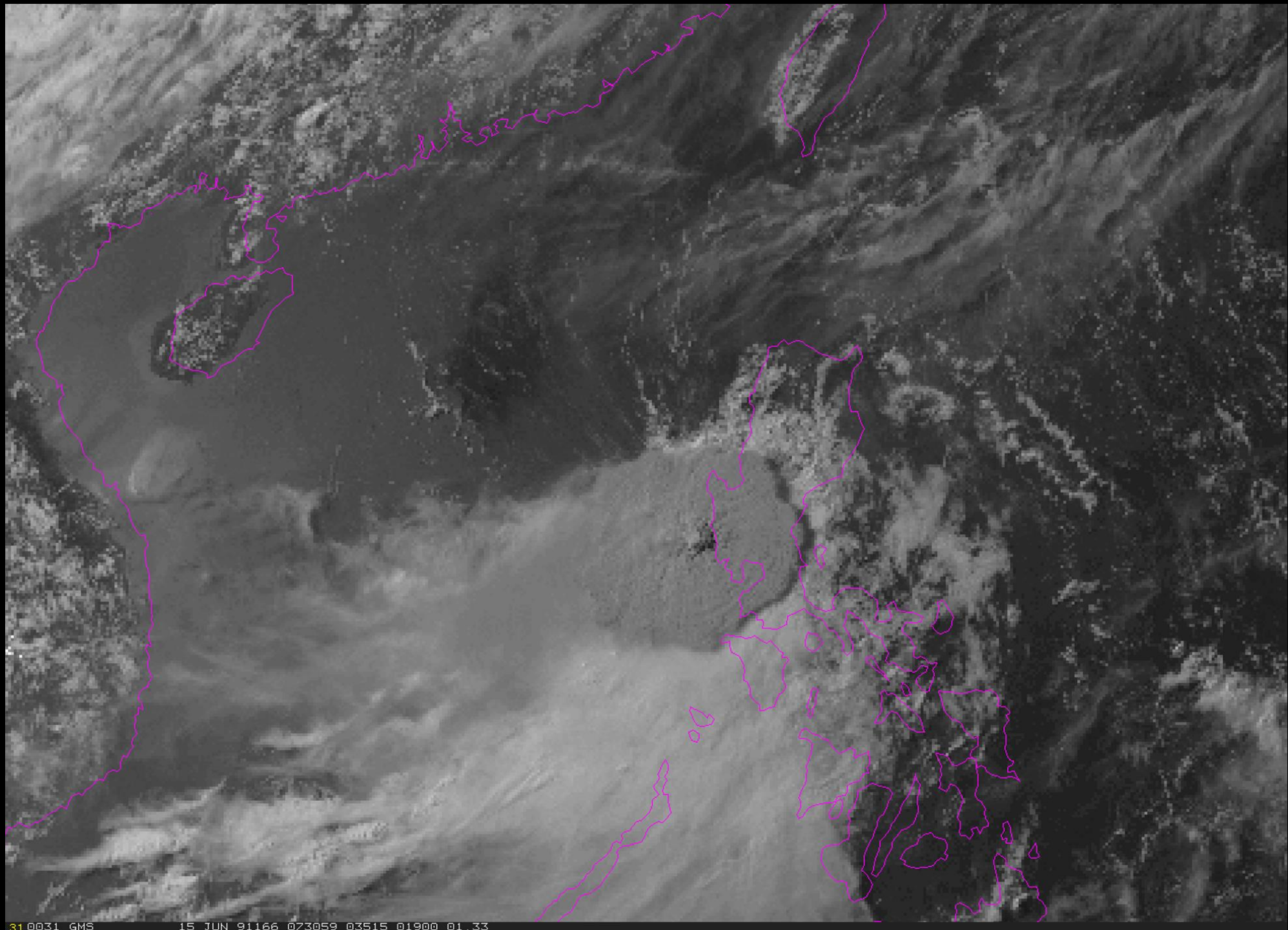
A large satellite image of Earth from space, showing the Western Pacific Ocean, Australia, and parts of Asia. The image is taken from a high angle, showing the curvature of the planet and the swirling patterns of clouds over the ocean.

Better volcanic warnings as
part of a global effort – the
role for geological survey
organisations.

Andrew Tupper

Mt Pinatubo &
Typhoon
Yunya/Diding,
June 1991

Images: Japan
Meteorological
Agency



Global Sendai Goals:

falling behind

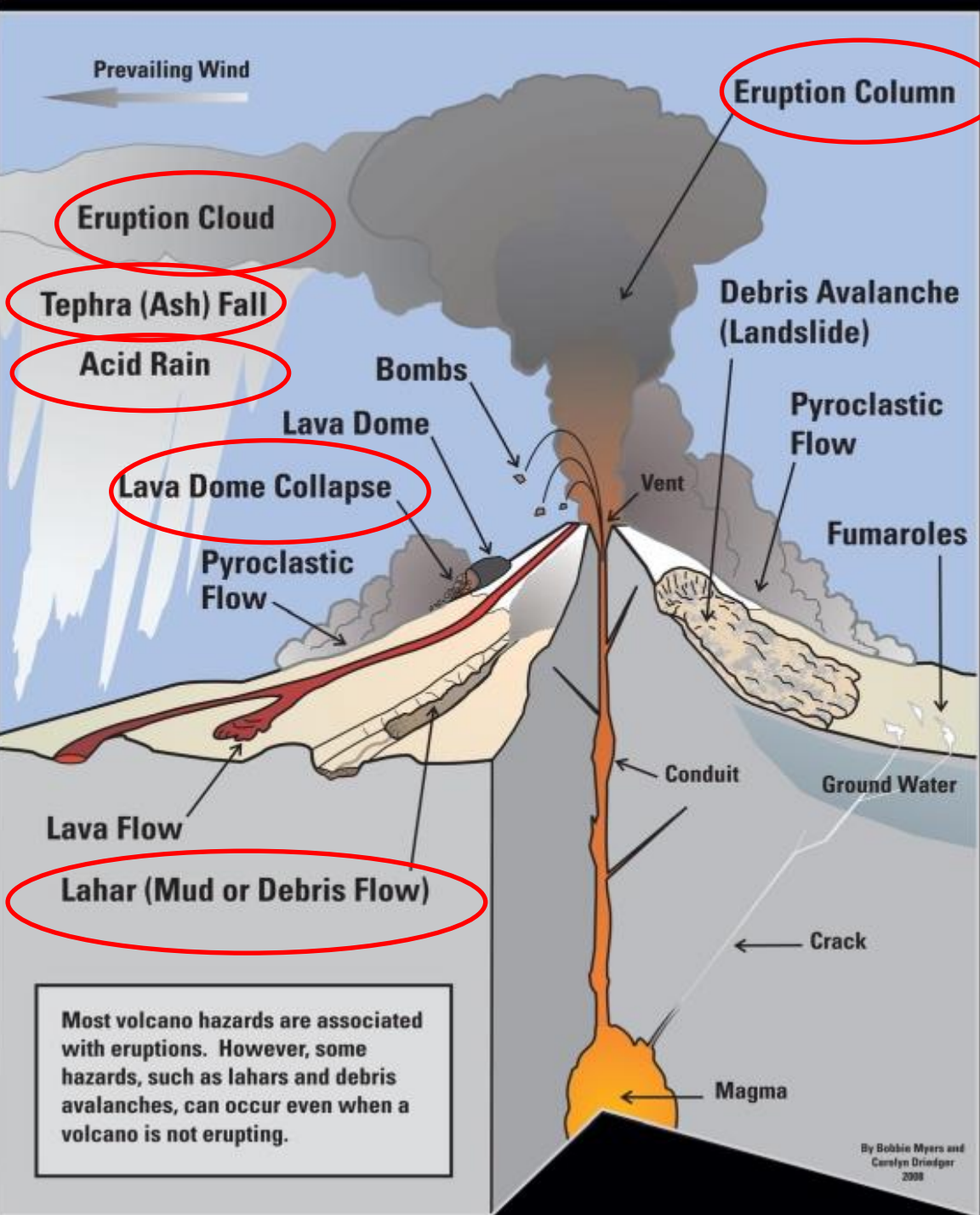
- (a) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015;
- (b) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015;⁹
- (c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;
- (d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;
- (e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
- (f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030;
- (g) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

"Early warnings for all"

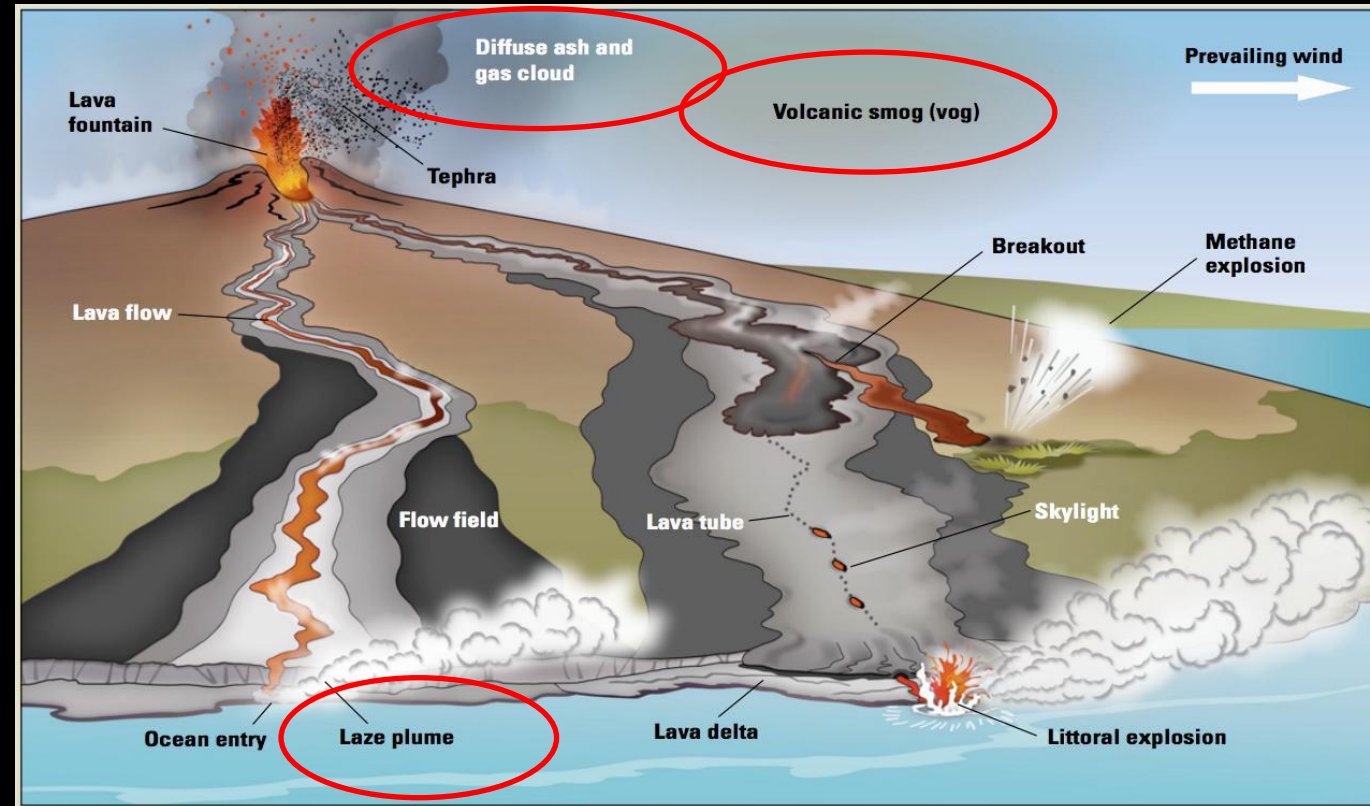
UN Secretary General, World Meteorological Day (23 March) 2022:

"...today I announce the United Nations will spearhead new action to ensure every person on Earth is protected by early warning systems within five years. I have asked the World Meteorological Organization to lead this effort and to present an action plan at the next UN climate conference, later this year in Egypt."

(reference is to COP 27, 7-18 November)



Can we have global multi-hazard early warning system coverage without volcanic hazards? – clearly not.
Both images: USGS



(& tsunamis, pumice, fire)

Why did the early warning system fail to save the lives of residents around Mount Semeru?

Published: December 13, 2021 2:22pm NZDT



Fadil Taha (45 years old) with a photo of his family in front of his house which was buried by hot clouds from Mount Semeru in Sumberwuluh Village, Lumajang, East Java, Tuesday 7 December 2021. ANTARA FOTO/Zabur Karunu/foc.

The Mount Semeru crisis in Indonesia on Dec. 4 and 5 killed at least 43 people, with some 13 people are missing and at least 3,000 housing units damaged as of Dec. 9. Thousands of residents, especially the Lumajang Regency, East Java were displaced to the nearby villages.

The Governor of East Java, where the volcano is located, claimed the volcano early warning system (VEWS) was up and running, citing the Center for

Users expect a seamless service

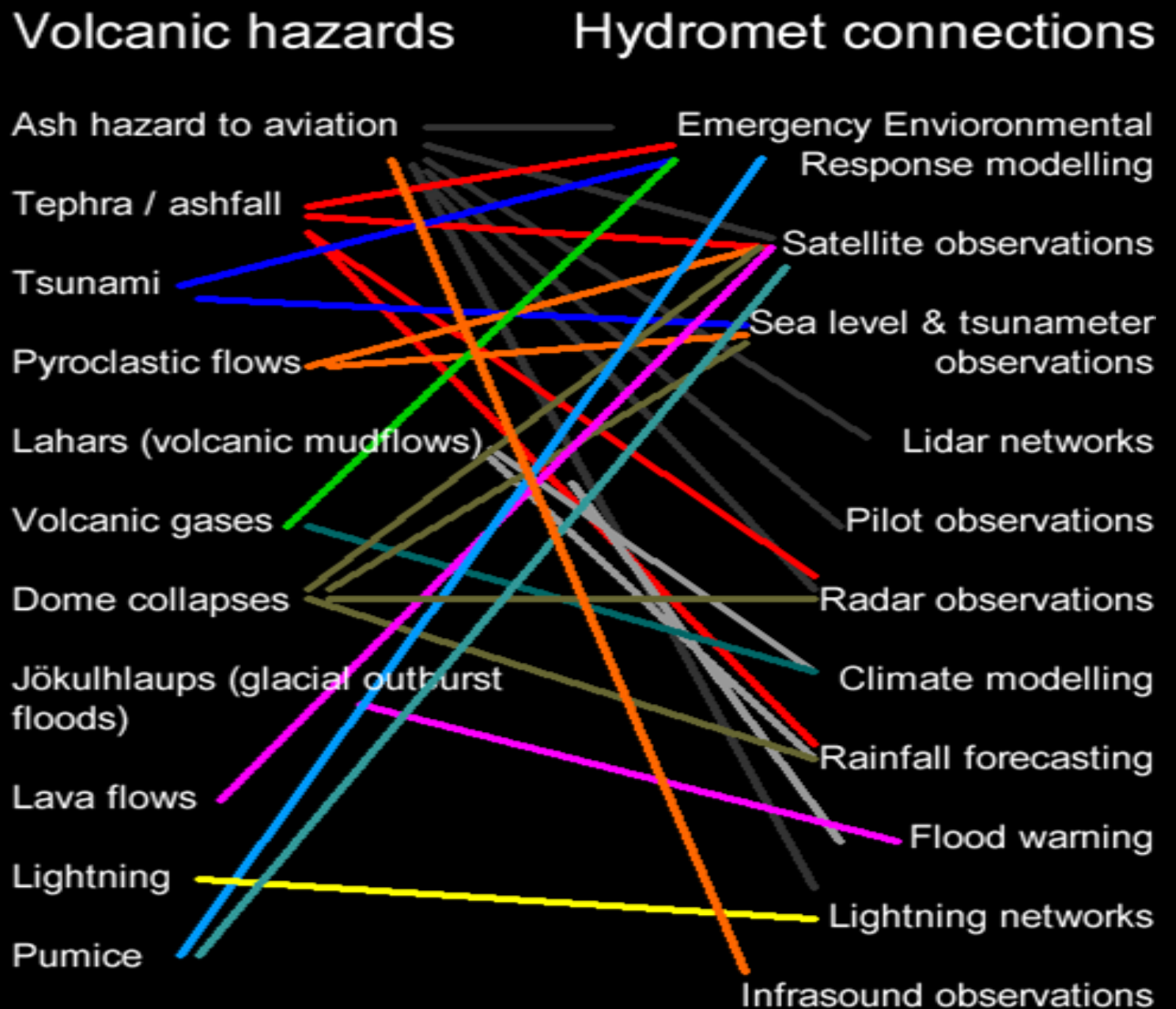
“The claim regarding the existence of a formal volcano early warning system (VEWS) that functions well but is proven unable to save the local people suggests that the whole VEWS remains an elitist bureaucratic procedural text that has nothing to do with public safety”

Jonathan A Lassa, The Conversation Dec 2021



Operational Science

So many ways to
work together!





The United Nations System

UN PRINCIPAL ORGANS

GENERAL ASSEMBLY

SECURITY COUNCIL

ECONOMIC AND SOCIAL COUNCIL

SECRETARIAT

INTERNATIONAL COURT OF JUSTICE

TRUSTEESHIP COUNCIL⁶

Subsidiary Organs

- Disarmament Commission
- Human Rights Council
- International Law Commission
- Joint Inspection Unit (JIU)
- Main Committees
- Standing committees and ad hoc bodies

Funds and Programmes¹

- UNDP** United Nations Development Programme
- UNCDF** United Nations Capital Development Fund
- UNV** United Nations Volunteers
- UNEP**⁸ United Nations Environment Programme
- UNFPA** United Nations Population Fund
- UN-HABITAT**⁸ United Nations Human Settlements Programme
- UNICEF** United Nations Children's Fund
- WFP** World Food Programme (UN/FAO)

Research and Training

- UNIDIR** United Nations Institute for Disarmament Research
- UNITAR** United Nations Institute for Training and Research
- UNSSC** United Nations System Staff College
- UNU** United Nations University

Other Entities

- ITC** International Trade Centre (UN/WTO)
- UNCTAD**^{1,6} United Nations Conference on Trade and Development
- UNHCR**¹ Office of the United Nations High Commissioner for Refugees
- UNOPS**¹ United Nations Office for Project Services
- UNRWA**¹ United Nations Relief and Works Agency for Palestine Refugees in the Near East
- UN-WOMEN**¹ United Nations Entity for Gender Equality and the Empowerment of Women

Related Organizations

- CTBTO PREPARATORY COMMISSION** Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization
- IAEA**^{1,3} International Atomic Energy Agency
- ICC** International Criminal Court
- IOM**¹ International Organization for Migration
- ISA** International Seabed Authority
- ITLOS** International Tribunal for the Law of the Sea
- OPCW**³ Organization for the Prohibition of Chemical Weapons
- WTO**^{1,4} World Trade Organization

Peacebuilding Commission

HLPF
High-level Political Forum on Sustainable Development

Subsidiary Organs

- Counter-Terrorism Committee

- International Residual Mechanism for Criminal Tribunals
- Military Staff Committee

- Peacekeeping operations and political missions
- Sanctions committees (ad hoc)
- Standing committees and ad hoc bodies

Functional Commissions

- Crime Prevention and Criminal Justice
- Narcotic Drugs
- Population and Development
- Science and Technology for Development
- Social Development
- Statistics
- Status of Women
- United Nations Forum on Forests

Regional Commissions⁸

- ECA** Economic Commission for Africa
- ECE** Economic Commission for Europe
- ECLAC** Economic Commission for Latin America and the Caribbean
- ESCAP** Economic and Social Commission for Asia and the Pacific
- ESCWA** Economic and Social Commission for Western Asia

Other Bodies¹⁰

- Committee for Development Policy
- Committee of Experts on Public Administration
- Committee on Non-Governmental Organizations
- Permanent Forum on Indigenous Issues
- UNAIDS** Joint United Nations Programme on HIV/AIDS
- UNGEGN** United Nations Group of Experts on Geographical Names
- UNGGIM** Committee of Experts on Global Geospatial Information Management

Research and Training

- UNICRI** United Nations Interregional Crime and Justice Research Institute
- UNRISD** United Nations Research Institute for Social Development

Departments and Offices⁹

- EOSG** Executive Office of the Secretary-General
- DCO** Development Coordination Office
- DESA** Department of Economic and Social Affairs
- DGACM** Department for General Assembly and Conference Management
- DGC** Department of Global Communications
- DMSPC** Department of Management Strategy, Policy and Compliance
- DOS** Department of Operational Support
- DPO** Department of Peace Operations
- DPPA** Department of Political and Peacebuilding Affairs
- DSS** Department of Safety and Security
- OCHA** Office for the Coordination of Humanitarian Affairs

- OCT** Office of Counter-Terrorism
- ODA** Office for Disarmament Affairs
- OHCHR** Office of the United Nations High Commissioner for Human Rights
- OIOS** Office of Internal Oversight Services
- OLA** Office of Legal Affairs
- OSAA** Office of the Special Adviser on Africa
- SRSG/CAAC** Office of the Special Representative of the Secretary-General for Children and Armed Conflict
- SRSG/SVC** Office of the Special Representative of the Secretary-General on Sexual Violence in Conflict
- SRSG/VAC** Office of the Special Representative of the Secretary-General on Violence Against Children

Specialized Agencies^{1,5}

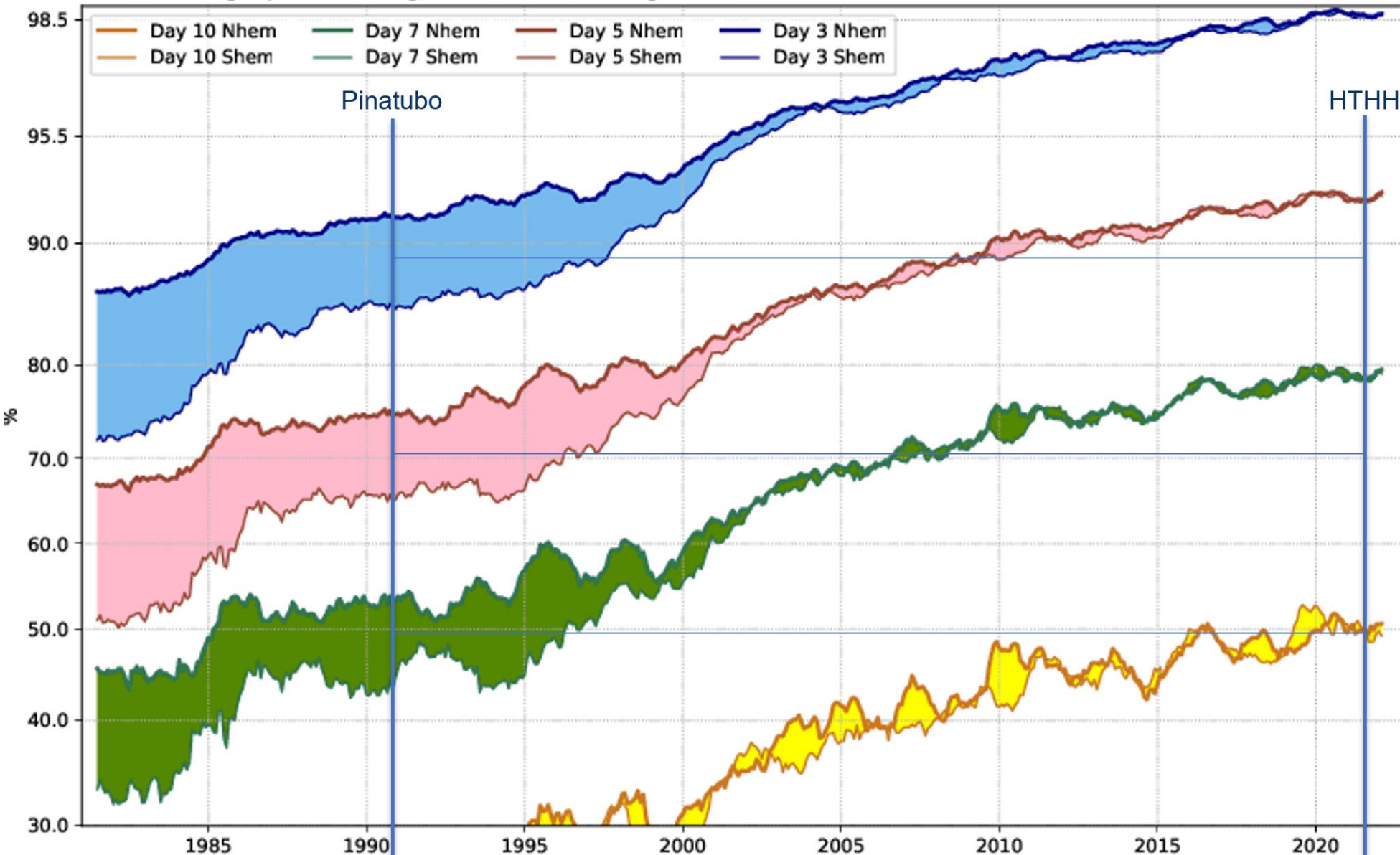
- FAO** Food and Agriculture Organization of the United Nations
- ICAO** International Civil Aviation Organization
- IFAD** International Fund for Agricultural Development
- ILO** International Labour Organization
- IMF** International Monetary Fund
- IMO** International Maritime Organization
- ITU** International Telecommunication Union
- UNESCO** United Nations Educational, Scientific and Cultural Organization
- UNIDO** United Nations Industrial Development Organization
- UNWTO** World Tourism Organization
- UPU** Universal Postal Union
- WHO** World Health Organization
- WIPO** World Intellectual Property Organization
- WMO** World Meteorological Organization
- WORLD BANK GROUP**⁷
 - IBRD** International Bank for Reconstruction and Development
 - IDA** International Development Association
 - IFC** International Finance Corporation

Notes:

- Members of the United Nations System Chief Executives Board for Coordination (CEB).
- UN Office for Partnerships (UNOP) is the UN's focal point vis-a-vis the United Nations Foundation, Inc.
- IAEA and OPCW report to the Security Council and the General Assembly (GA).
- WTO has no reporting obligation to the GA, but contributes on an ad hoc basis to GA and Economic and Social Council (ECOSOC) work on, inter alia, finance and development issues.
- Specialized agencies are autonomous organizations whose work is coordinated through ECOSOC (intergovernmental level) and CEB (inter-secretariat level).
- The Trusteeship Council suspended operation on 1 November 1994, as on 1 October 1994 Palau, the last United Nations Trust Territory, became independent.
- International Centre for Settlement of Investment Disputes (ICSID) and Multilateral Investment Guarantee Agency (MIGA) are not specialized agencies in accordance with Articles 57 and 63 of the Charter, but are part of the World Bank Group.
- The secretariats of these organs are part of the UN Secretariat.
- The Secretariat also includes the following offices: The Ethics Office, United Nations Ombudsman and Mediation Services, and the Office of Administration of Justice.
- For a complete list of ECOSOC Subsidiary Bodies see un.org/ecosoc.

International science cooperation **works**.

ECMWF HRes
ACC 500hPa geopotential height (12-month running mean)



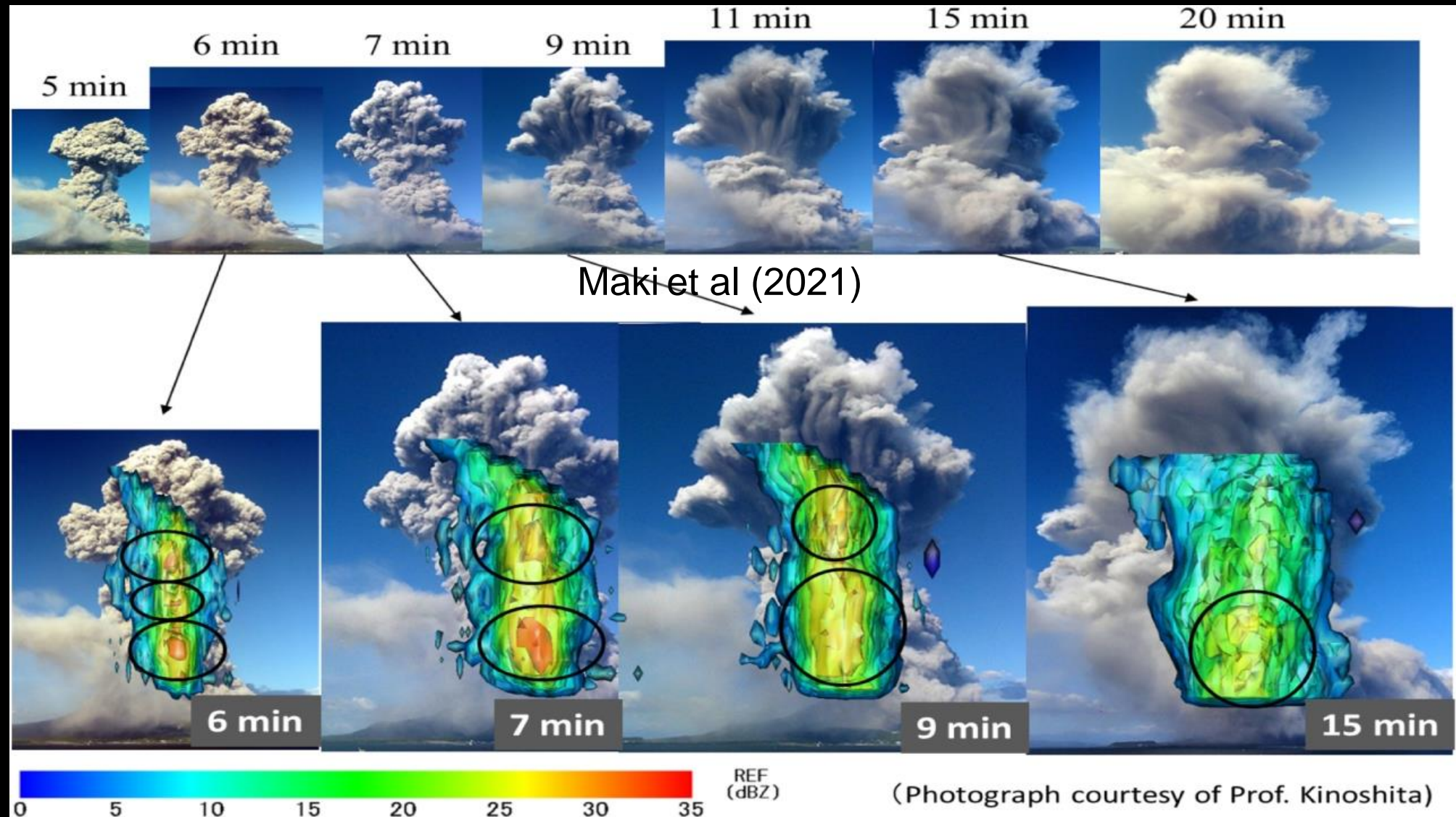
A 5 day forecast in 2022 is better than a 3 day forecast in 1991

A 7 day forecast in 2022 is better than a 5 day forecast in 1991

A 10 day forecast in 2022 is as good as a 7 day forecast in 1991

Source: ECMWF
(https://charts.ecmwf.int/products/plwww_m_hr_ccaf_adrian_ts?single_product=latest)

Imagine if we could combine any observations operationally in real-time in the same way across the world?

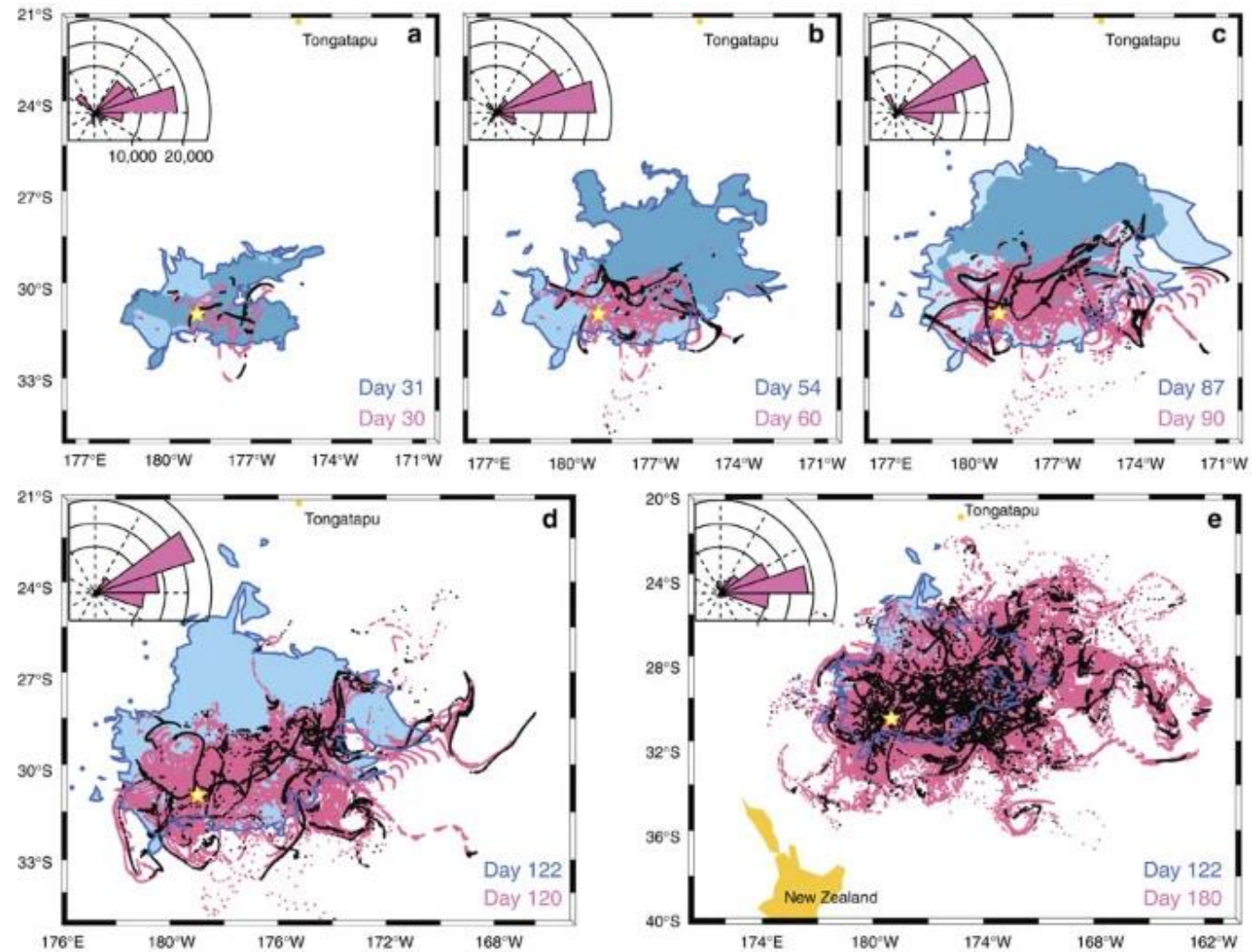


How about some pumice forecasts?

“There is a need for operational detection and forecasting of pumice raft dispersal to mitigate hazards by preparing communities and industries.

This service does not currently exist, which is in contrast to the well-established Volcanic Ash Advisory Centres that provide detection and reporting to the International Civil Aviation Organization to mitigate risks from atmospheric ash plumes. As velocity fields are sampled from a global model, trajectory calculations can be repeated for any specific eruption, anywhere in the World Ocean, at short notice.”

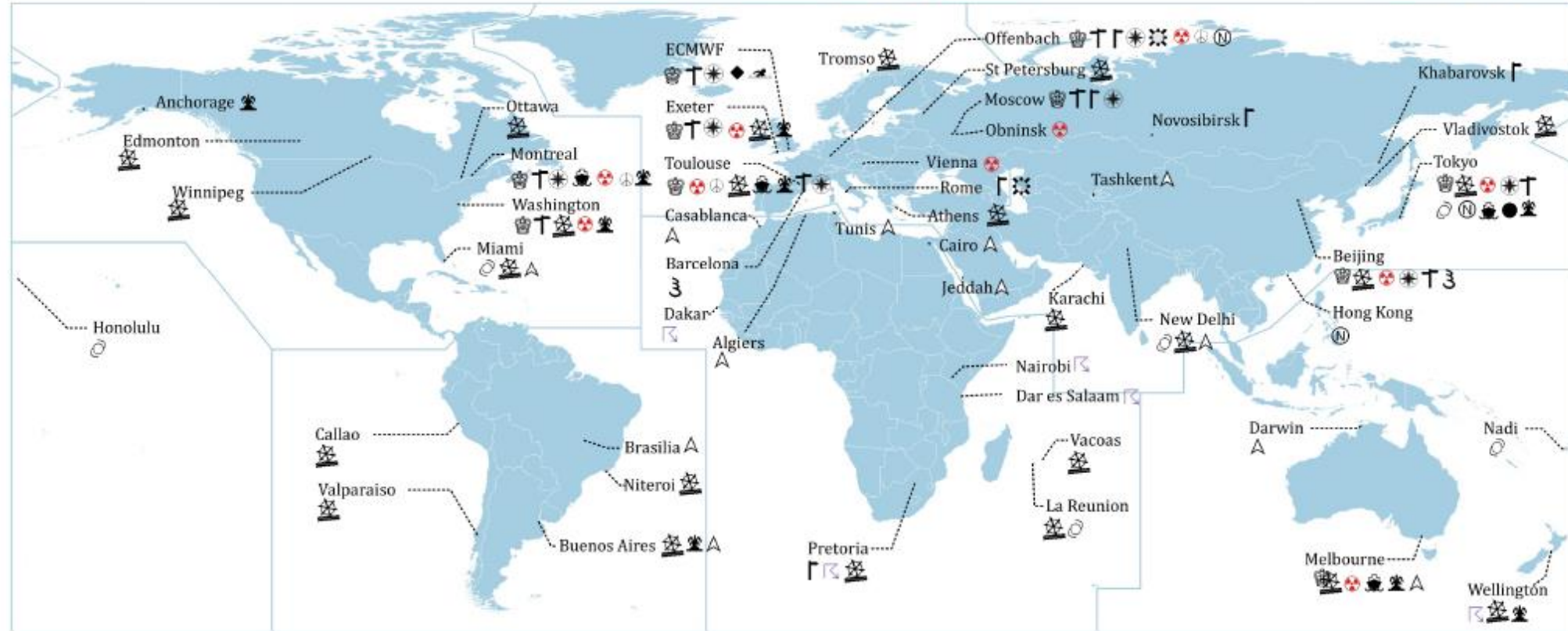
Jutzler et al, 2014,
<https://doi.org/10.1038/ncomms4660>



WMO Designated Global Data-processing and Forecasting System Centres

- Nowcasting to medium-range prediction

Updated on 22 July 2021



Legend (The number in parenthesis indicates the number of designated Centres)

- | | | |
|---|--|--|
| ☞ World Meteorological Centre (WMC) (10) | 🌊 RSMC Numerical Ocean Wave Prediction (4) | ☄ RSMC Sand and Duststorm Forecasts (2) |
| Ⓐ RSMC* Geographic Specialization (12) | Ⓜ RSMC Nowcasting (3) | ☪ ICAO designated Volcanic Ash Advisory Centres (9) |
| ⚡ RSMC Global Deterministic NWP** (9) | 🌪 RSMC Regional Severe Weather Forecasting (5) | 🌊 RSMC Marine Meteorological Services (24) |
| ⚡ RSMC Global Ensemble NWP (8) | 🌀 RSMC Tropical Cyclone Forecasting (6) | ◆ Lead Centre for Deterministic NWP Verification (1) |
| ⌚ RSMC Limited-Area Deterministic NWP (6) | ☢ RSMC Nuclear Emergency Response (10) | ● Lead Centre for EPS Verification (1) |
| ⚡ RSMC Limited-Area Ensemble NWP (2) | ☪ RSMC Non-Nuclear Emergency Response (3) | 🌊 Lead Centre for Wave Forecast Verification (1) |

* RSMC stands for Regional Specialized Meteorological Centre

** NWP stands for Numerical Weather Prediction

Disclaimer

The depiction and use of boundaries, geographic names and related data shown on maps are not warranted to be error free nor do they necessarily imply official endorsement or acceptance by the WMO.

We already have a global system to share numerical prediction in operations!

The GDPFS:
new name:
WMO Integrated Processing and Prediction System (WIPPS)

So much to do for better tsunami warnings... *in coordination with work on other hazards (not a single-hazard approach!)*.

Do we believe that submarine / coastal volcanoes should be better monitored? Who will champion the cause?

Intergovernmental Oceanographic Commission

Global Tsunami Early Warning and Mitigation Programme

Coordinated by IOC, the Global Tsunami Warning System plays a critical role in protecting lives. The IOC Tsunami Programme supports Member States in assessing tsunami risk, implementing Tsunami Early Warning Systems (EWS) and in educating communities at risk about preparedness measures.

[Home](#) » [Our Work](#) » [Global Tsunami Early Warning and Mitigation Programme](#) »

Coordinated by IOC-UNESCO, the Global Tsunami Warning System plays a critical role in protecting lives. The IOC-UNESCO Tsunami Programme supports Member States in assessing tsunami risk, implementing Tsunami Early Warning Systems (EWS) and in educating communities at risk about preparedness measures. With the support of Tsunami Service Providers and Tsunami Information Centers, IOC-UNESCO helps Member States in assessing tsunami risk, implementing Tsunami EWS and in educating communities at risk about preparedness measures.

Four suggestions for geological survey organisations:

- 1) Promote the needs of the operational geohazard community – in this case, volcano observatories.
- 2) Prioritise solid, trusting partnerships with corresponding groups and institutions – to the point we can advocate for each other's interests.
- 3) Propose and perform inspiring pilot projects that demonstrate appropriate, sustainable approaches to multi-hazards involving volcanoes.
- 4) Use any leverage at global level to promote better arrangements at UN.

More discussion: [Tupper & Bear-Crozier \(2022\)](#)

Improving global coordination of volcanic hazard warnings... *Bull. Volcanology*, 84, 50

andrewtupper@naturalhazardsconsulting.com

