

EGU2020-15249, updated on 21 Oct 2020  
<https://doi.org/10.5194/egusphere-egu2020-15249>  
EGU General Assembly 2020  
© Author(s) 2020. This work is distributed under  
the Creative Commons Attribution 4.0 License.



## A yellow SWIM service dedicated to aviation and ATM by providing early warnings of volcanic SO<sub>2</sub> layer height from TROPOMI and IASI sensors

**Hugues Brenot**<sup>1</sup>, Nicolas Theys<sup>1</sup>, Scott Wilson<sup>2</sup>, Rory Clarkson<sup>3</sup>, Lieven Clarisse<sup>4</sup>, Adam Durant<sup>5,6</sup>, Giuseppe Salerno<sup>7</sup>, Stefano Corradini<sup>8</sup>, Riccardo Biondi<sup>9</sup>, Klaus Sievers<sup>10</sup>, Christophe Lerot<sup>1</sup>, Jeroen van Gent<sup>1</sup>, Sheri Smith<sup>5</sup>, and Michel Van Roozendael<sup>1</sup>

<sup>1</sup>Royal Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium (brenot@aeronomie.be)

<sup>2</sup>Eurocontrol, Headquarters, Brussels, Belgium (scott.wilson@eurocontrol.int)

<sup>3</sup>Rolls-Royce, Derby, UK (rory.clarkson@rolls-royce.com)

<sup>4</sup>Université Libre de Bruxelles (ULB), Spectroscopy, department of Quantum Chemistry and Atmospheric Remote Sensing, Brussels, Belgium (lclariss@ulb.ac.be)

<sup>5</sup>Satavia, Cambridge, UK (adam.durant@satavia.com)

<sup>6</sup>Michigan Tech., Geological and Mining Engineering and Sciences, Houghton, MI, USA (adam.durant@satavia.com)

<sup>7</sup>Istituto Nazionale di Geofisica e Vulcanologia (INGV), Osservatorio Etneo, Catania, Italy (giuseppe.salerno@ingv.it)

<sup>8</sup>Istituto Nazionale di Geofisica e Vulcanologia (INGV), Rome, Italy (stefano.corradini@ingv.it)

<sup>9</sup>Università degli Studi di Padova, Dipartimento di Geoscienze, Padova, Italy (riccardo.biondi@unipd.it)

<sup>10</sup>Klaus Sievers Aviation Weather, Lenggries, Germany (klaus\_sievers@web.de)

Volcanic ash and gas is, like sulphur dioxide (SO<sub>2</sub>), a major risk for air traffic. To mitigate this risk and to improve situational awareness for air traffic management (ATM), we describe a new service using the SWIM (System Wide Information System Management) Yellow Profile – see <https://www.eurocontrol.int/publication/eurocontrol-specifications-system-wide-information-management-swim> – and aligned with the ATM Information Reference Model (AIRM) as required.

This new service provides early warnings of volcanic SO<sub>2</sub> layer height (SO<sub>2</sub>LH) retrievals from 3 satellite instruments (TROPOMI on board S5P, and IASI-A&B on board MetOp-A&B). The implementation of this service is enveloped in the framework of OPAS – Operational alert Products for ATM via SWIM – project, a KTN (Knowledge Transfer Network) Engage Catalyst funded project (Thematic Challenge 3; <https://engagektn.com>) of SESAR JU (Single European Sky ATM Research Joint Undertaking; <https://www.sesarju.eu>).

We present the TROPOMI SO<sub>2</sub>LH algorithm and the uses of inverse modelling and external observations from satellites and ground-based DOAS-FLAME instruments to validate TROPOMI SO<sub>2</sub>LH products for recent eruptions (i.e. Etna in Dec. 2018, Raikoke in June 2019, Ubinas in July 2019, Taal in January 2020). Cross-comparison with the satellite instruments CALIOP (Cloud-Aerosol Lidar with Orthogonal Polarization), IASI (Infrared Atmospheric Sounder Interferometer) and with GNSS (Global Navigation Satellite System) radio-occultations, is shown.

This study will describe the specification of our SWIM service and highlight the point of view of an engine constructor (Rolls-Royce) directly in relation with airlines and ATM, with regard to the objectives of the APOS project. Note that due to engine susceptibility to aerosols, the avoidance of flights through volcanic plumes and SO<sub>2</sub> clouds is critical.

The development of our new SO2LH products from TROPOMI contributes to an existing early warning system, so called SACS (Support to Aviation Control Service; <http://sacs.aeronomie.be>). This system is dedicated to support aviation and ATM, and was recently upgraded in the frame of EUNADICS-AV project (European Natural Airborne Disaster Information and Coordination System for Aviation; <http://www.eunadics.eu>), with many other alert products related to natural airborne hazard affecting air traffic (e.g. volcanic ash column and layer height, smoke from forest fires and desert dust).