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IUGG response to the societal impact of the recent Eyjafjallajokull volcano eruptions

The plume of Eyjafjallajokull volcano on April 17, 2010
(image courtesy of and copyright Snaevarr Gudmundsson).

Ash clouds from the Icelandic volcano have caused extreme disruptions to scheduled aircraft flights as they drifted over northern to central and eastern Europe and affected hundreds of thousand of travelers on all continents.

Tom Beer, the IUGG President, and *Setsuya Nakada*, the President of the International Associations of Volcanology and the Chemistry of the Earth's Interior (IAVCEI), initiated discussions with IAVCEI experts in volcanic ash cloud dynamics and in health hazards of volcanoes (*Peter Baxter*, University of Cambridge, UK; *Claire Horwell*, Durham Univeristy, UK; *Joan Marti*, Institute of Earth Sciences "Jaume Almera", Barcelona, Spain; *Stephen McNutt*, University of Alaska at Fairbanks, USA; *Stephen Sparks* of the University of Bristol, UK), and with the IUGG representatives to the U.N. International Civil Aviation Organization - ICAO (*William Rose*, Michigan Tech, and *Marianne Guffanti* of USGS, both USA) on the Union contribution to the understanding of the dynamics of volcanic ash clouds, safety of air transportation and health. This discussion led to the following IUGG Statement on Volcanic Ash Clouds adopted by the Union's Bureau on 20 April 2010.

Statement on Volcanic Ash Clouds

Adopted by the IUGG Bureau on 20 April 2010

Explosive eruptions form broken hot magma and volcanic gas, which heats the air and rises like a thunderstorm. This brings volcanic ash and gases high into the atmosphere, up to the levels where jet aircraft fly and even beyond. This ash and gas are blown by the wind, which blows in different directions at various heights. The ash and gas lead to volcanic clouds, which incorporate water and ice particles. If these clouds reach the surface of the Earth then they may cause adverse respiratory effects in susceptible individuals. They are also a threat to the safety of jet aircraft because the ash melts inside the engines and may cause engine failure and other damage. These clouds may last for days or even weeks and can travel all the way around the world.

Ground based radar systems and satellite sensors can map the volcanic clouds. The satellite sensors can detect, measure and map ash, ice and sulfur dioxide gas. Radar and satellite data provide information about cloud altitude in near real time. There are accurate trajectory models, which can forecast the winds at all levels and predict the position of volcanic ash in advance. Volcanic ash aviation centres worldwide relay this information to aircraft dispatchers and pilots.

To summarise:

1. Volcanic clouds, which may be invisible, especially in the dark, are a hazard to jet aircraft because they contain volcanic ash, which melts inside jet engines and can cause engine failure.
2. There have been cases in the past where jet aircraft flew into invisible volcanic ash clouds and all engines stopped.
3. The volcanic clouds may exist at a variety of altitudes and can affect the health of people on the ground, and also may be dangerous to aircraft.
4. The extent of the volcanic clouds can be mapped by satellites, which sense silicate ash, ice and sulfur dioxide.
5. The existence of the volcanic cloud is sustained by continuing volcanic activity, but volcanic clouds may drift long distances and be detectable for a week or more after eruption.
6. The altitude of the volcanic cloud generally increases as the eruption intensity increases.
7. The volcanic cloud position is dynamic and is governed by wind directions, which are typically different at different altitudes. Once an eruption begins, the volcanic cloud position can be forecast by trajectory models.

The International Union of Geodesy and Geophysics (IUGG) through its constituent scientific association, the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), works with the U.N. International Civil Aviation Organization (ICAO) to understand better the physics, chemistry and dynamics of volcanic clouds and to find ways for pilots to distinguish volcanic ash clouds from normal clouds.

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