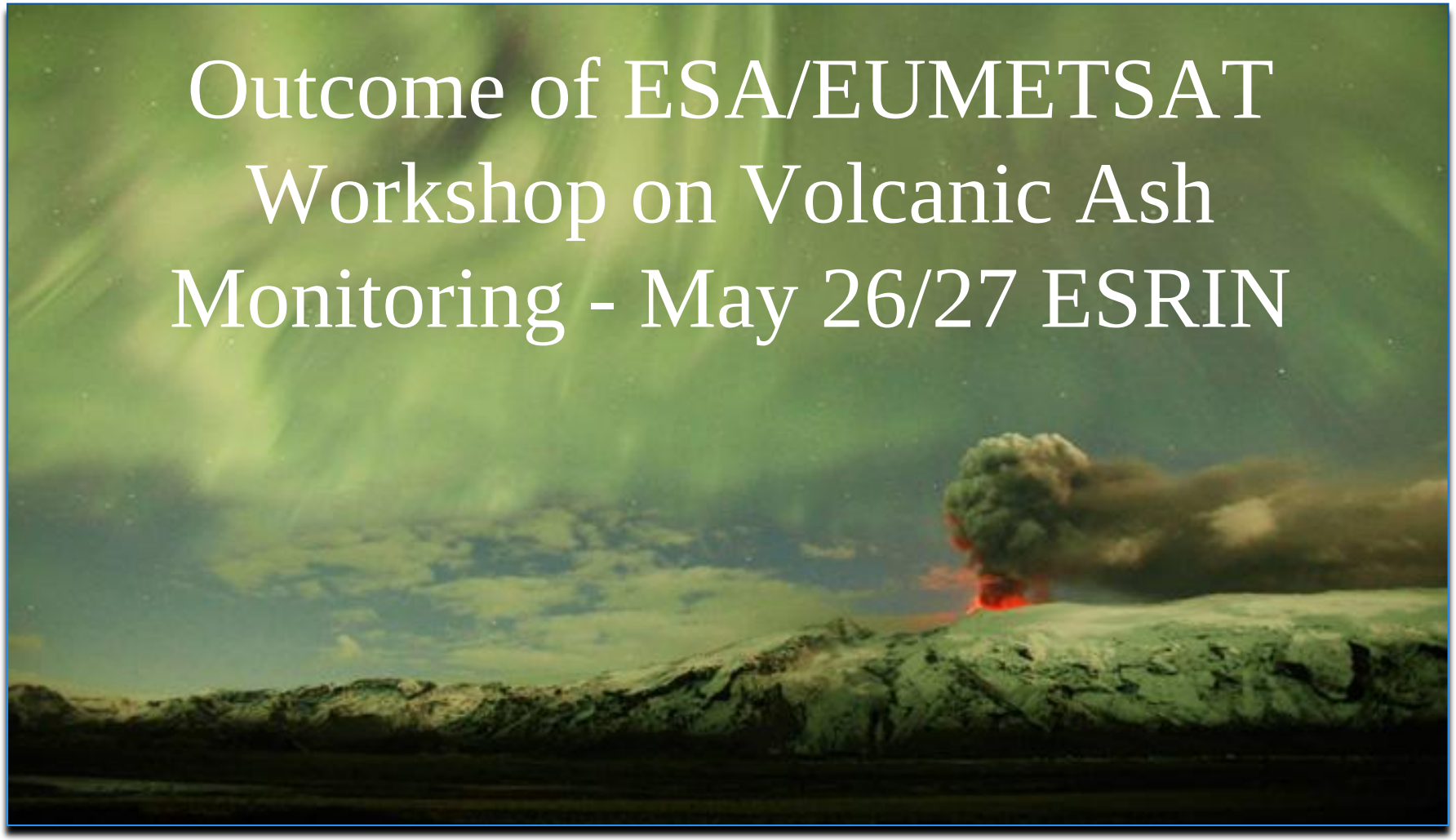
Outcome of ESA/EUMETSAT Workshop on Volcanic Ash Monitoring - May 26/27 ESRIN



Claus Zehner –ESA

ESA/EUMETSAT Workshop on Volcanic Ash Monitoring from Space – 26/27 May at ESRIN

- to take stock of Europe's remote sensing capabilities to address the impact of the Eyjafjoll eruption
- more than 50 participants (scientists (remote sensing experts, meteorologists, volcanologists …)
- Major outcome: **position paper** on this special event with **recommendations on which ESA and EUMETSAT will act!**
- **http://earth.eo.esa.int/workshops/Volcano/index.php**
- Oral Sessions:
  - Eruption, VAACs, New Ash Threshold Value
  - Modelling
  - Remote Sensing of the Ash Plume (research airplanes, ground-based, satellites)
- Discussions in splinter meetings
  - Satellite data: usefulness and access?
  - Modelling of the ash plume movement: need to include real data in order to be more credible?
  - Science and ongoing projects (ESA, EUMETSAT, EC , national ...) on using satellite data for the purpose of volcanic ash monitoring?
  - Are there implications for the utility of already planned missions or is there the need for new instrumentation?

Participation

ISAC-CNR

EUFAR

EMPA

Head of Remote Sensing Unit-INGV-CNT

Clarendon Laboratory

University of L'Aquila

ULB

CNRS

Istituto Nazionale Geofisica Vulcanologia

Météo-France CNRM/GMEI/LISA

Finnish Meteorological Institute

University of Lille

Norwegian Institute for Air Research

Institut für Chemie & Dynamik Geosphäre (ICG-2)

ECMWF

Institut de Physique du Globe de Paris

German Meteorological Service (DWD)

ISAC-CNR

EUMETSAT

Karlsruher Institut für Technologie (KIT)

Meteo France - Toulouse VAAC

CETEMPS

NASA

EUMETSAT

European Commission

Institut für Physik der Atmosphäre

NUI Galway,

Sapienza University of Rome

Leibniz Institute for Tropospheric Research

Istituto Nazionale Geofisica e Vulcanologia

EUMETSAT

IPSL

CNR

CNR - IMAA

NILU

University of Leicester

University of Bremen

DLR

Michigan Technological University

U.S. Geological Survey

Istituto Nazionale Geofisica e Vulcanologia

University of Natural Resources (BOKU)

Istituto Nazionale di Geofisica e Vulcanologia

KNMI

French Volcanologic and Seismologic Observatories

Belgian Institute for Space Aeronomy

IASB-BIRA

School of GeoSciences

Icelandic Met. Office

Belgian Institute for Space Aeronomy

National University of Ireland

University of Bristol

Deutscher Wetterdienst

Position Paper

- **Are we making best use of existing observing systems to address the problems created by the Eyjafjoll eruption (research air-borne, ground-based, satellite measurements)?**
- **How can the R&D community best contribute to improve the VAAC analysis, and prediction of the volcanic ash plume in the European airspace (models, validation of models, inclusion of measurements into models, accuracy, confidence levels)?**
- **What are the observations VAACs need and what are the implications to future satellite observing systems (METOP, MTG, post-EPS, ADM, EARTHCARE, Sentinels, …)?**
- **Recommendations**

Preliminary Conclusions 1

- **The first phase of the eruption was characterised by low magmatic gas content, high glaciogenic water vapour content in the eruption column and high fine grained ash content in the distal ash cloud.**
- **The collection of remote sensing data, acquired over the period of the eruption of Eyjafjöll, present a remarkably consistent and coherent story.**
- **Operational (NRT) data-streams typically do not contain quantitative information about height or concentration of hazardous species.**
- **The tolerance to ash of commercial aircraft engines was a critical component in information used in the decision making process, and was poorly constrained at the start of the eruption.**
- **The satellite data used in the response is stored in a number of locations across the data-sphere.**
- **Collaboration between groups who specialise in different sensors was done under best effort, but was limited and uncoordinated.**

Preliminary Conclusions 2

- **Knowledge transfer between the research and operational communities requires a more formal architecture.**

- **One of the largest uncertainties has been information on the status of the eruption for model initialisation. This leads to discrepancies in model outputs and is a key recommendation going forward - consistency in model initialisation and sharing of information on initialisation.**

- **A second big uncertainty has been obtaining information on ash cloud concentrations. Aircraft, primarily research facilities with appropriate instrumentation, have been a key tool but have been unable to fly through thick ash due to engine manufacturer constraints.**

- **It is proved difficult to make definitive statements about ash cloud extent from any one single observational source. There is a need to integrate all observing sources in NRT (if possible) to have a best estimate picture of geographical coverage, height and depth and, concentration.**

- **Exchange of information and sharing of best practice is vital and we will all need to learn lessons from the present eruption.**

Recommendations 1

10 Major Recommendations with about 60 detailed Recommendations

1) **Access to all data sources of volcanic plume observations in Europe should be open, accelerated and improved. [8]**

2) **Existing observing capabilities within Europe should be further consolidated and enhanced by combining satellite, airborne and ground-based systems for detecting and characterizing ash clouds. [8]**

3) **Concerted developments should be undertaken to integrate existing advanced retrieval methods into operational processors.[7]**

4) **Techniques for assimilation and inversion of satellite data in dispersion models should be further developed and applied to provide quantified ash cloud advisory information.[7]**

5) **Relevant satellite observation systems and data products should be formally validated with observations from other sources and should, where appropriate, be certified versus quantitative requirements for volcanic plume monitoring. [6]**

Recommendations 2

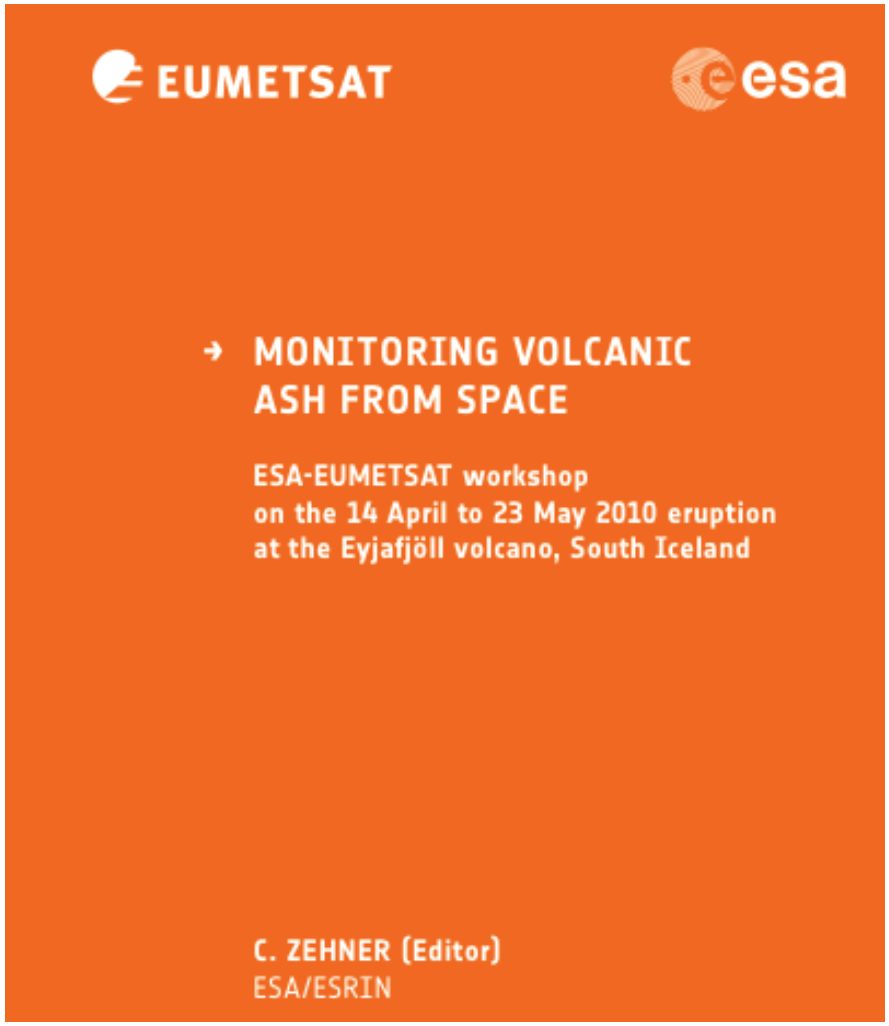
6) **Actions should be taken to ensure that planned future European satellites will provide more efficient and guaranteed support for ash cloud related crises; both operational systems (MTG, Sentinels) and research missions (explorers).[12]**

7) **Studies should be made of potential new satellites and instruments dedicated to monitoring volcanic ash plumes and eruptions. [3]**

8) **Intensive basic research should be conducted on physical, chemical and radiometric properties of volcanic ash, from crater to aged clouds.[3]**

9) **European recommendations and actions should be coordinated with ICAO, as the global presiding aviation regulatory authority, and with WMO, as coordinator of the global system of VAACs. [2]**

10) **A follow-up workshop should be organized to review progress on these recommendations after 1 year**.



1. Are we making best use of existing observing systems to address the problems created by the Eyjafjöll eruption (airborne, ground-based, satellite measurements)?

Lead authors: I.M. Watson, Prata A.J., Rose W. I., Saunders R., Schneider D., Thomas H. E., Thordason T., and Zehner C.

2. How can the R&D community best contribute to improve VAAC analysis and prediction of volcanic ash plume?

Lead authors: H. Elbern, Broad A., Engelen R., Husson P., Scollo S., Seibert P., Stohl A., Tait S., T. Thordarson, and Varghese S.

3. What are the observations VAACs need and what are the implications for future satellite observing systems (e.g. METOP, MTG, post-EPS, ADM, Earthcare, Sentinels)?

Lead authors: A.J. Prata, Aminou D., Buongiorno F., Carboni E., Fehr T., Mannstein H., Munro R., Remedios J., and Thorsteinsson H.