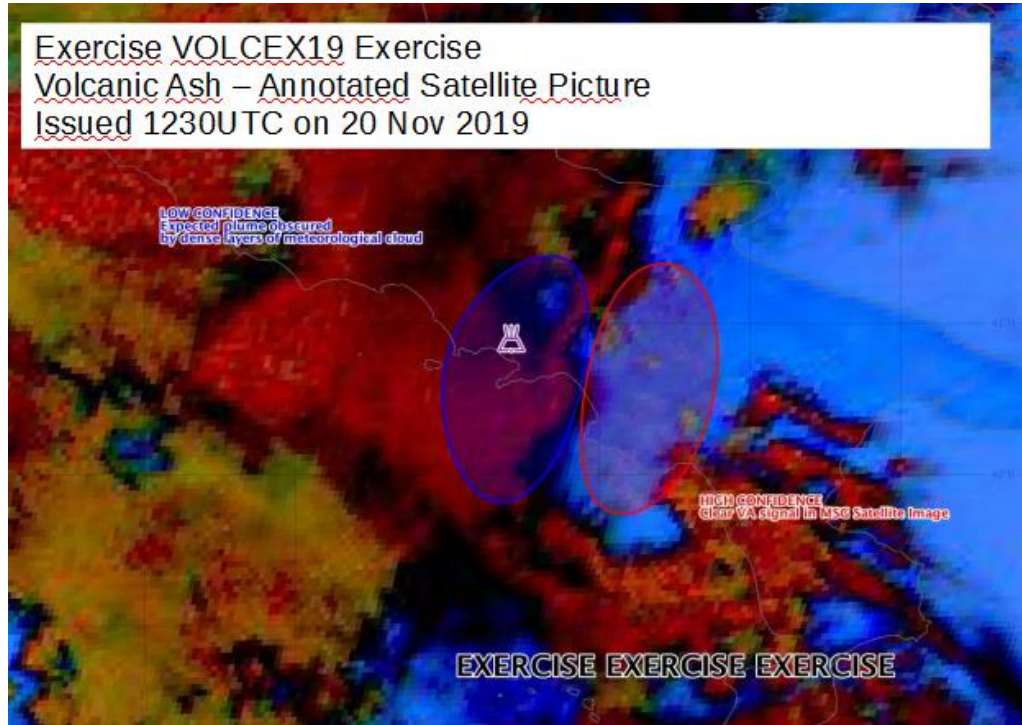
volcex19 - ash concentration from FL350 to FL5
 valid from 2019/11/20 06:00 UTC to 2019/11/20 12:00 UTC
EXERCISE !!! EXERCISE !!! EXERCISE !!!

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 All concentrations are subject to a level of uncertainty relative to errors in the estimation of the eruption strength.

low medium



VAAC products : Annotated satellite views (fictitious)

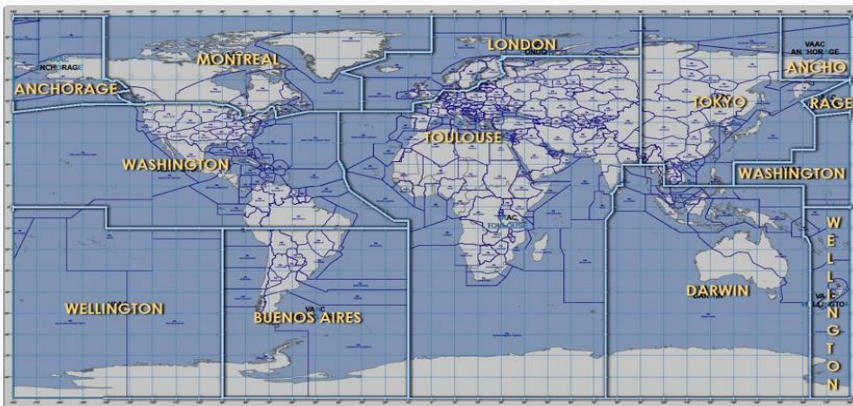


Toulouse Volcanic Ash Advisory Center

Last Update: October 01, 2019 at 13:10 utc

The nine VAACs (Volcanic Ash Advisory Centers), have been designated by the International Civil Aviation Organization to provide their expertise to civil aviation in case of significant volcanic eruptions.

They are a basic part of the IAVW. (International Airways Volcano Watch).



The VAAC zones.

- Anchorage
- Buenos Aires
- Darwin
- Montreal
- London
- Tokyo
- Wellington
- Washington

Most Recents VAA

- ETNA - 2019-10-01 09:05 UTC
- ETNA - 2019-09-30 12:00 UTC
- ETNA - 2019-09-28 06:24 UTC
- NYAMURAGIRA - 2019-09-26 14:02 UTC
- NYAMURAGIRA - 2019-09-26 13:16 UTC

Volcanoes

- [Agua De Pau](#)
[Askja](#)
[Calbuco](#)
- [Cameron Mt](#)
[Campi Flegrei](#)
[Chaiten](#)
- [Cordon Caulle](#)
[Dubbi](#)
[Etna](#)
[Eyjafjoll](#)
- [Fayal](#)
[Fogo](#)
[Furnas](#)
[Grimsvotn](#)
- [Heard](#)
[Katla](#)
[Merapi](#)
[Meru](#)
[Nabro](#)
- [Nyamuragira](#)
[Nyiragongo](#)
- [Ol Doinyo Lengai](#)
[Piton De La Fournaise](#)
- [Sete Cidades](#)
[Stromboli](#)
[Terceira](#)
- [Teyr Djebel](#)
[Vulcano](#)

States

- [Australia](#)
[Cameroon](#)
[Cape Verde](#)
- [Chile](#)
[Dr Congo](#)
[Eritrea](#)
[France](#)
- [Iceland](#)
[Indonesia](#)
[Italy](#)
[Portugal](#)
- [Tanzania](#)
[Yemen](#)

Years

- [2006](#)
[2007](#)
[2008](#)
[2009](#)
[2010](#)
- [2011](#)
[2012](#)
[2013](#)
[2014](#)
[2015](#)
- [2016](#)
[2017](#)
[2018](#)
[2019](#)

List by :

- volcano names

- countries

- years



VAAC Toulouse ADVISORIES VOLCANOES CONTACT

VESUVIUS - 2019-11-20 05:52 utc

VA ADVISORY
 DTG: 20191120/0552Z
 VAAC: TOULOUSE
 VOLCANO: VESUVIUS 211020
 PSN: N4049 E01425
 AREA: ITALY
 SUMMIT ELEV: 1281M
 ADVISORY NR: 2019/3
 INFO SOURCE: EXERCISE VOLCEX19 EXERCISE
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 ERUPTION DETAILS:ERUPTION AT 20191118/0600Z EXERCISE VOLCEX19 EXERCISE
 OBS VA DTG: 20/0600Z
 OBS VA CLD: SFC/FL100 N3945 E00200 - N4645 E01115 - N3845 E01900 - N3130 E01130 - N3945 E00
 FCST VA CLD +6 HR: 20/1200Z SFC/FL100 N4015 W00230 - N4715 E01315 - N3730 E02030 - N3200 E0
 FCST VA CLD +12 HR: 20/1800Z SFC/FL100 N3930 W00330 - N4545 E01515 - N3815 E02115 - N3200 E
 FCST VA CLD +18 HR: 21/0000Z SFC/FL100 N3930 W00330 - N4615 E01845 - N3645 E02230 - N3045 E
 RMK: EXERCISE EXERCISE EXERCISE
 NXT ADVISORY: NO LATER THAN 20191120/1200Z=

- VAG (png)
- VAG (csv)
- Concentration maps (png)
- Concentration maps (csv)
- Concentration maps SFC-FL200 (pdf)
- Concentration maps FL200-FL350 (pdf)
- Concentration maps FL350-FL550 (pdf)
- Concentration maps SFC-FL200 (kmz)
- Concentration maps FL200-FL350 (kmz)
- Concentration maps FL350-FL550 (kmz)
- Annotated satellite views (png)
- VAAC Remarks

Most Recents VAA

- FOGO - 2020-01-13 14:32 UTC
- FOGO - 2020-01-13 13:37 UTC
- FOGO - 2020-01-13 10:41 UTC
- ETNA - 2019-12-31 22:55 UTC
- ETNA - 2019-12-17 16:20 UTC

Volcanoes

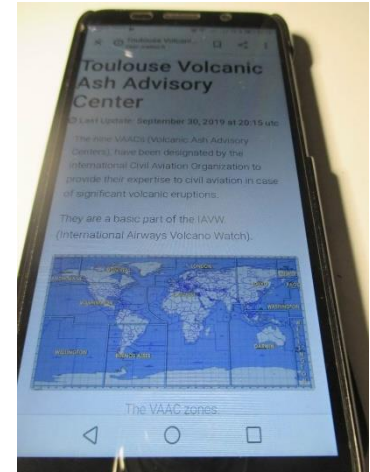
- Agua De Pau Askja Calbuco
- Cameroon Mt Campi Flegrei Chaiten
- Cordon Caulle Dubbi Etna Eyjafjoll
- Fayal Fogo Furnas Grimsvotn
- Heard Katla Merapi Meru Nabro
- Nyamuragira Nyiragongo
- Oi Doinyo Lengai Piton De La Fournaise
- Sete Cidades Stromboli Terceira
- Teyr Djebel Vesuvius Vulcano

States

- Australia Cameroon Cape Verde
- Chile Dr Congo Eritrea France
- Iceland Indonesia Italy Portugal
- Tanzania Yemen

Years

- 2006 2007 2008 2009 2010
- 2011 2012 2013 2014 2015
- 2016 2017 2018 2019 2020



Responsive web design : Easy display on smartphone

Concentrations charts : downloadable in png, csv, kmz formats + Archive



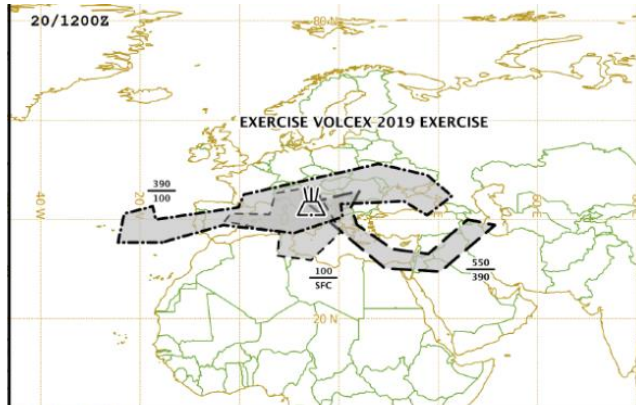
Thank you for your attention !

<http://vaac.meteo.fr/>

Special Attention : VAG vs Concentration Charts

VAG :

- Based on observations and dispersion model outputs
- snapshot (fixed time)
- choice of vertical layers
- « forecaster made » : take into account the very last observations



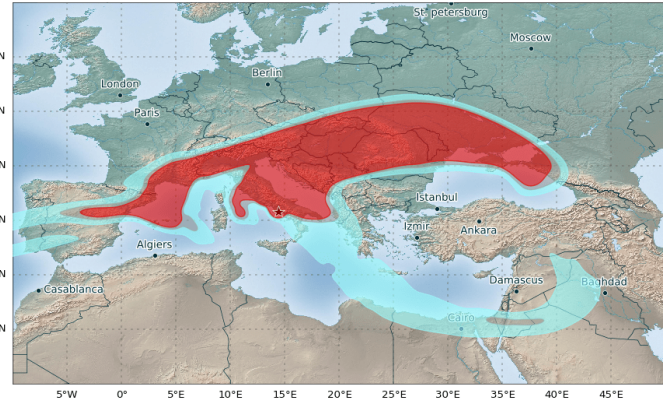
VA Concentration Charts :

- temporal mean (6h)
- imposed vertical layers
- automated numerical product

volcex19 - ash concentration from FL200 to FL350
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low medium high





ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



ICAO

North American
Central American
and Caribbean
(NACC) Office
Mexico City

South American
(SAM) Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU