VAAC Wellington - Research Updates

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5th NZ Aviation Meteorology Symposium, 2021-10-27

MetService
TE RATONGA TIRORANGI

Outline

Current System: VOLCAT & HYSPLIT

New products:

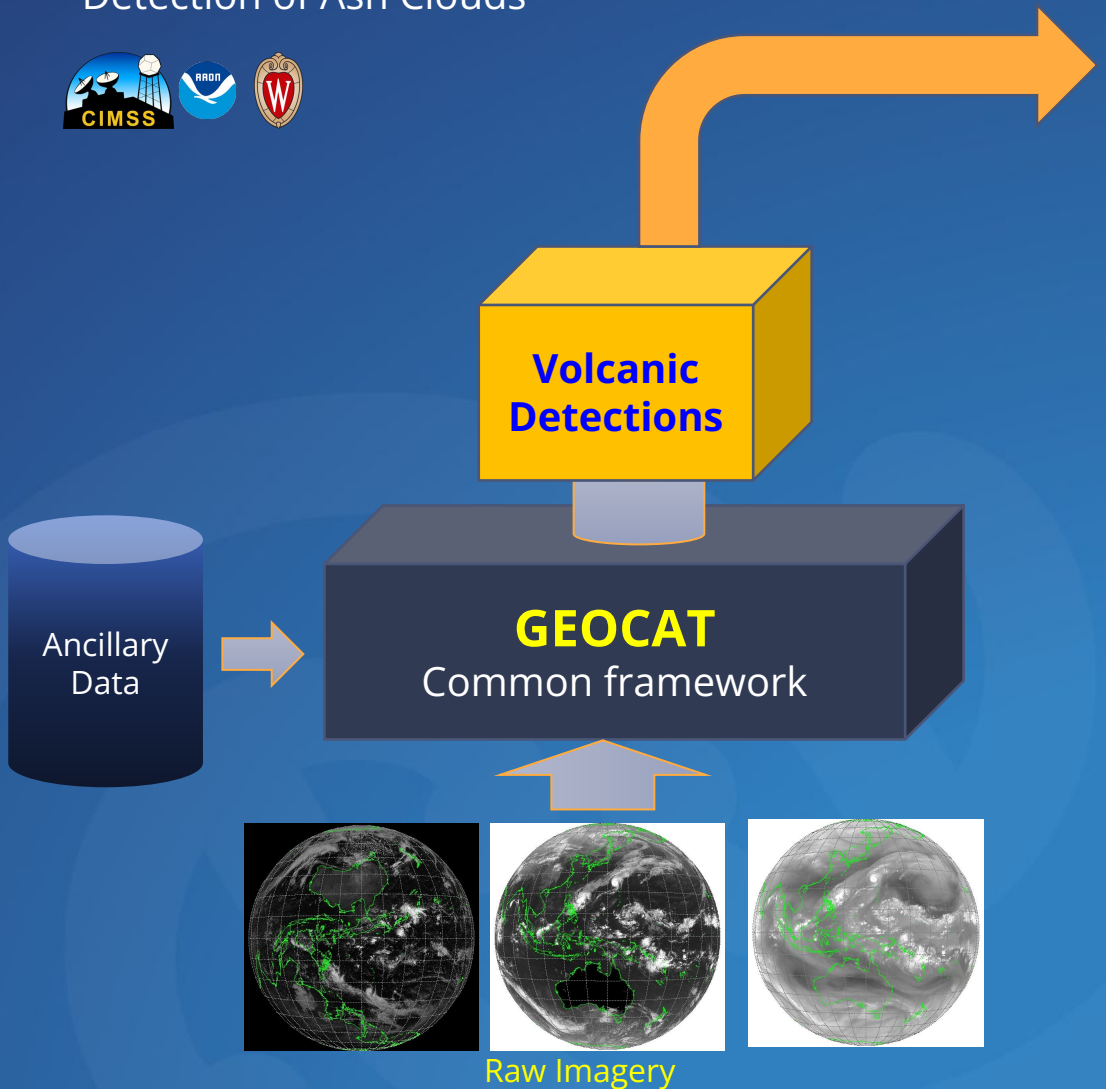
- Quantitative Ash
- Ensemble products:
  - Probabilities of exceedance
  - Risk Matrix

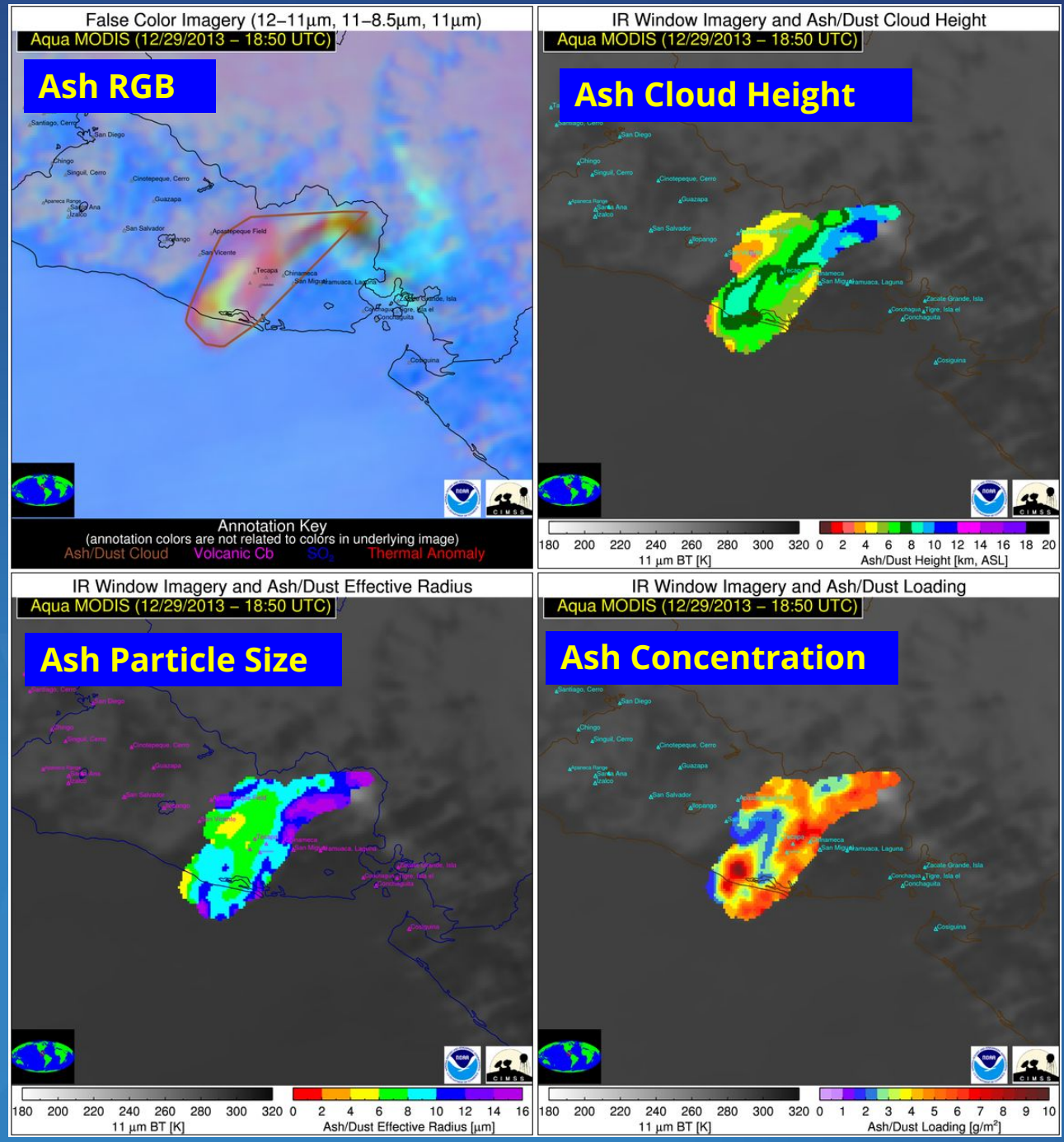
New architecture

Summary

VOLCAT - VOLcanic Cloud Analysis System

Detection of Ash Clouds





Automatic Triggering of Dispersion Model

VOLCAT Alert

VOLCAT has detected volcanic ash at Yasur (Vanuatu,France). Please look at the standard volcat loop in Loopy and verify this event.

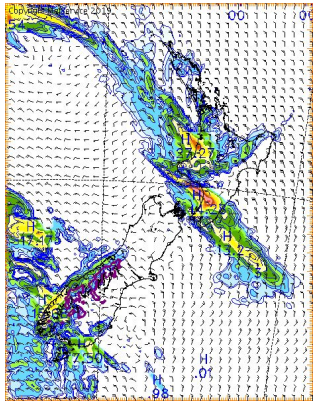
Details	
Image time	2021-10-17 15:40:00
Latitude of Radiative Centre	-19.53
Longitude of Radiative Centre	169.44
Maximum cloud height	8.3 km
90th percentile cloud height	8.2 km
Identification method	Plume/Puff Extraction (SECO+)

HYSPLIT has been triggered with the following set of parameters:

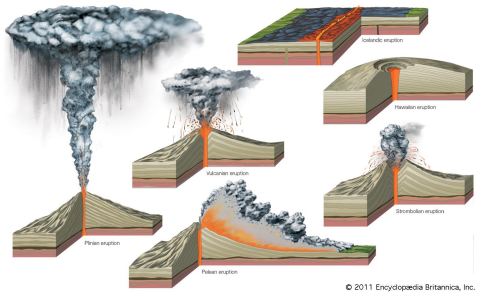
Defaults from Mastin et. al. for Yasur			
Label	**Plume height (km AMSL)**	**Duration (h)**	**Mass eruption rate (kg/s)**
small	2000	100	5000
moderate	7000	60	100000
large	10000	5	1000000

From VOLCAT retrieved cloud height			
Label	**Plume height (km AMSL)**	**Duration (h)**	**Mass eruption rate (kg/s)**
volcat	8200	60	665681

NWP

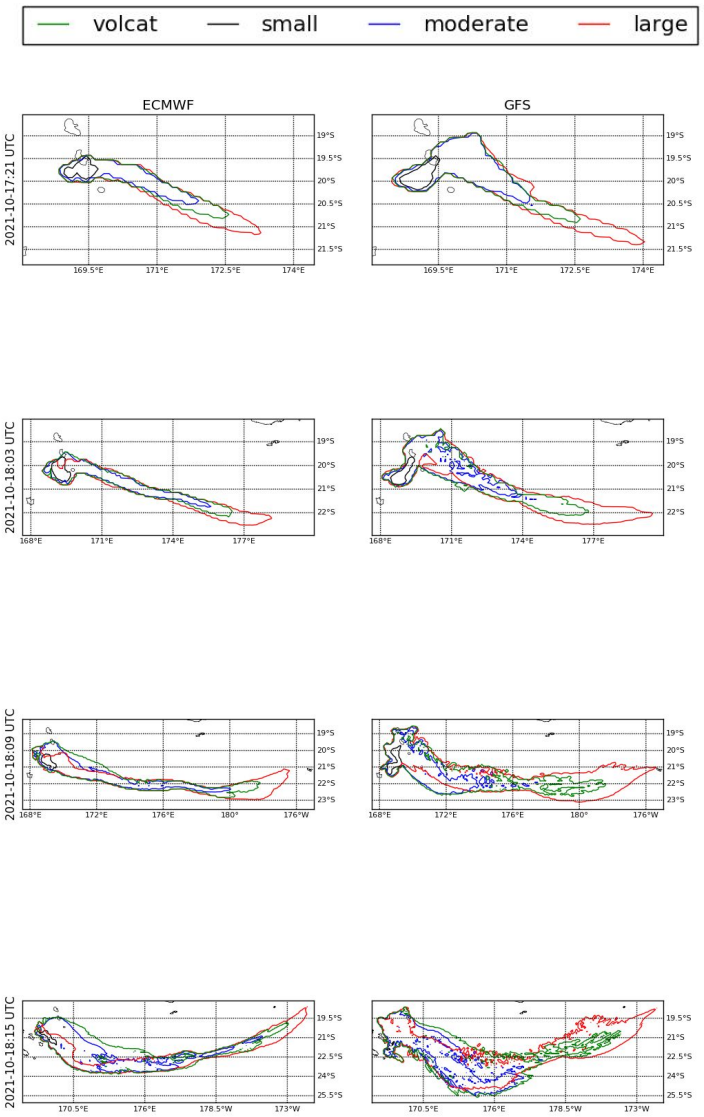


HYSPLIT
AIR RESOURCES LAB



Eruption type DB

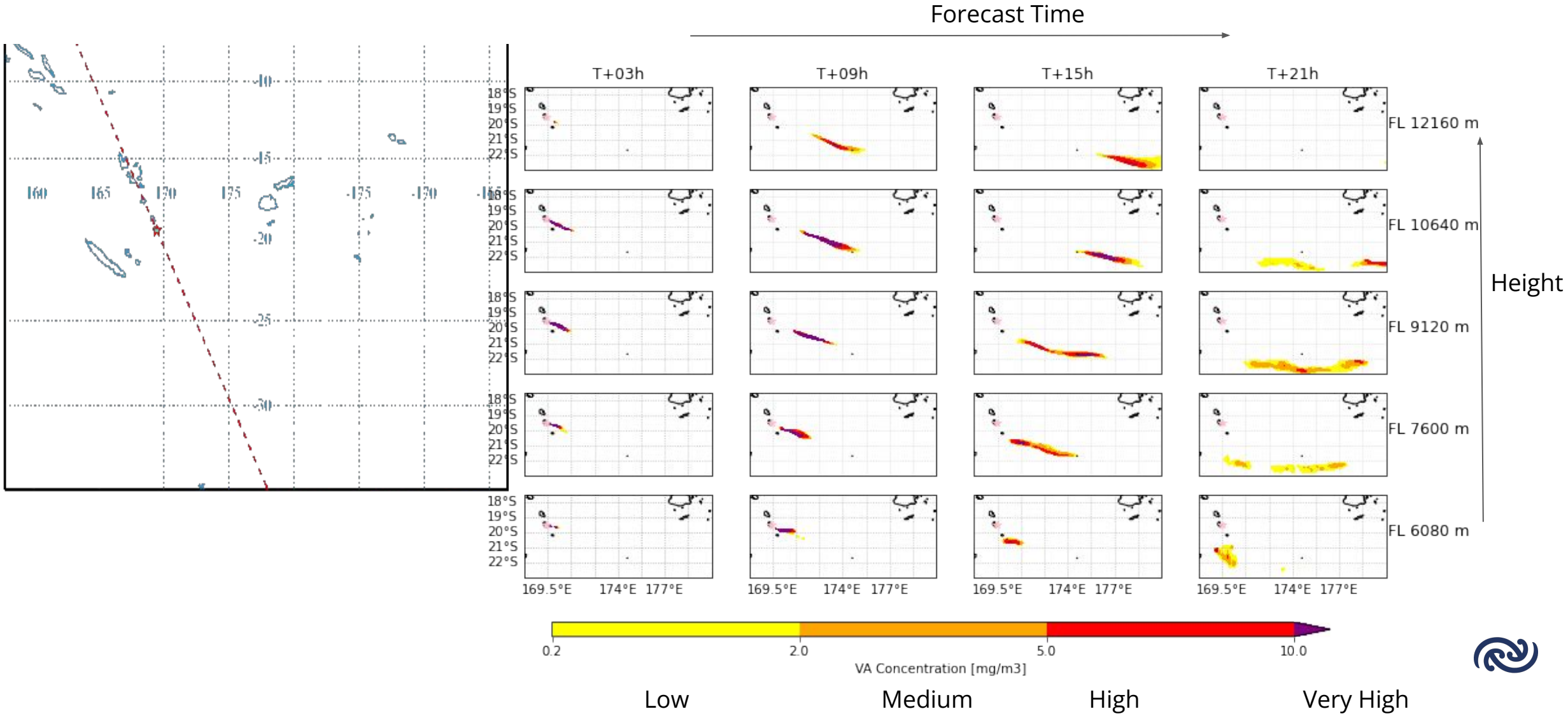
Forecast Dispersion Scenarios



New products: Quantitative Volcanic Ash

Example: Yasur 2021-10-17 15:40:00Z

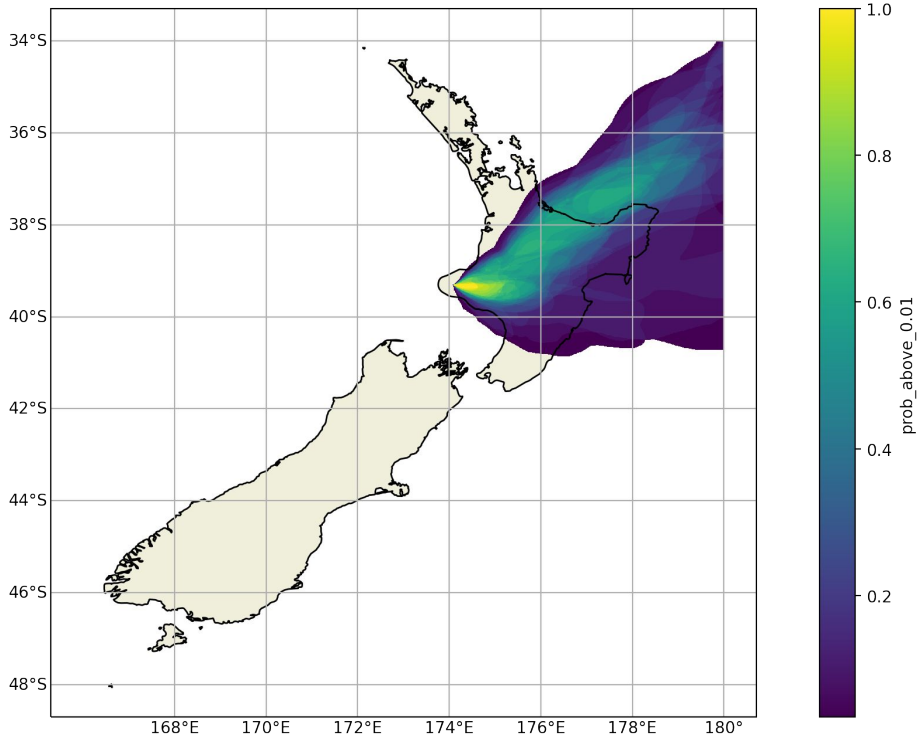
- In 0.1 deg resolution grid
- at every 500 ft
- Every 3h



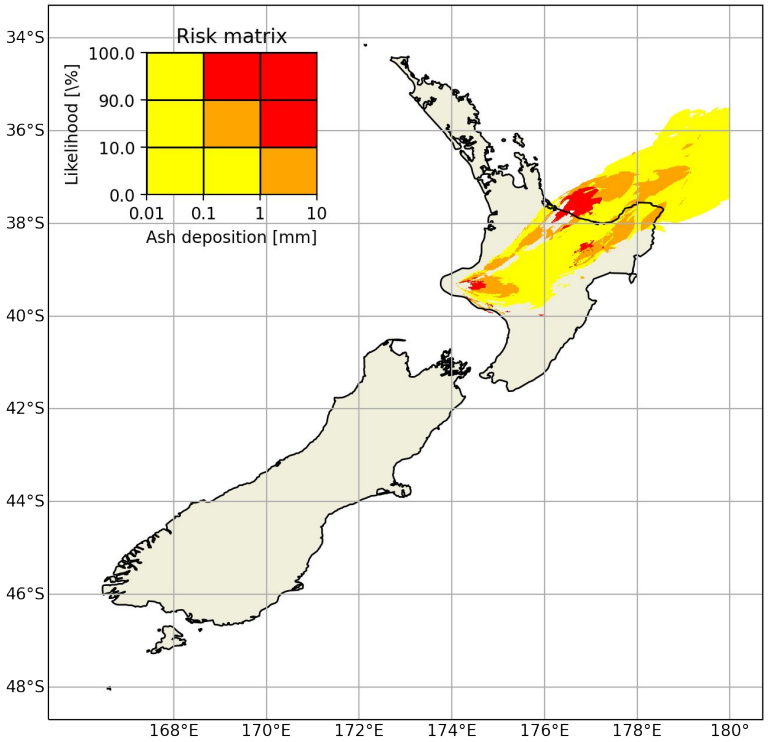
New products: Prob of Exceedance and Risk Matrix

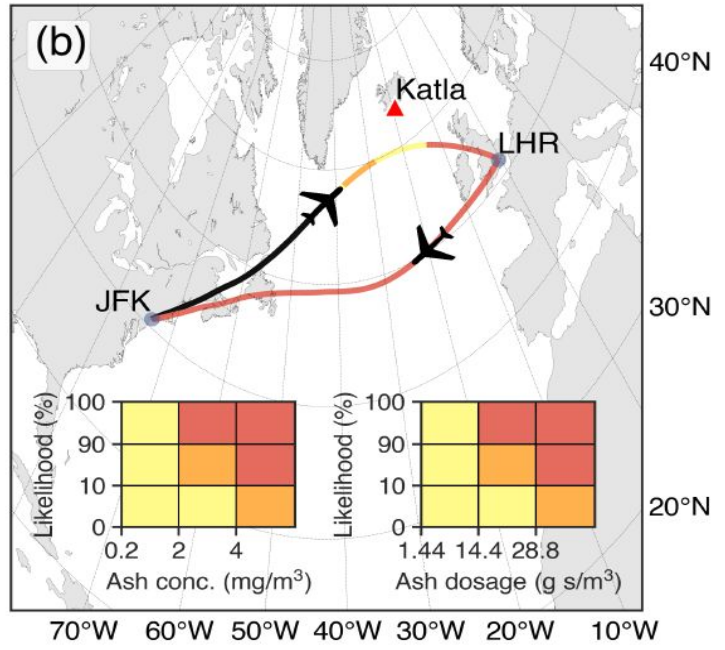
Taranaki
Ensemble of eruption parameters and GEFS

Probability of ashfall > 0.01 mm



Risk Matrix



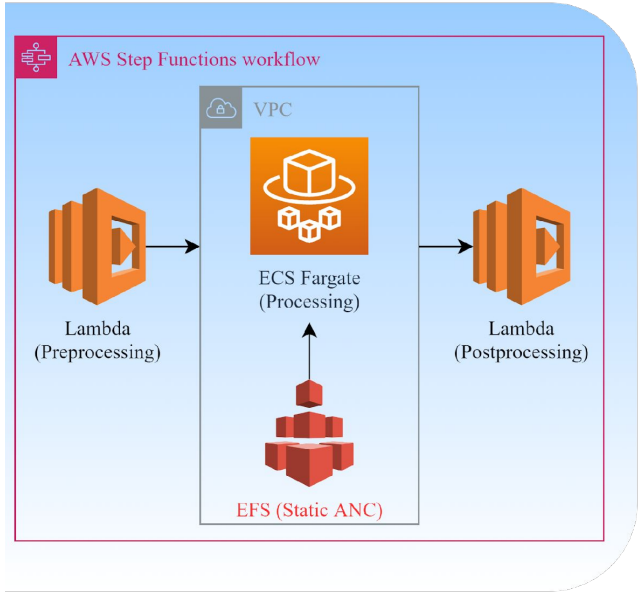


Prata et al 2019

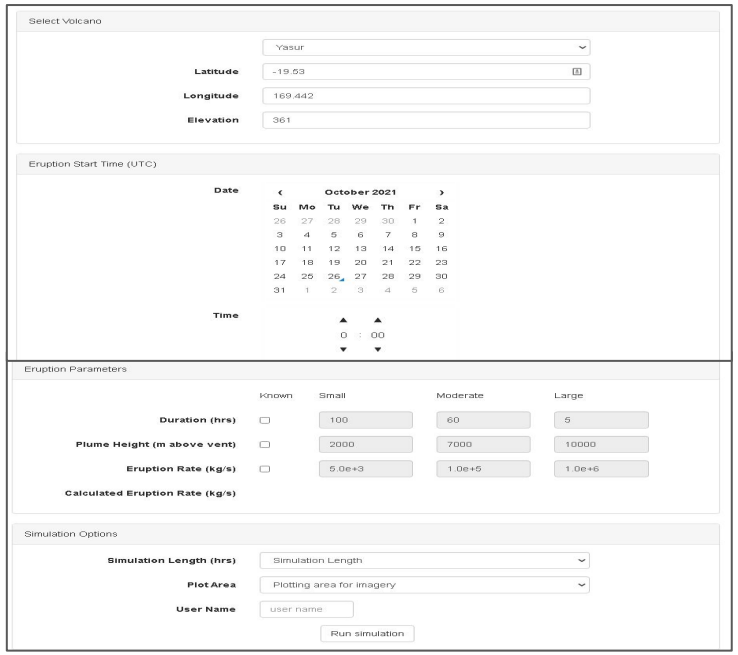
New AWS Workflow

Automation, Modularity, Timeliness & Reliability

- Containerized model (ECS **Fargate**)
- **Step** Functions orchestrate calling **Lambda** functions and ECS Fargate with appropriate arguments for pre/run/post processing
- AWS **CodePipeline** for versioning of code and automatic deploy of eruption configurations
- System to be triggered by **API** call from Forecasters Graphical **User Interface**



User Interface



API communicates eruption parameters and triggers Execution

In Summary

Undergoing developments at MetService for Volcanic Ash Forecasts

Updated Hysplit model:

- Tuning code for **speed**

New and improved NWP forcing:

- **More levels and variables**
- Higher resolution ECMWF ANZ (0.1 deg)
- Latest Metservice WRF NZ 4km
- **GFS ensembles**

Updated AWS Services

- **Automation, Timeliness & Reliability**

Modular system:

- Easier to run for different eruptions
- System triggered by **API call**
- Easier to add new products:
  - **Quantitative Ash**
  - **Ensemble statistics**
    - **Probabilities of Exceedance**
    - **Risk Matrix**