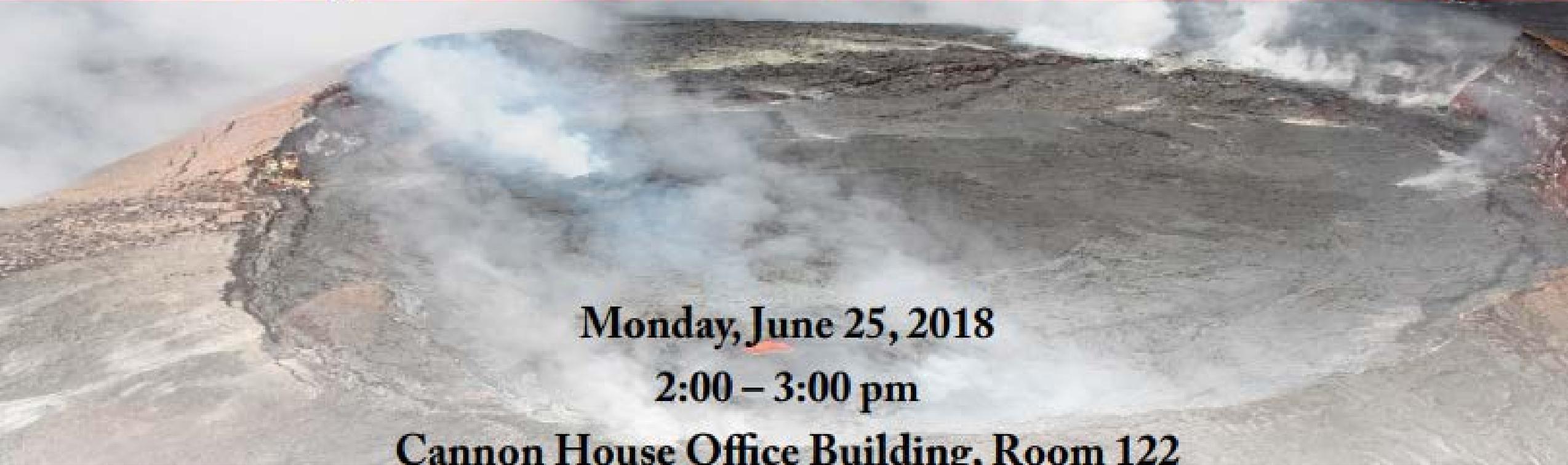


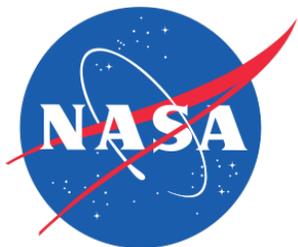
Volcano Monitoring: Reducing the Risks of Volcanic Hazards for Society



Monday, June 25, 2018

2:00 – 3:00 pm

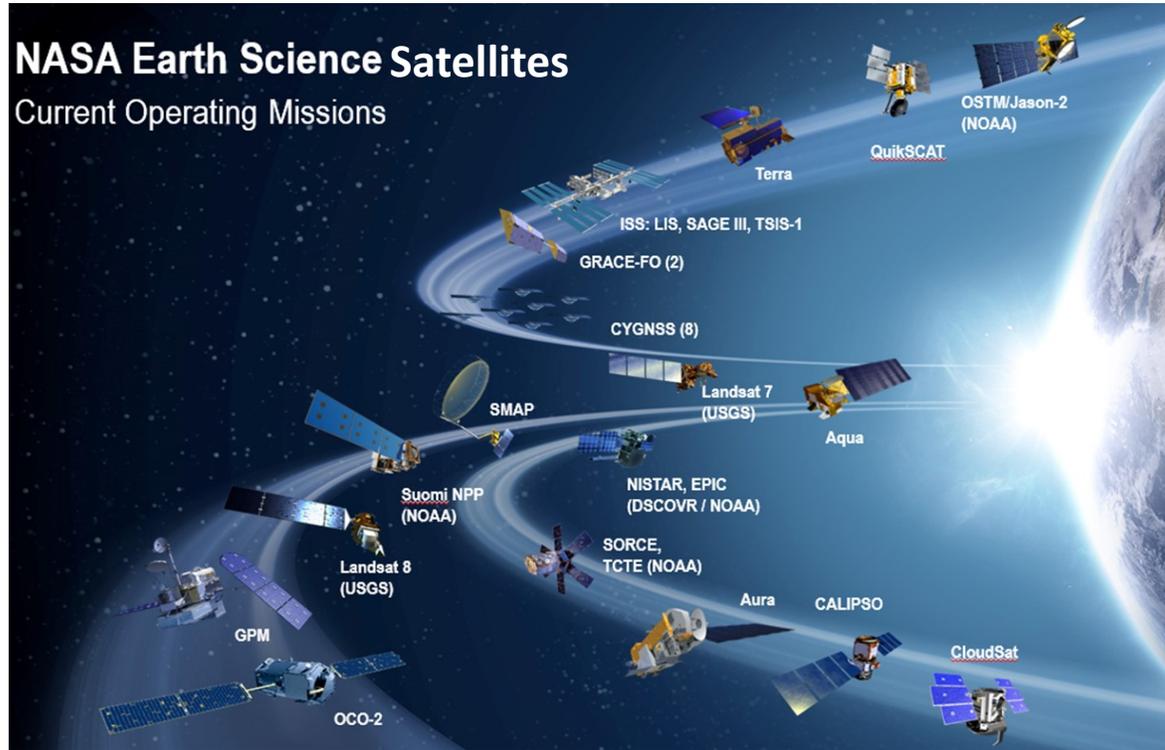
Cannon House Office Building, Room 122



Jean-Paul Vernier,
NASA Disasters Program



Contributing to the *Group on Earth Observations* and *Sendai Framework* For Disaster Risk Reduction

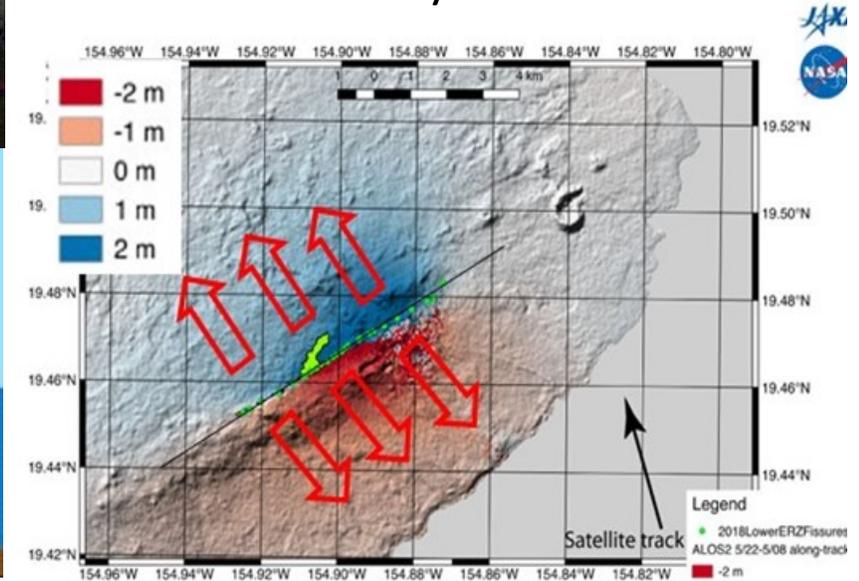
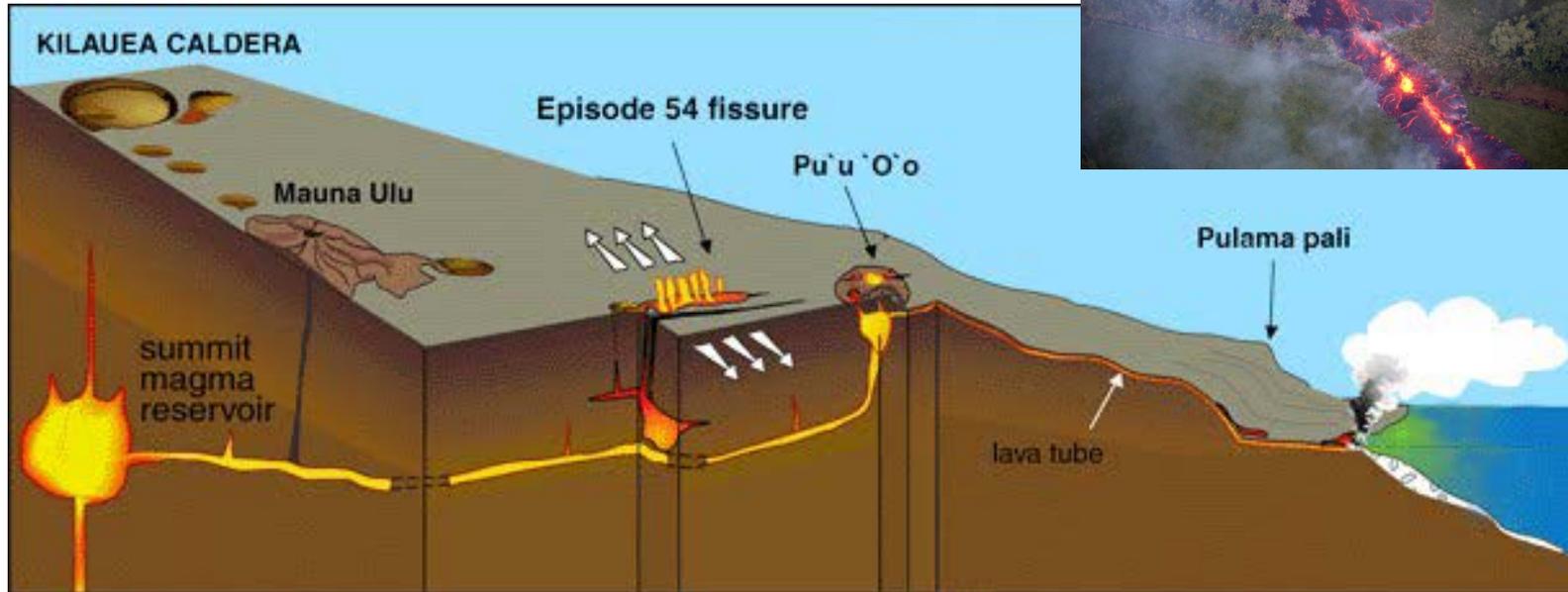


Monitoring hazards, exposure and vulnerability

Detecting Dramatic and Sudden Changes: Ground movement from Kilauea eruption as seen from Space



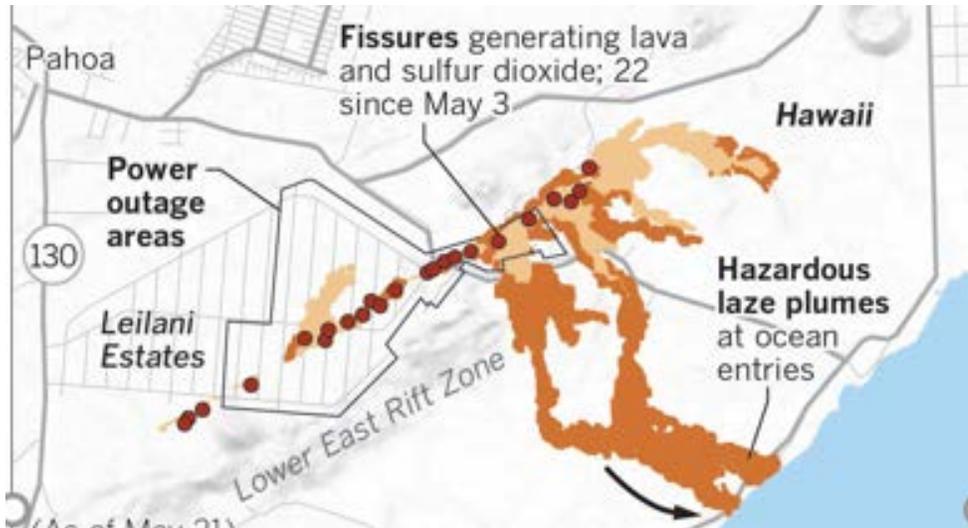
ALOS-2 Ground Evolution
between May 8 and 22nd



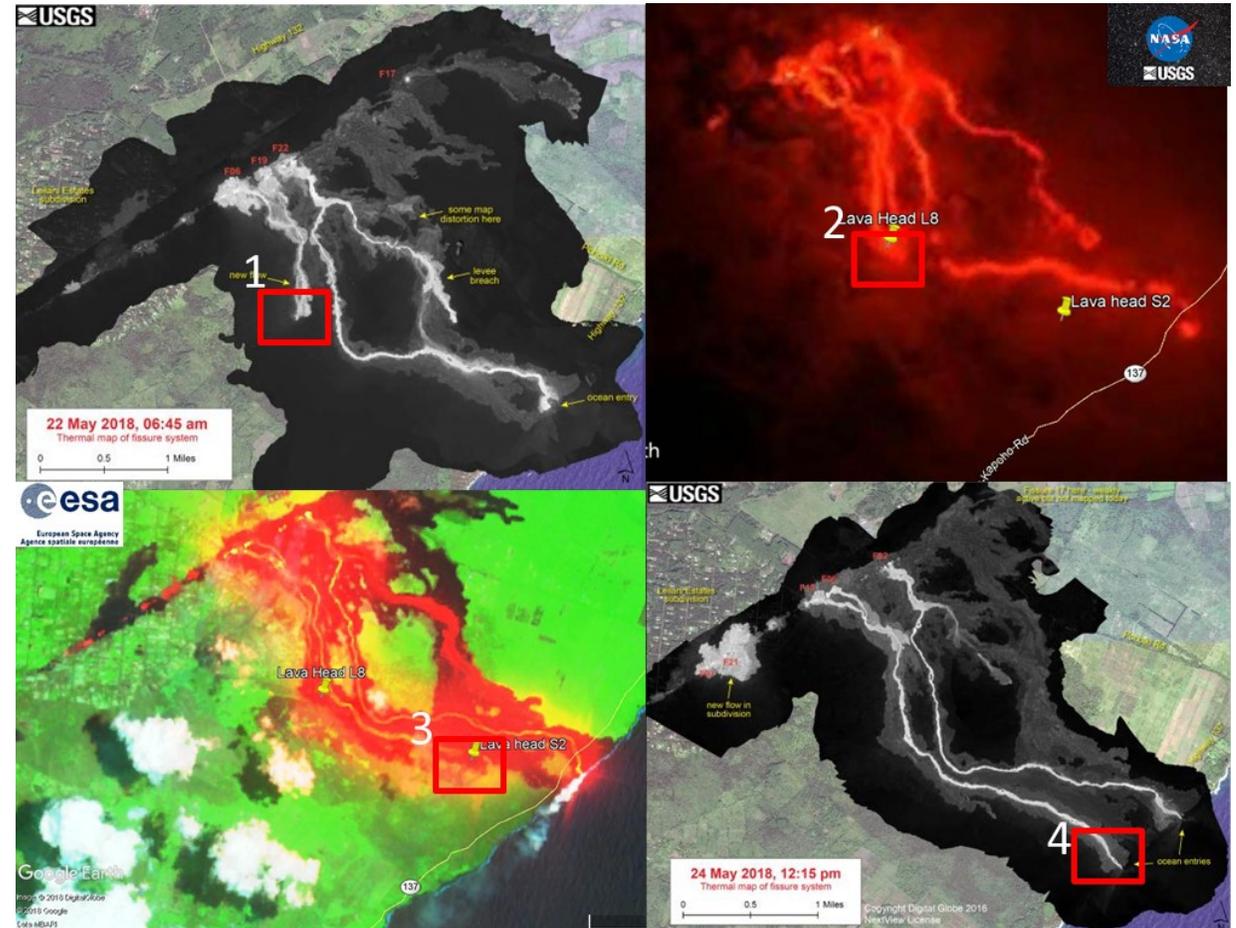
✓ *Fissure formation, lava intrusions and other critical information needed by decision makers and communities.*

Tracking Evolution and Threat as Kilauea Lava Races to the Ocean

May 22nd and 24th



Flowing lava and SO₂ emissions, threaten safety and health of populations, damage to infrastructure with disruption to lifelines including power outages



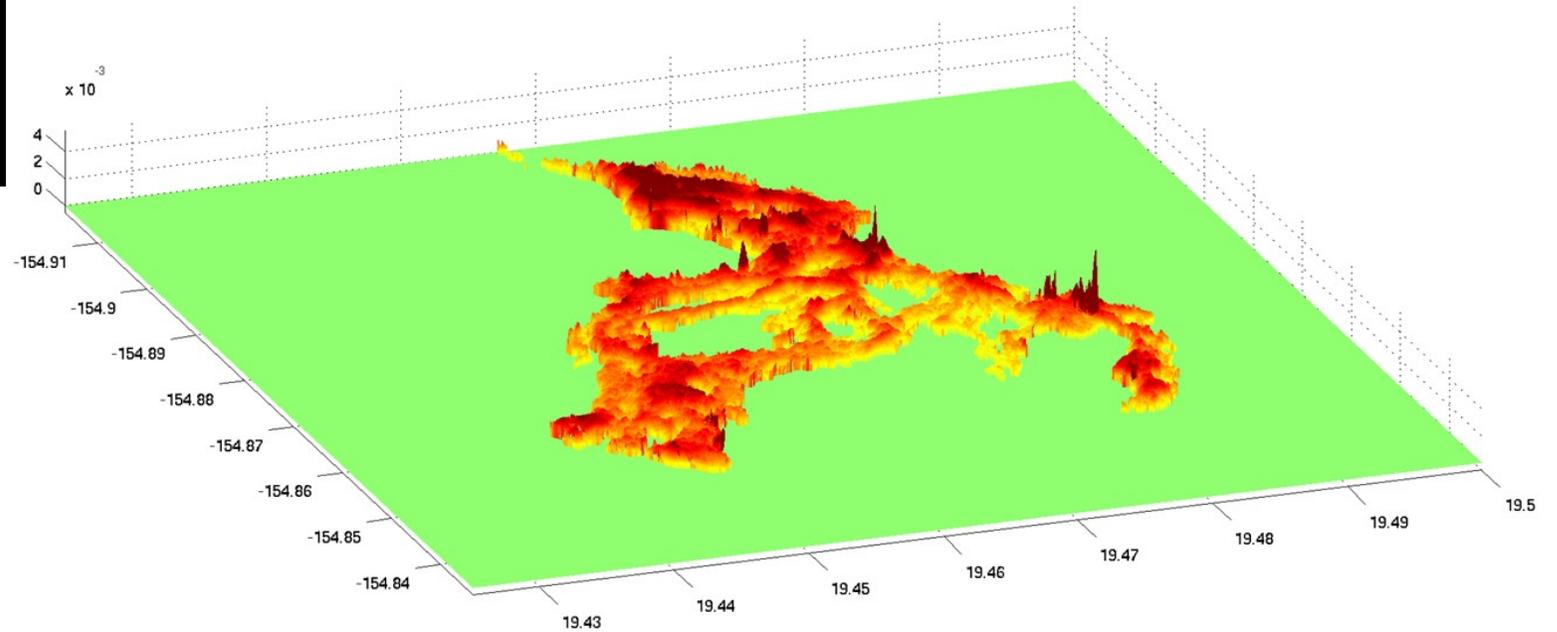
USGS, ESA, NASA Combining Information is key!

Measuring Rapid Surface Change and Impacts by Airborne Radar

NASA-GLISTIN



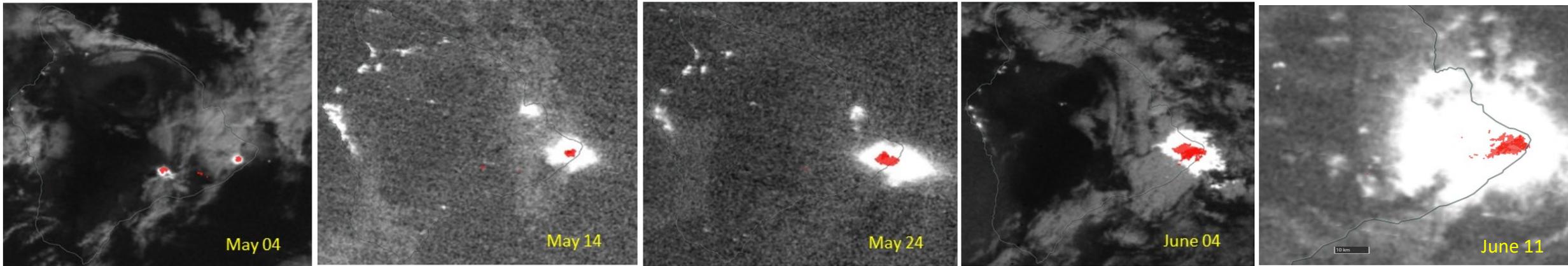
Measuring volume of material during the eruption enables estimates of how large the magma chamber is and how long the eruption may last



3-D Lava Flow on May 22



Locating Fires and Thermal Anomalies from Growing Lava Fountains



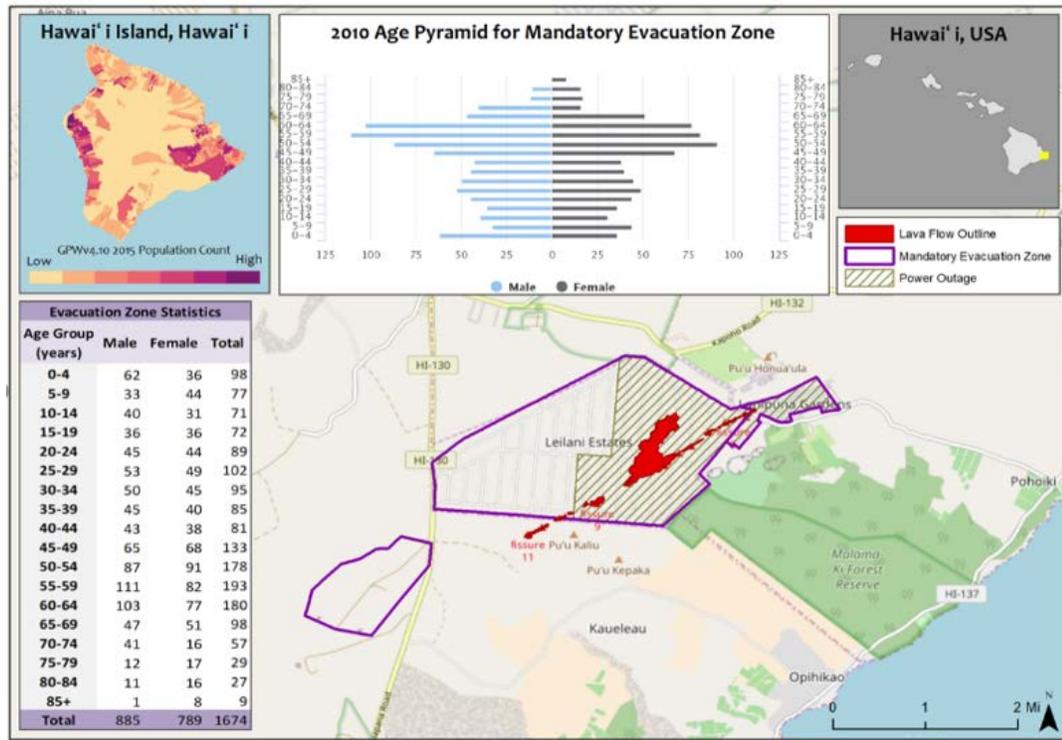
LANCE Fire Information for Resource Management System (FIRMS) with VIIRS Nighttime imagery via Worldview
May 4 to June 4

Lava fountains feed lava flow and threaten nearby communities, damage and loss to infrastructure



Dr. Jean-Paul Vernier, June 11, 2018

Assessing Risk and Socioeconomic Impact to Inform Actions



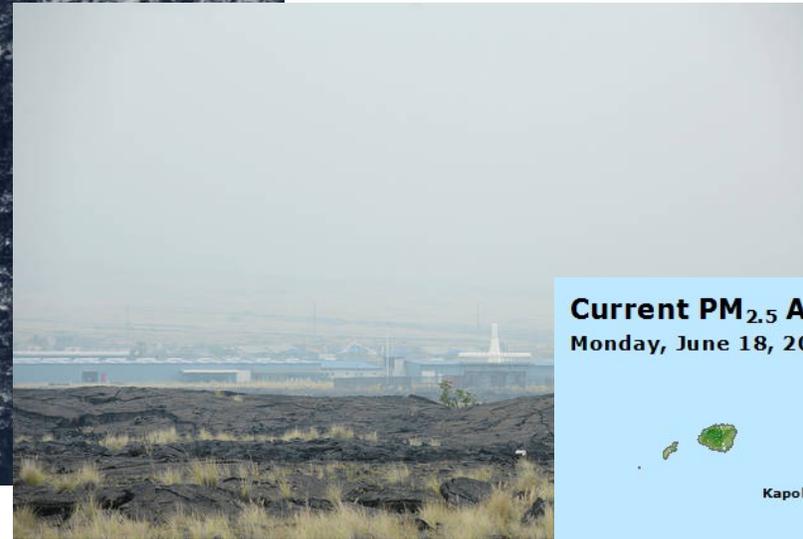
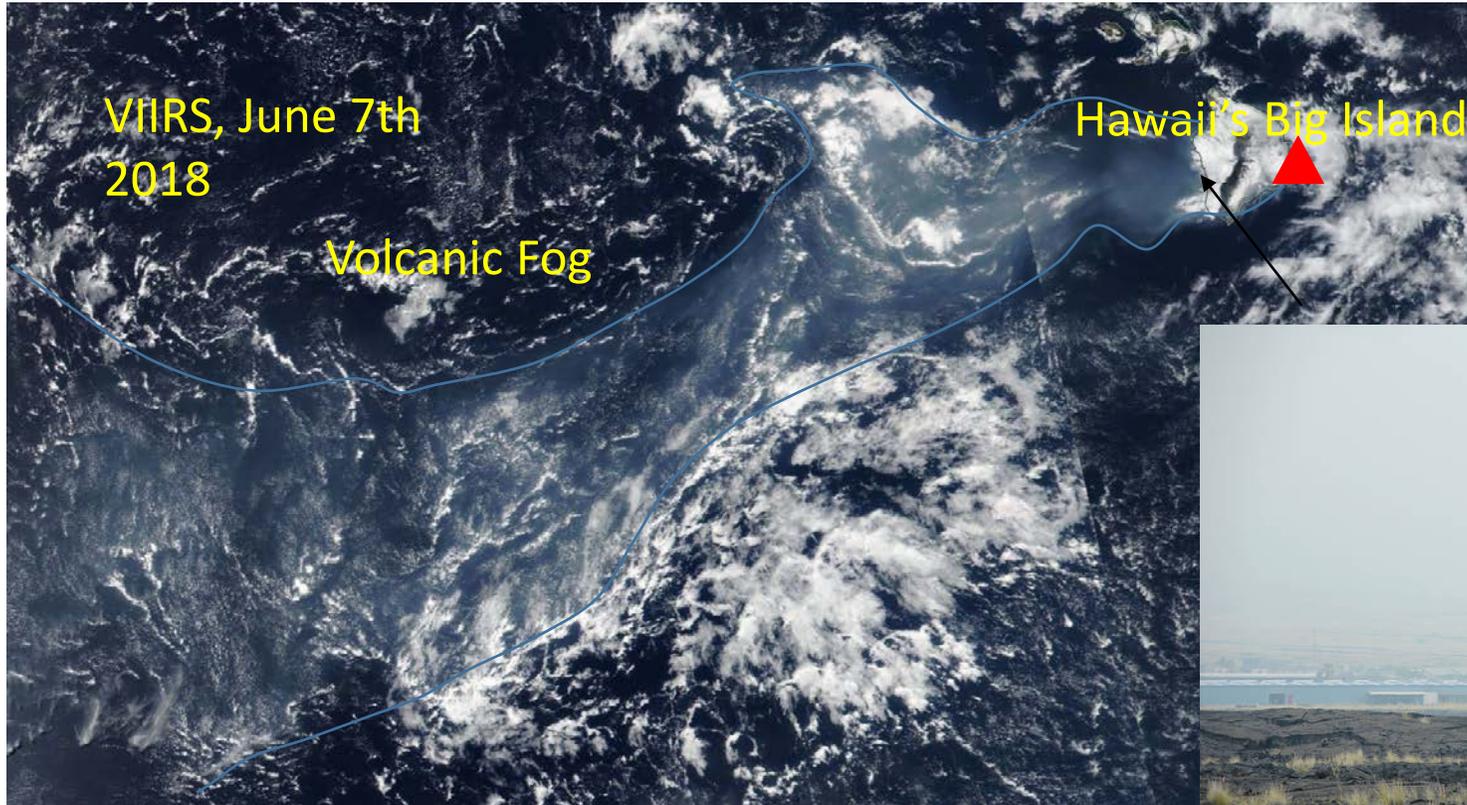
Data Sources: Center for International Earth Science Information Network - CIESIN - Columbia University, 2017. Gridded Population of the World, Version 4 (GPW4): Population Count, Revision 10, Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4PQ1PPM>. Accessed 5/11/2018. United States Census Bureau, 2010 TIGER/Line Shapefiles. <https://www.census.gov/geo/maps-data/data/tiger-line.html>. Accessed 05/01/2012. Center for International Earth Science Information Network - CIESIN - Columbia University, 2017. Gridded Population of the World, Version 4 (GPW4): Basic Demographic Characteristics, Revision 10, Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4BHTD7F>. Accessed 5/11/2018. and County of Hawaii, Department of Information Technology, 2018. Lava Working 2018 public v6. ArcGIS Web Service. Accessed: 5/11/2018. Basemap: OpenStreetMap (www.openstreetmap.org/)



Observations help inform population within Mandatory Evacuation Zone

Distinguishing Severe Flight and Air Quality Risk Volcanic Fog (VOG)

*Ash is a hazard to aviation;
Sulfur Dioxide gas becomes
sulfate particles (VOG) that
pose air quality risks.*

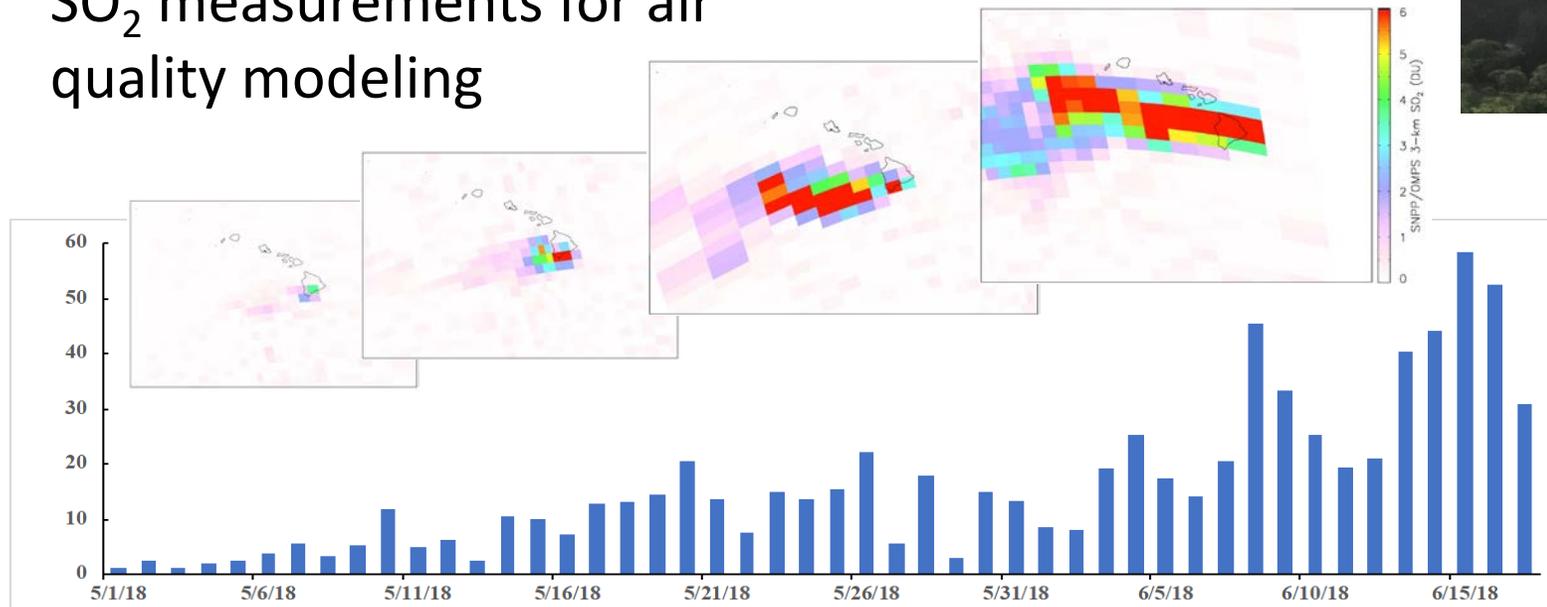


NASA MISR instrument distinguishes aerosol-type:
- volcanic ash vs sulfate/water particles.



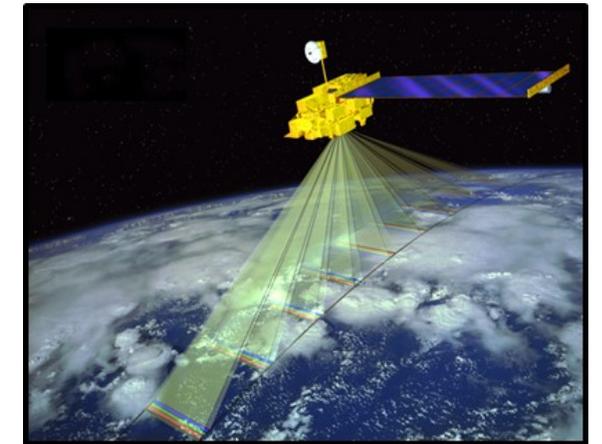
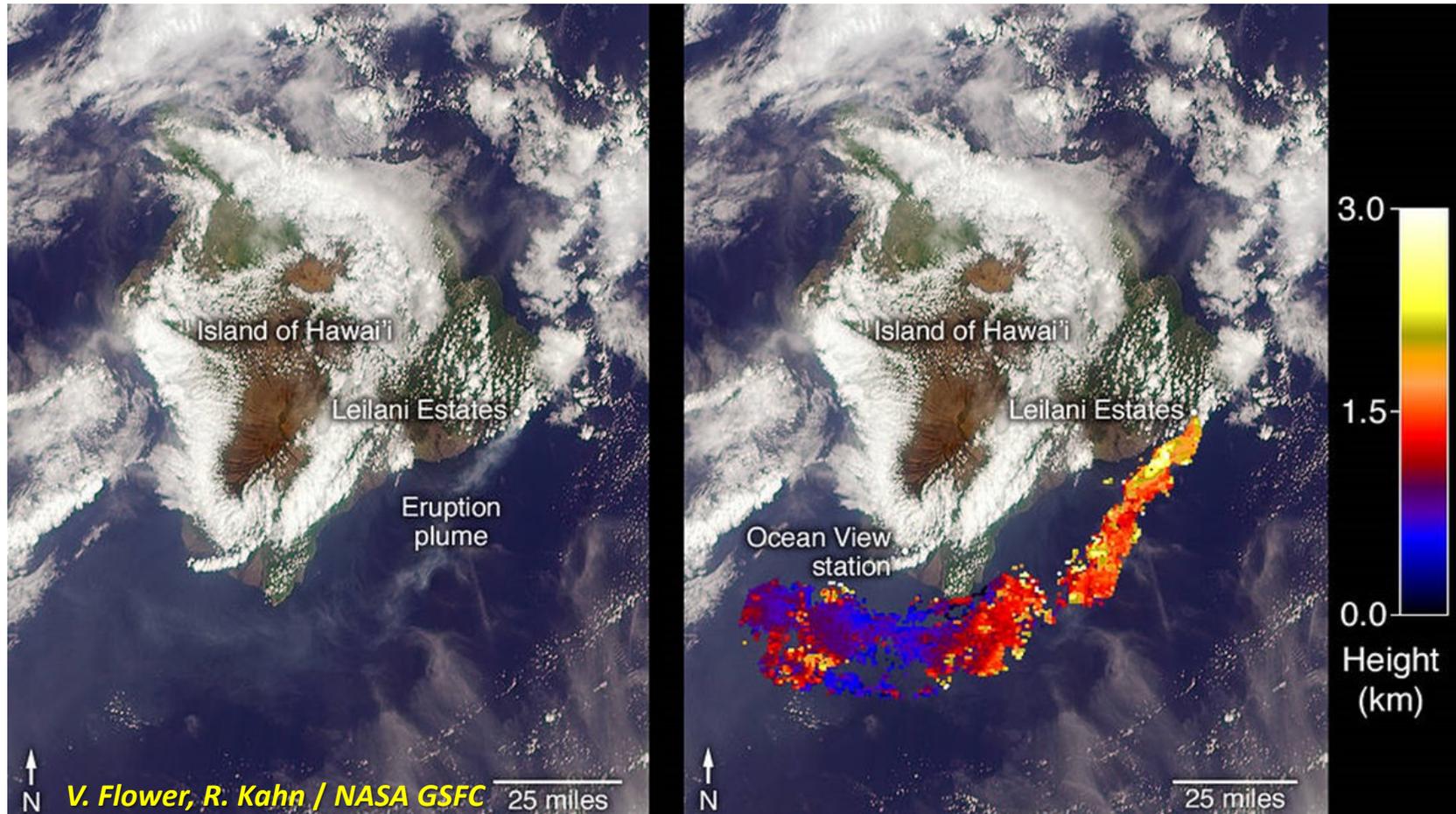
Daily Monitoring of Increasing Sulfur Dioxide (SO₂) Load and Mounting Hazard

NASA SNPP/OMPS instrument provides daily SO₂ measurements for air quality modeling



The spread of SO₂ affects air quality, climate, and causes acid rain over wide areas

Analyzing Plume Height and Composition Risk

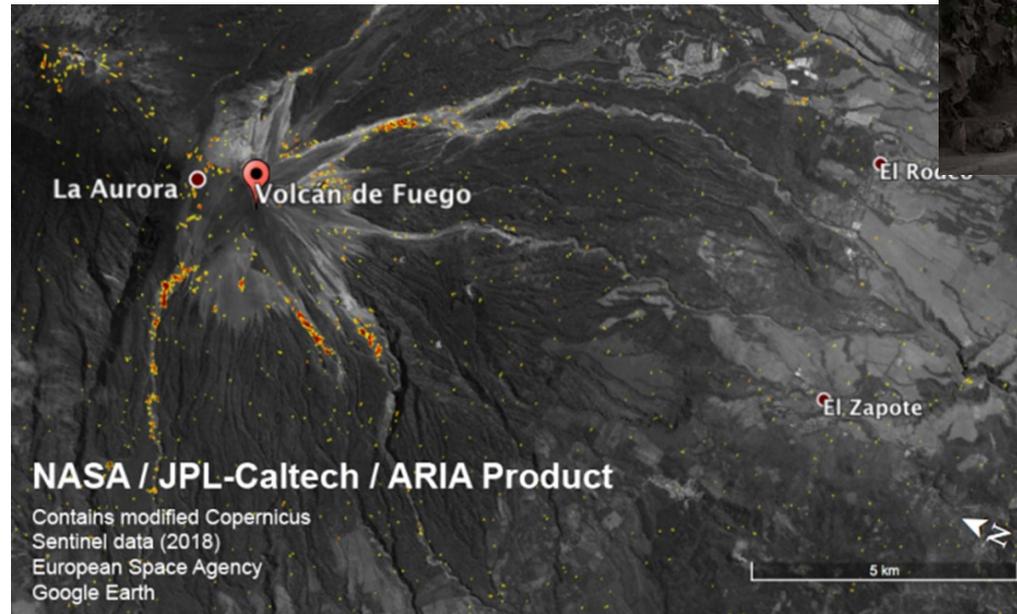


NASA MISR Instrument
– 9 cameras provide stereoscopic coverage of plume

Plume-height maps initialize models that predict the downwind evolution of potential air quality and aviation risks

NASA – Ongoing Monitoring of the Global Cities on Volcanoes

Dramatic Eruption of Fuego, Guatemala



Perils to life and lifelines are monitored to aiding search & rescue and to inform recovery with Damage Proxy Maps (DPMs) and Loss Models based on radar satellite imagery



Conclusion

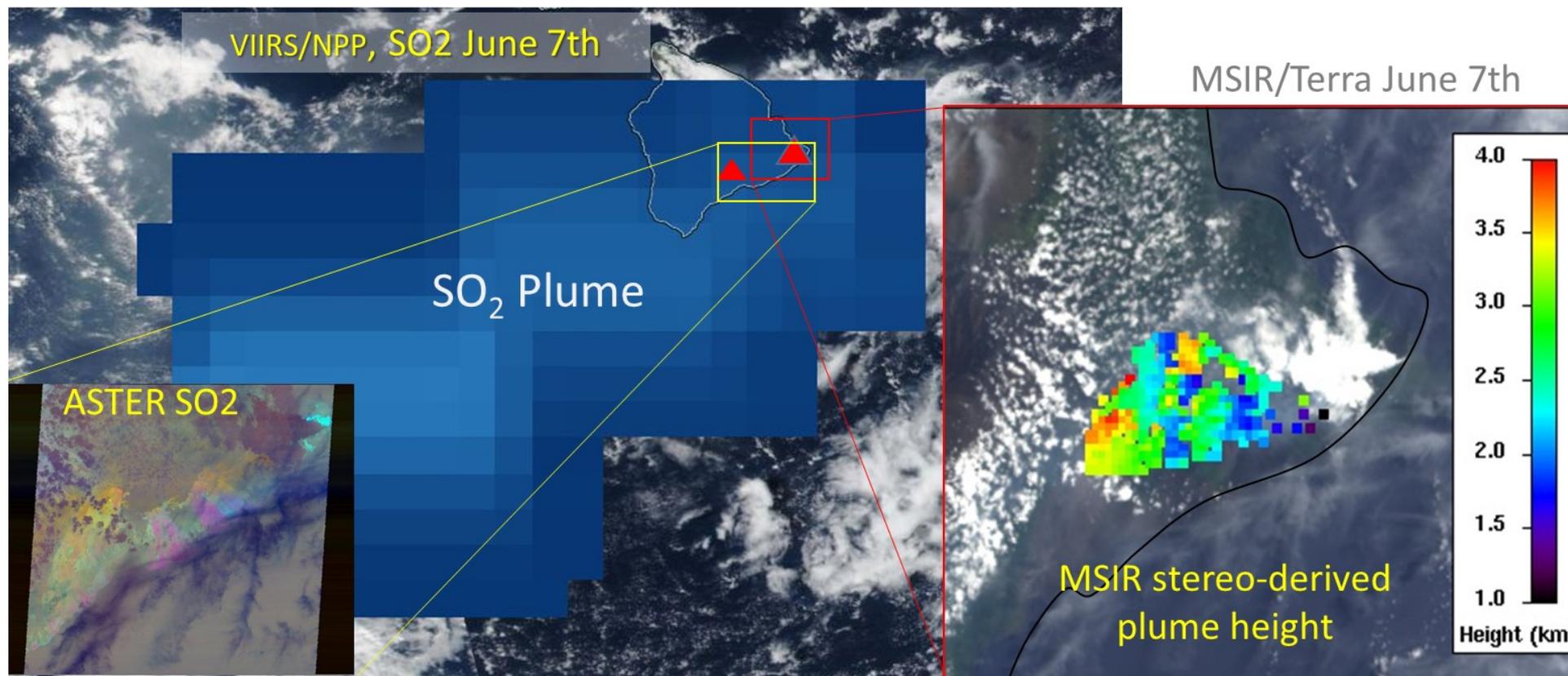
- ❑ NASA's scientists and investigators use satellites and airborne systems to
 - ❑ ***Advance science, assessment and monitoring*** of volcano risk globally
 - ❑ ***Inform planning and response decisions***
 - ❑ ***Enable risk reduction policies***

- ❑ NASA partners with domestic agencies and international observatories on an ongoing basis to
 - ❑ ***Promote open and timely data access***
 - ❑ ***Coordinate disaster risk planning, response and recovery***
 - ❑ ***Build capacity and sustainable resilience***
 - ❑ ***Support emergency managers and communities at risk***

- ❑ For further information visit <https://disasters.nasa.gov/>.



Integrating VOG Plume-height and Emission Rates for Risk Mapping



Plume heights + OMI UV and ASTER Infrared instruments estimate toxic sulfur dioxide (SO₂) concentrations, a possible air quality risk.