

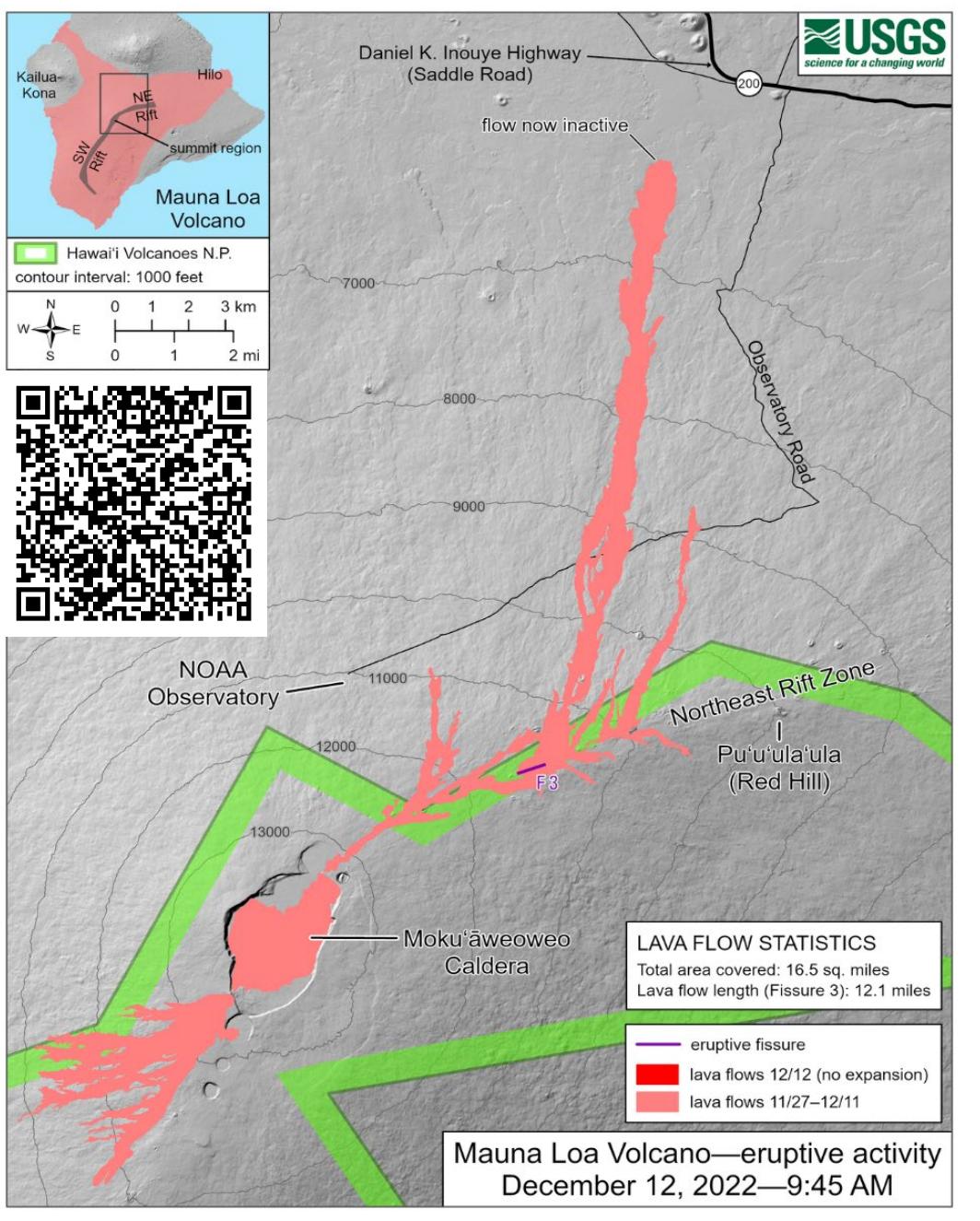


PROBABILISTIC ASH FORECASTS: Case study of Mauna Loa eruption in 2022

Alice Crawford¹, Jamie Kibler², Tianfeng Chai¹, Mark Cohen¹, Steven Olson³, Shane Mill³, Justin Sieglaff⁴, Michael Pavolonis²,

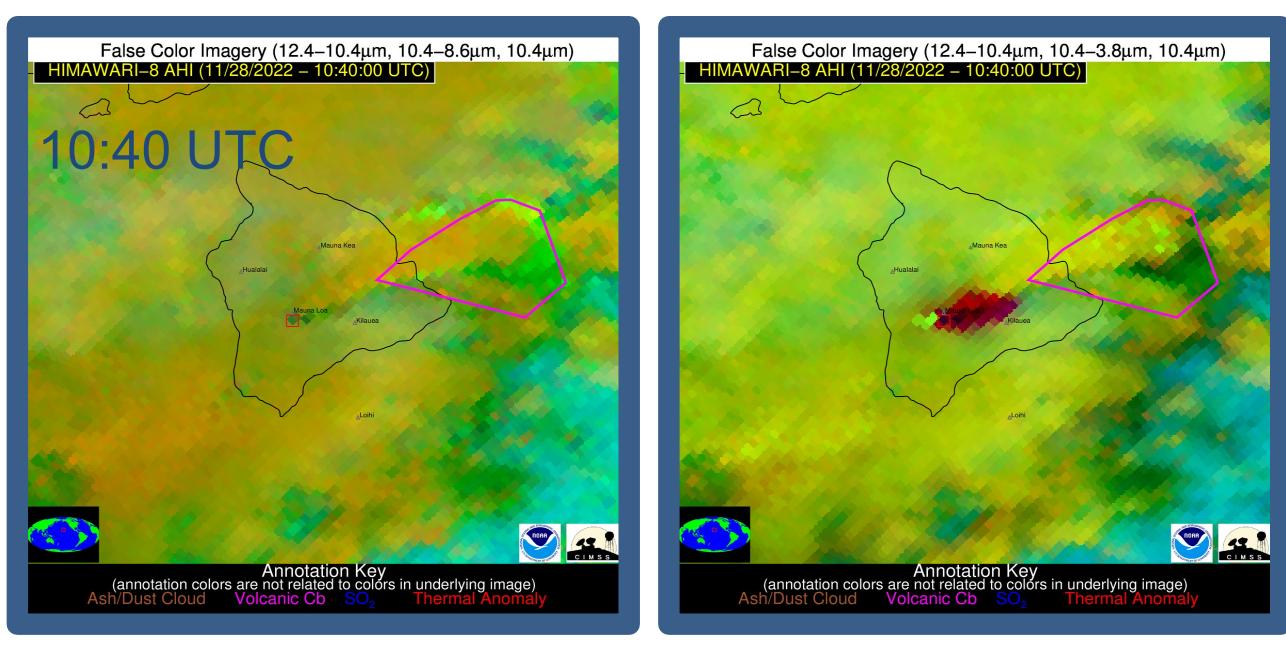
NOAA Air Resources Laboratory¹, NOAA NESDIS², NOAA Meteorological Development Laboratory³, University of Wisconsin-Madison Cooperative Institute for Meteorological Satellite Studies⁴

Eruption of Mauna Loa



VAAs Issued

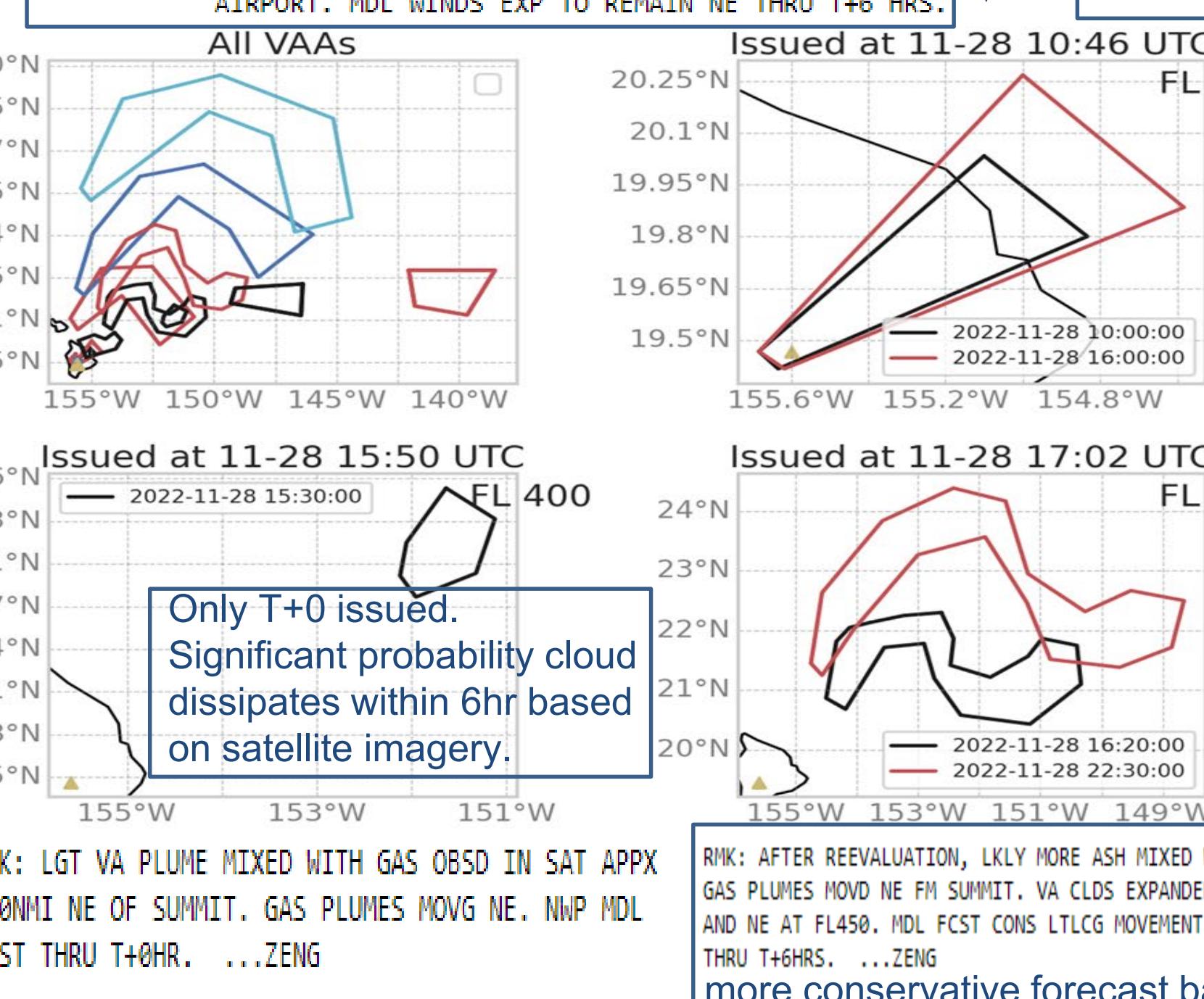
Washington VAAC issued VAA and VAG for Event:
Initial VAA – 10:22 UTC 28 November 2022
First forecast VAA – 10:46 UTC 28 November 2022
Updated forecast VAA – 12:29 UTC 28 November 2022
End VAA – 04:15 UTC 29 November 2022



VOLCAT False color imagery from Himawari about 1 h after the eruption. Detected plume outlined in magenta.

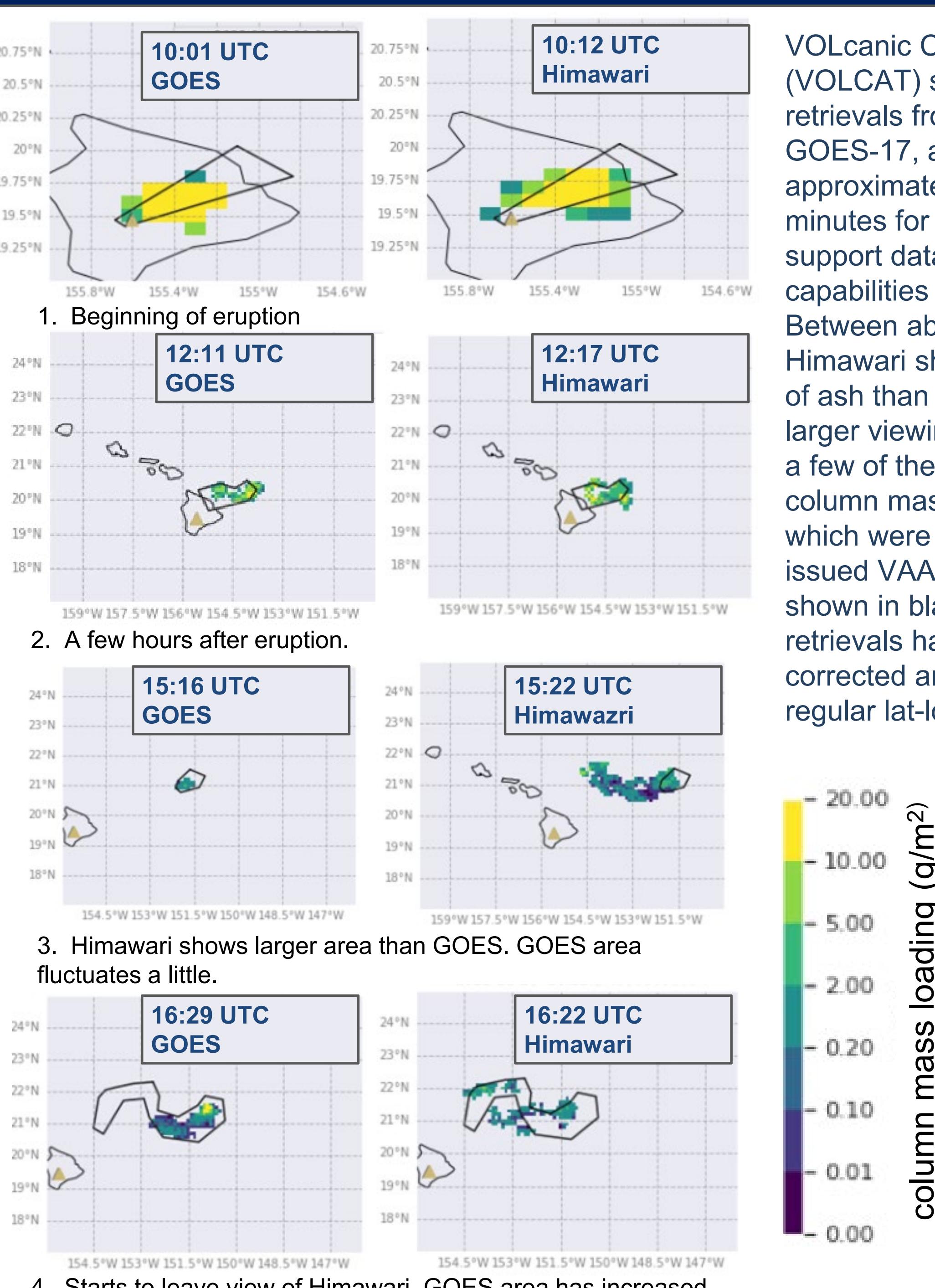
Initial large uncertainty in amount of ash in the plume as well as whether eruption would be ongoing.

RMK: LRG ERUPTION OBS AT SUMMIT FM STLT AND WEBCAM, OBSERVATORY AND WFO RPTD THAT VA IS LIKELY MIXED INTO LRG PLUME MV NE TWD HILo AIRPORT, MDL WINDS EXP TO REMAIN NE THRU T+6 HRS.



It was difficult to assess when the ash would dissipate. As the ash and gas cloud continued to move east northeast in satellite imagery the analyst could see that the cloud was becoming mostly gases. Although that was translated in the advisory, users who had access to the same satellite imagery and volcanic ash information, had many questions and concerns once the forecast was downgraded from the T+18 hrs. Multiple users requested a longer duration forecast.

Observations



VOLCAT system satellite retrievals from Himawari-8 and GOES-17, available approximately every 5-10 minutes for the event could support data fusion modeling capabilities (see right panel). Between about 12 and 15 UTC, Himawari showed a larger area of ash than GOES due to its larger viewing angle. Below, just a few of the satellite retrievals of column mass loading are shown which were close in time to issued VAAs (T+0 polygons are shown in black). The satellite retrievals have been parallax corrected and regridded onto a regular lat-lon grid.

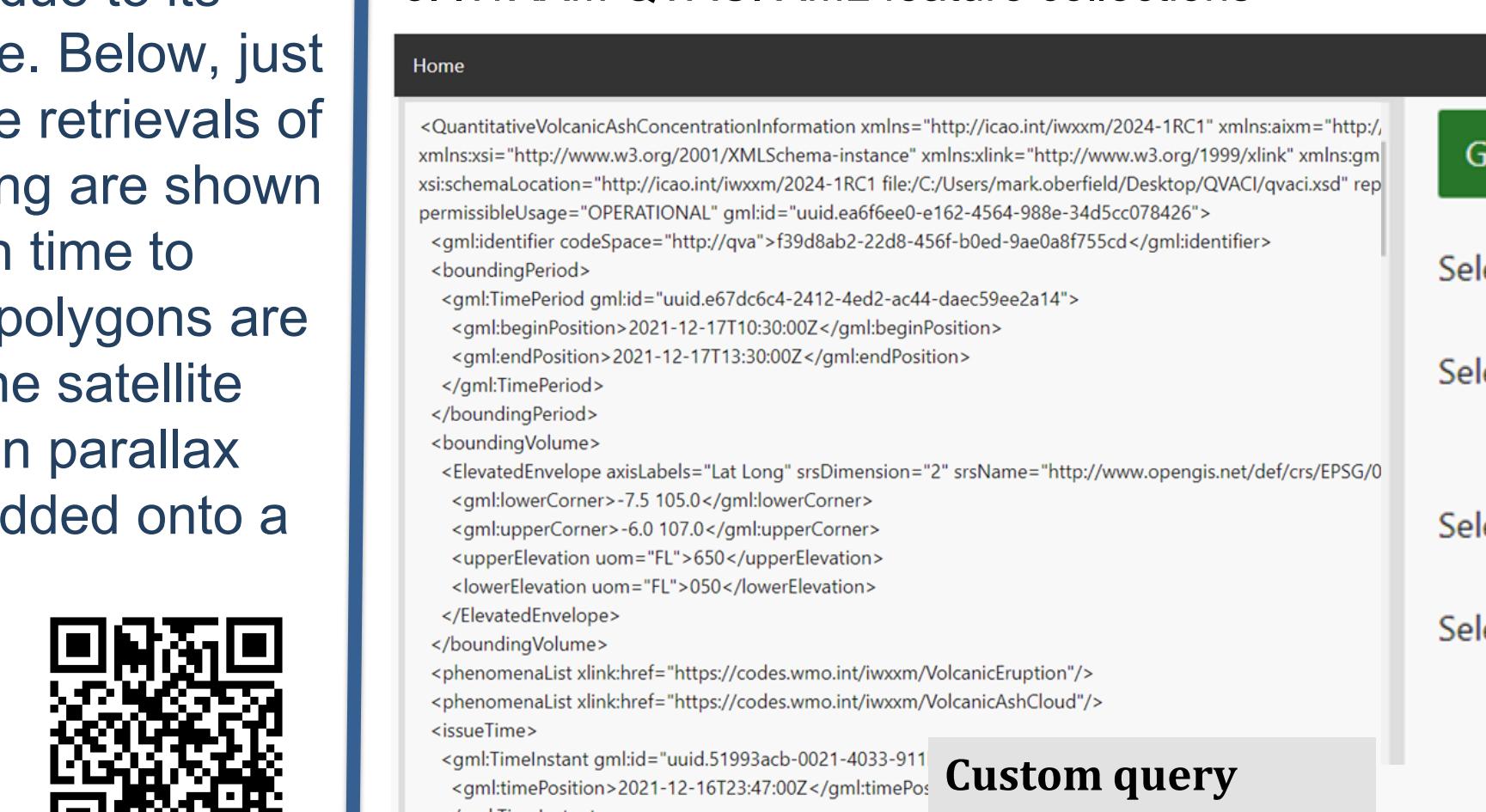


A NOAA QVA prototype currently consists of two independent components:

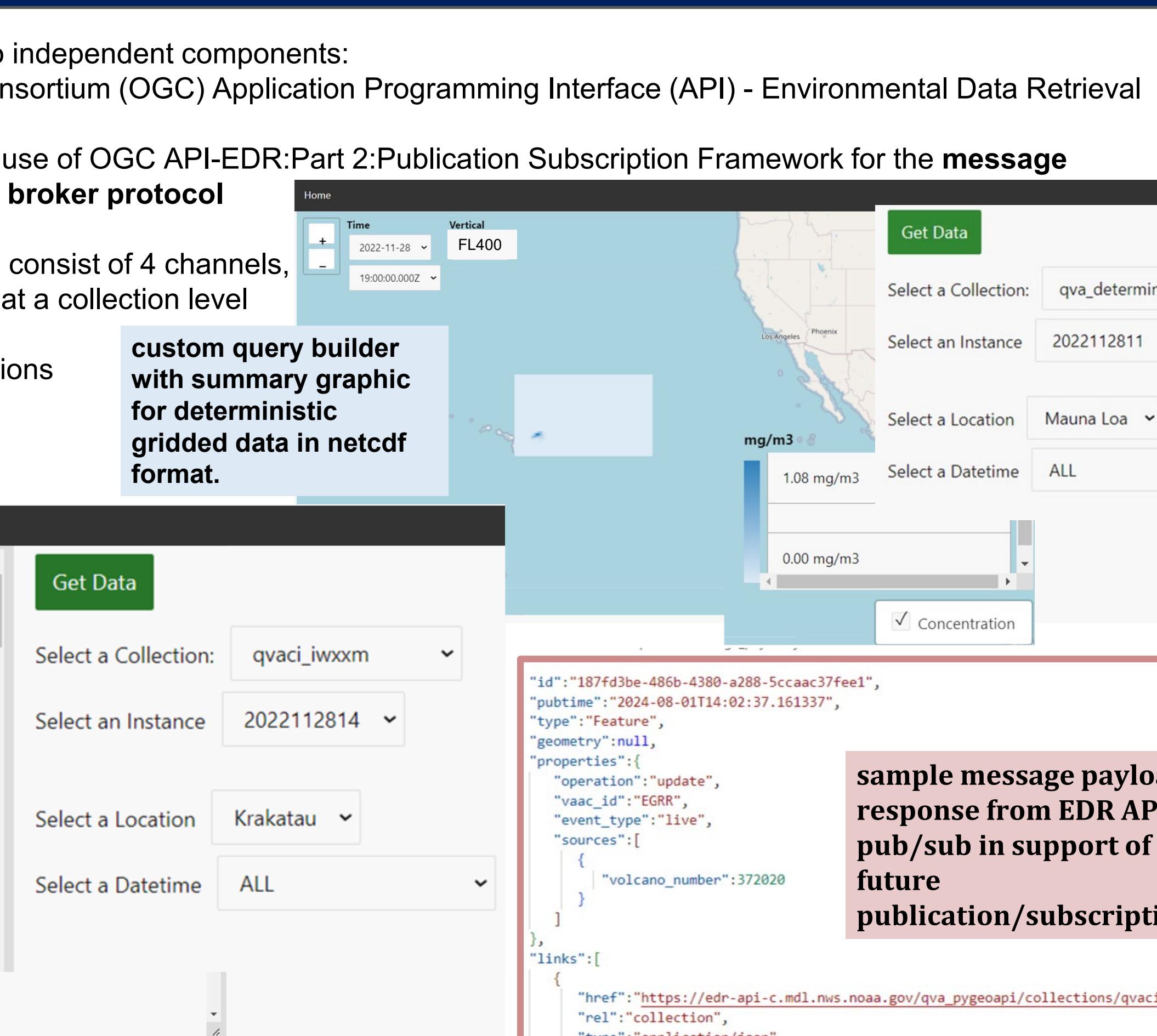
1. A RESTful API using an Open Geospatial Consortium (OGC) Application Programming Interface (API) - Environmental Data Retrieval (EDR) "locations" query type
2. A Publication/Subscription framework making use of OGC API-EDR:Part 2:Publication Subscription Framework for the message payload and SWIM compliant for the message broker protocol

The Publication Subscription implementation will consist of 4 channels, a **root level** channel and **3 channels** to register at a collection level

1. Probabilistic NetCDF gridded data
2. Deterministic NetCDF gridded data
3. IWXXM QVACI XML feature collections



QVA Information Service



Discussion

- Current advisories provide an estimate of the likely location of ash and convey uncertainties through the remarks. Analysts use their judgement to include or exclude areas in the polygon which have low probabilities of discernible ash being present.
- Transitioning new modeling tools to operations will support analysts creating the current VAA as well as production of the new QVA information.
- The development of new modeling tools has followed the development of satellite products which provide near real time detection and alerting of ash clouds as well as retrievals of volcanic ash cloud properties. Improvements in observations leads to improvements in forecasting.
- It is expected that new modeling capabilities will be transitioned to operations and updated over a period of many years.
- The full QVA information will be available through an API and a subset of the information will be provided through supplemental graphics.

Contact information

Address: 5830 University Research Court, College Park, MD 20740
Email: alice.crawford@noaa.gov

Address: 5830 University Research Court, College Park, MD 20740
Email: alice.crawford@noaa.gov

Tel: 301-683-1380