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

✓ 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 SO$_2$ 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

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

Observations help inform population within Mandatory Evacuation Zone
Distinguishing Severe Flight and Air Quality Risk
Volcanic Fog (VOG)

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

Ash is a hazard to aviation;
Sulfur Dioxide gas becomes sulfate particles (VOG) that
pose air quality risks.
Daily Monitoring of Increasing Sulfur Dioxide (SO$_2$) Load and Mounting Hazard

NASA SNPP/OMPS instrument provides daily SO$_2$ measurements for air quality modeling

The spread of SO$_2$ affects air quality, climate, and causes acid rain over wide areas.

https://SO2.gsfc.nasa.gov
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 (SO$_2$) concentrations, a possible air quality risk.