

VOLCANOLOGICAL APPLICATIONS OF ECOSTRESS DATA



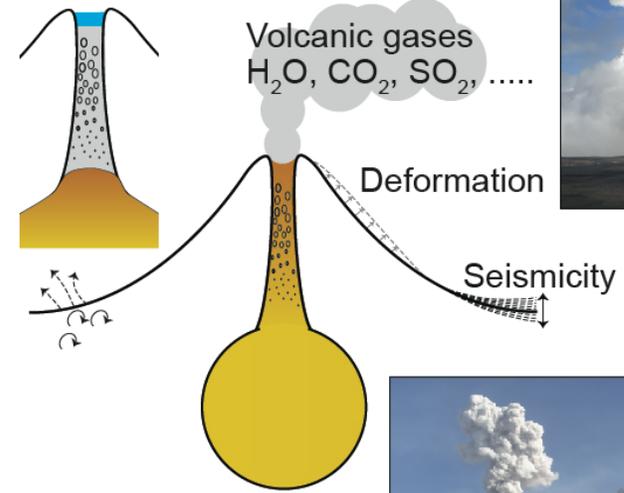
Robert Wright

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Unrest



Crater lake



Low temperature hydro/geothermal anomaly (~ $\Delta 10-100$ K)

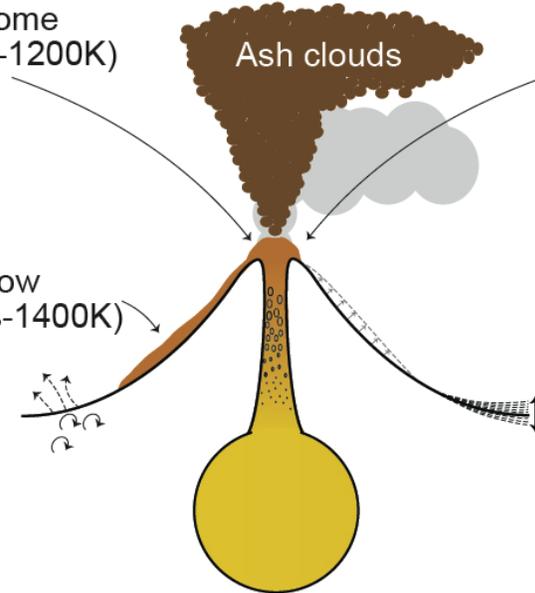


Lava dome ($\Delta 100s-1200K$)



Lava flow ($\Delta 100s-1400K$)

Eruption

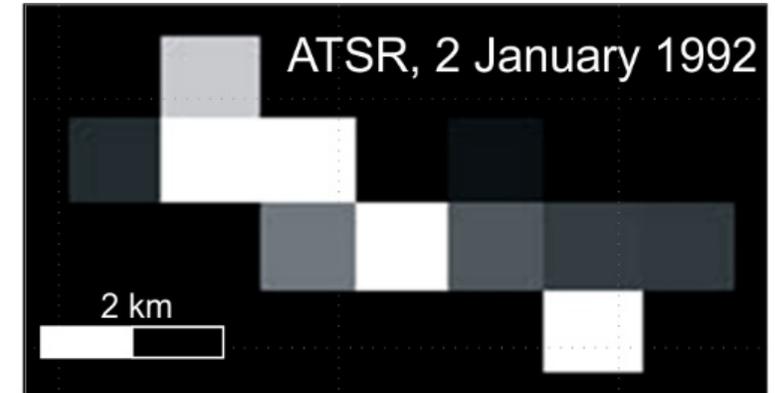
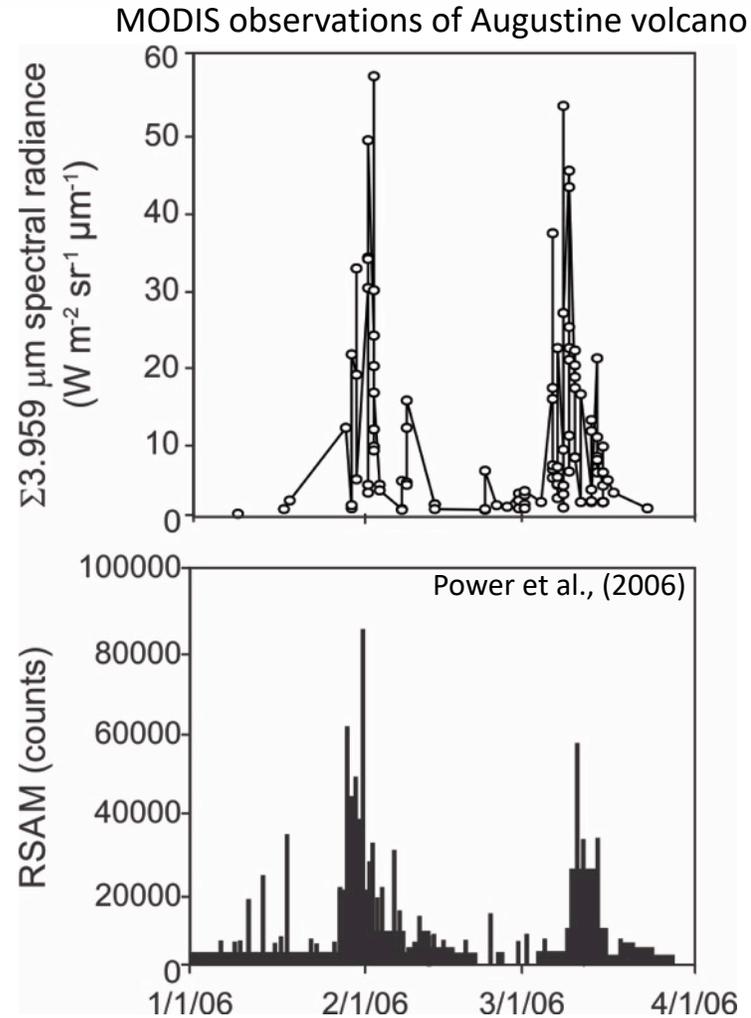


Lava lake ($\Delta 100s-1400K$)



HAVING OUR VOLCANOLOGICAL CAKE AND EATING IT WITH ECOSTRESS

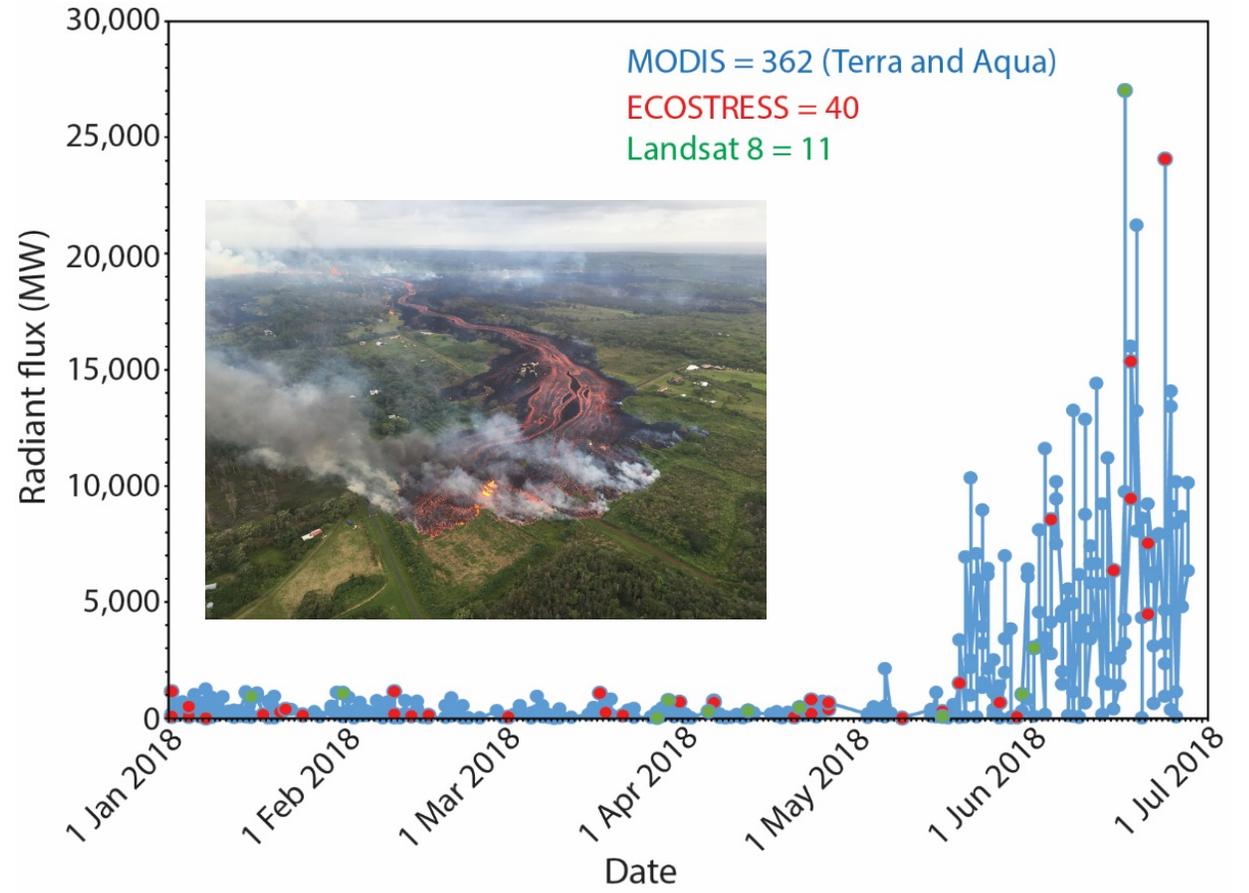
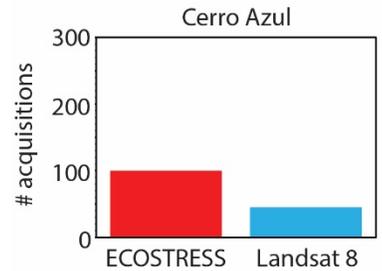
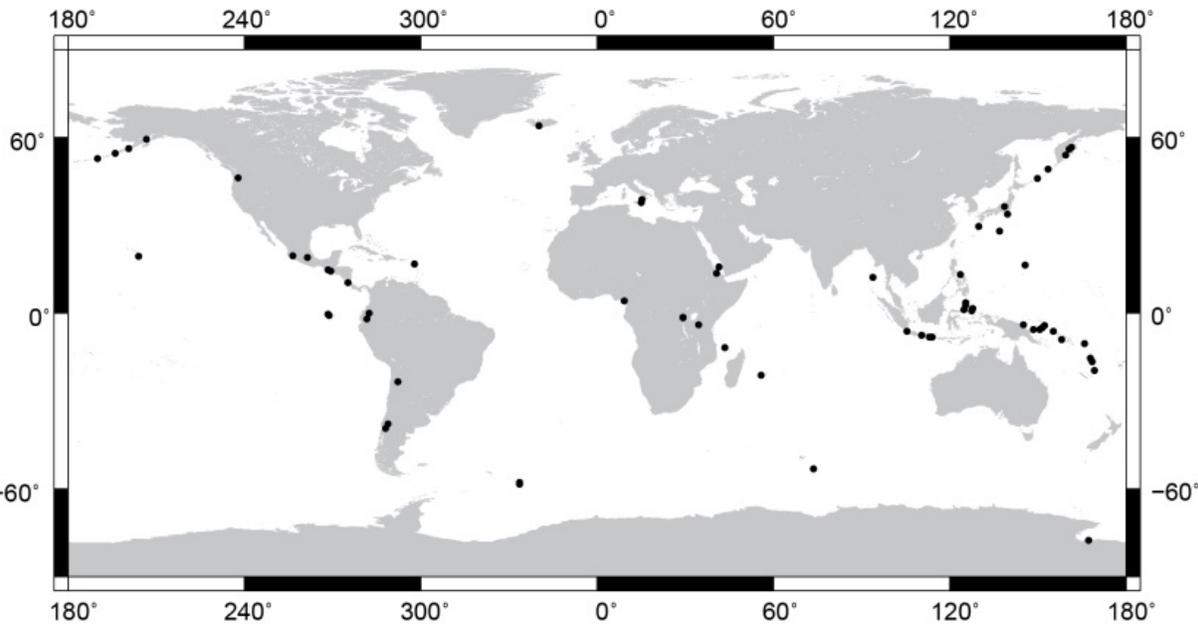
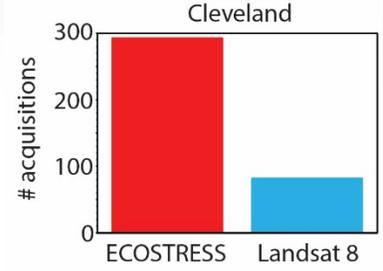
- Volcanic processes vary on all time scales, making high temporal resolution observations essential for quantifying their behavior
- ECOSTRESS will provide a new and unique data set that combines the spatial resolution of a Landsat-class sensor, the (LWIR) spectral resolution of an ASTER-class sensor, with the temporal resolution of a MODIS-class sensor
- Many volcanic processes will be amenable to study using ECOSTRESS as a result
- ECOSTRESS data provision is obviously not of a latency required to be used during an eruption, but still very valuable to prove the concept of how high spatial, temporal and spectral resolution LWIR data can improve our ability to measure and quantify global volcanic processes and hazards with future missions of this type.



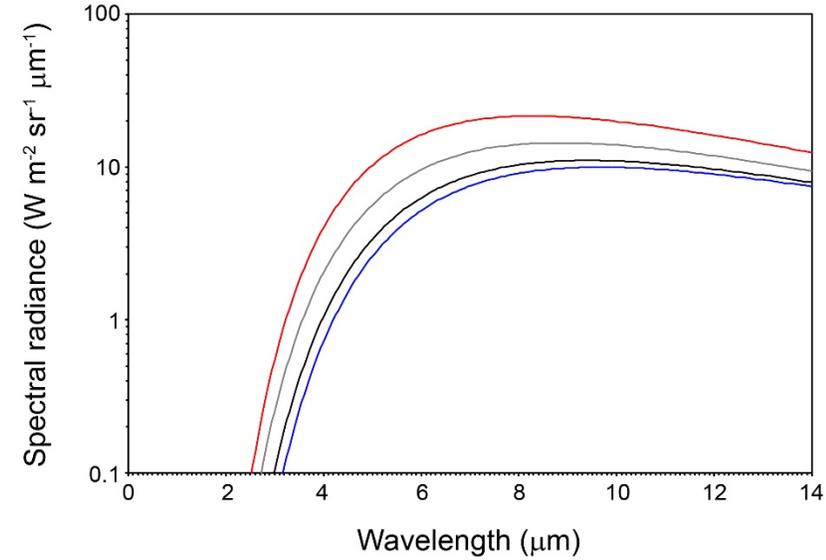
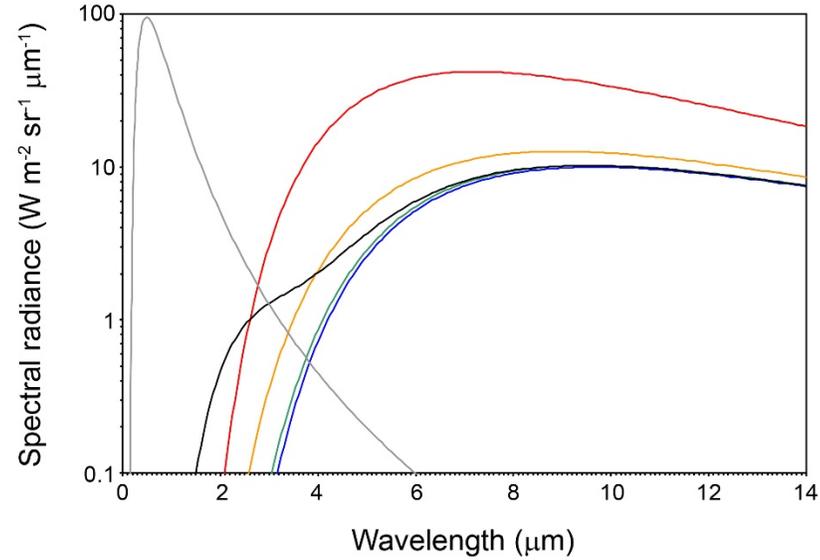
High and low temporal resolution images of lava flows at Mount Etna, 1992



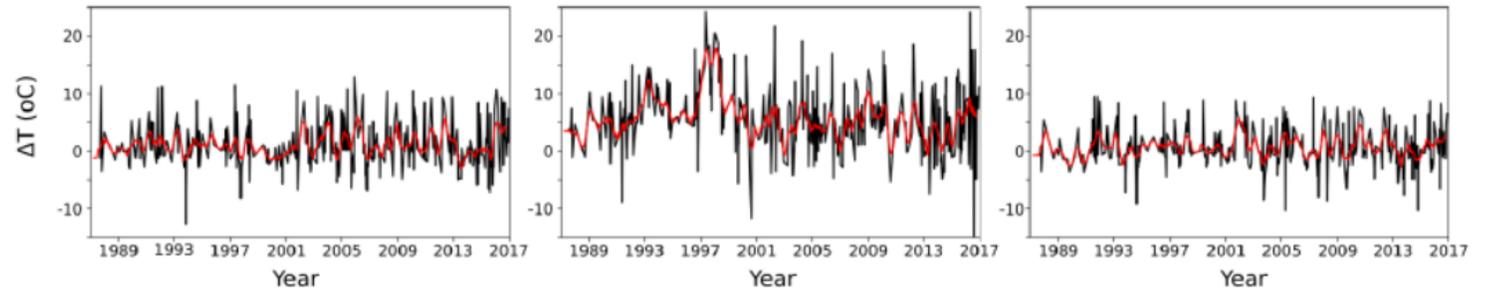
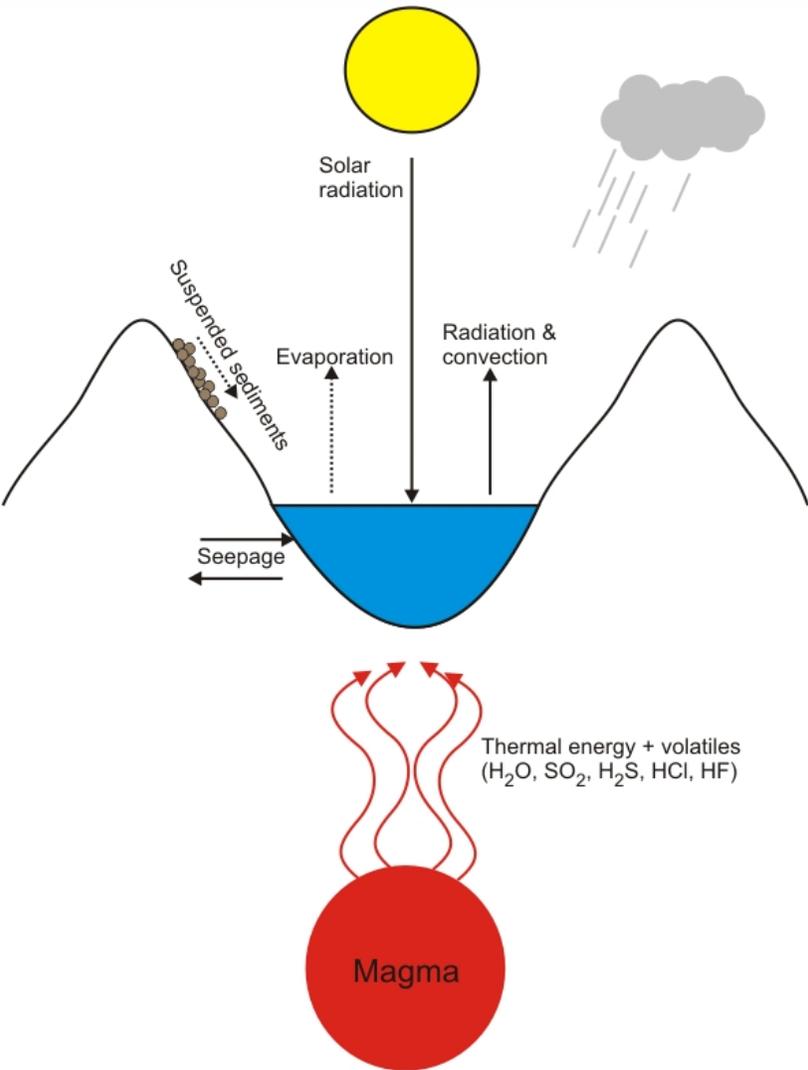
UNIQUE INSIGHTS INTO GLOBAL VOLCANISM WILL BE PROVIDED BY THE UNUSUAL CADENCE AND HIGH TEMPORAL RESOLUTION WITH WHICH ECOSTRESS WILL OBSERVE



ECOSTRESS WILL QUANTIFY LOW TEMPERATURE HYDROTHERMAL AND GEOTHERMAL VOLCANIC UNREST WITH UNPRECEDENTED SPATIAL AND TEMPORAL RESOLUTION

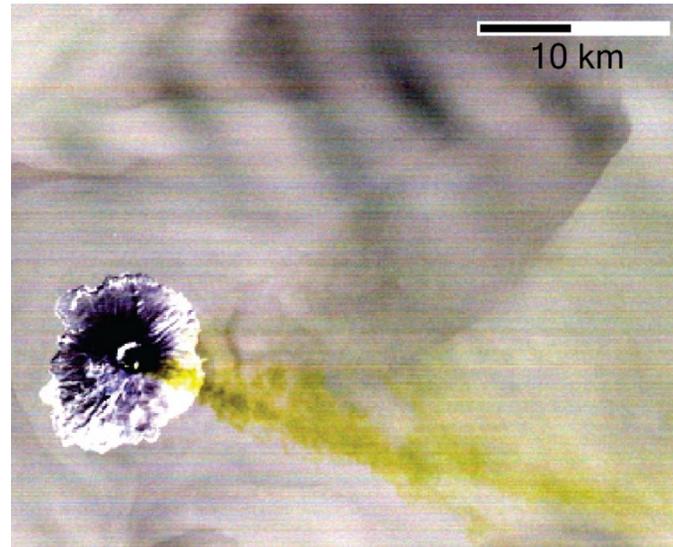
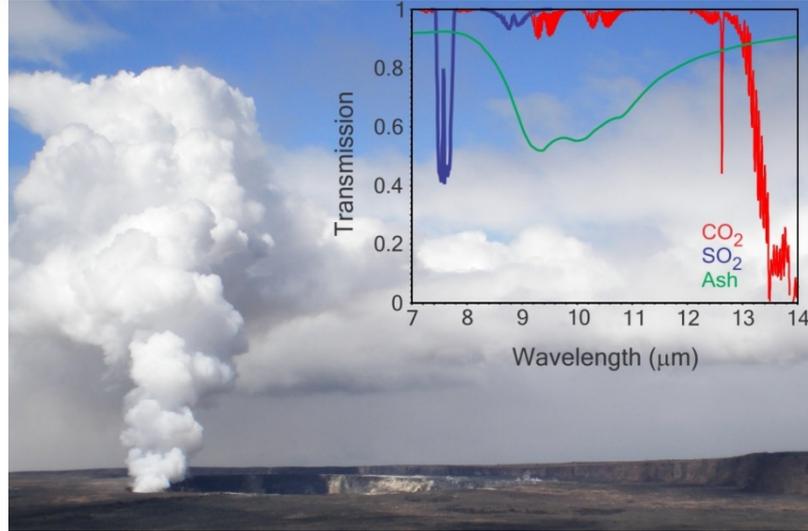
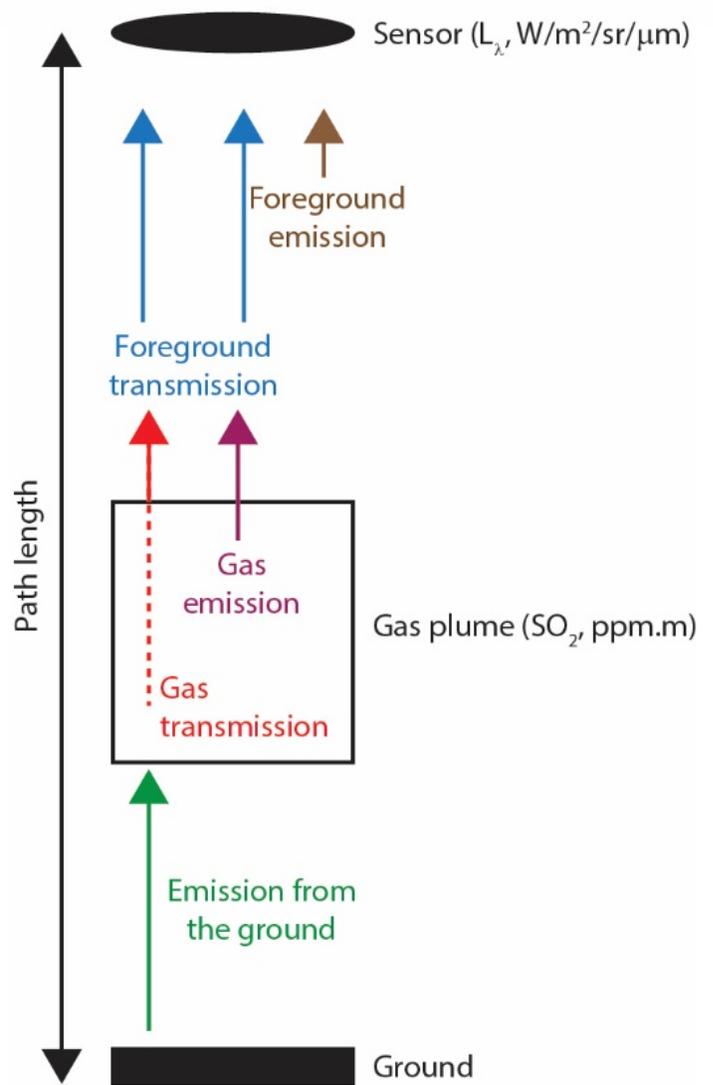


DO VOLCANIC CRATER LAKES EXHIBIT VARIATIONS IN TEMPERATURE PRIOR TO ERUPTIONS?

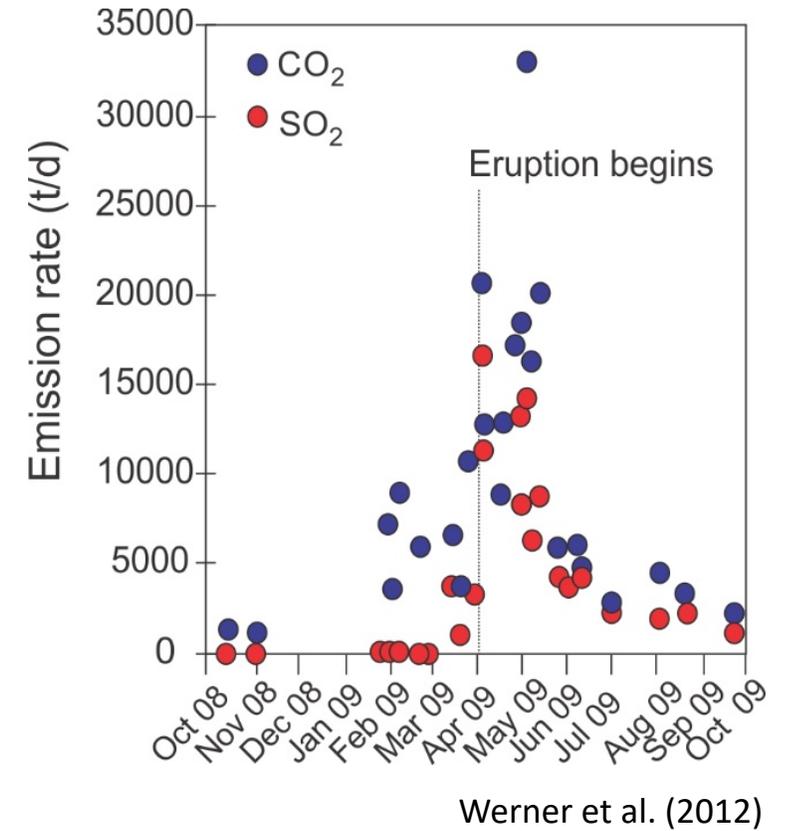


Murphy et al. (2018)

ECOSTRESS WILL ALLOW US TO QUANTIFY VOLCANIC SULFUR DIOXIDE EMISSIONS WITH AN HITHERTO PRECISION AND TEMPORAL RESOLUTION



ASTER LWIR color composite of SO₂ in the plume emitted from Miyaka-Jima volcano, Japan

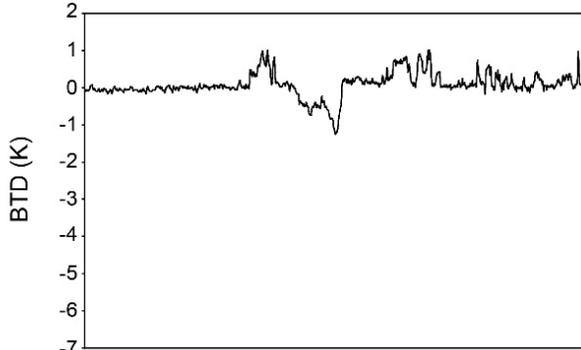
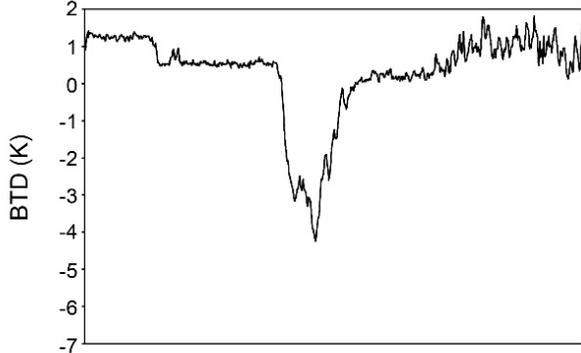
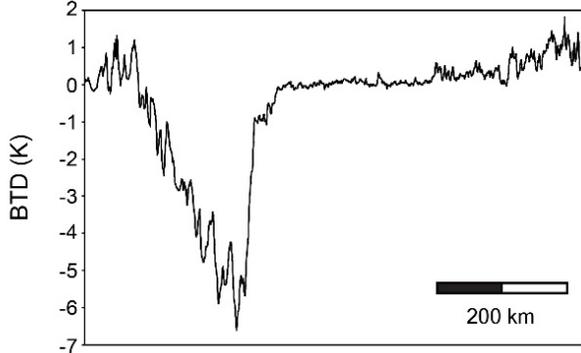
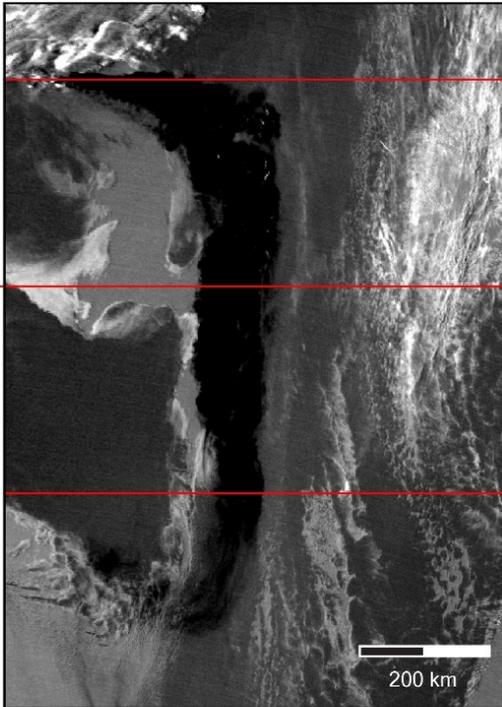
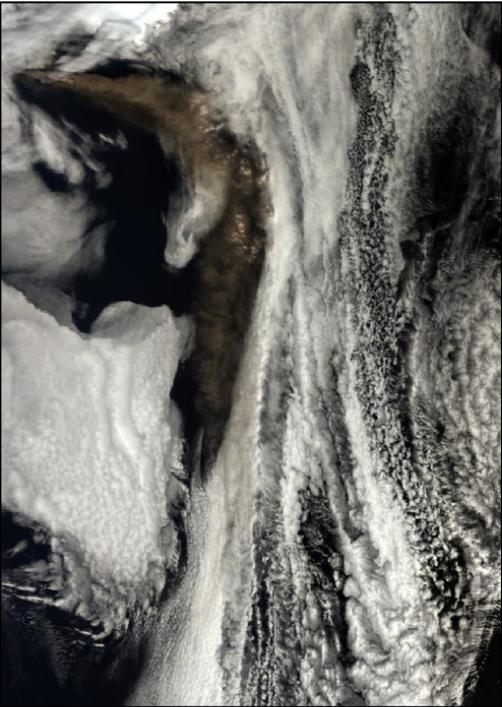


Werner et al. (2012)

ECOSTRESS WILL BE ABLE TO PROVIDE ESSENTIAL CALIBRATION DATA FOR VOLCANIC ASH DETECTION AND FORECASTING



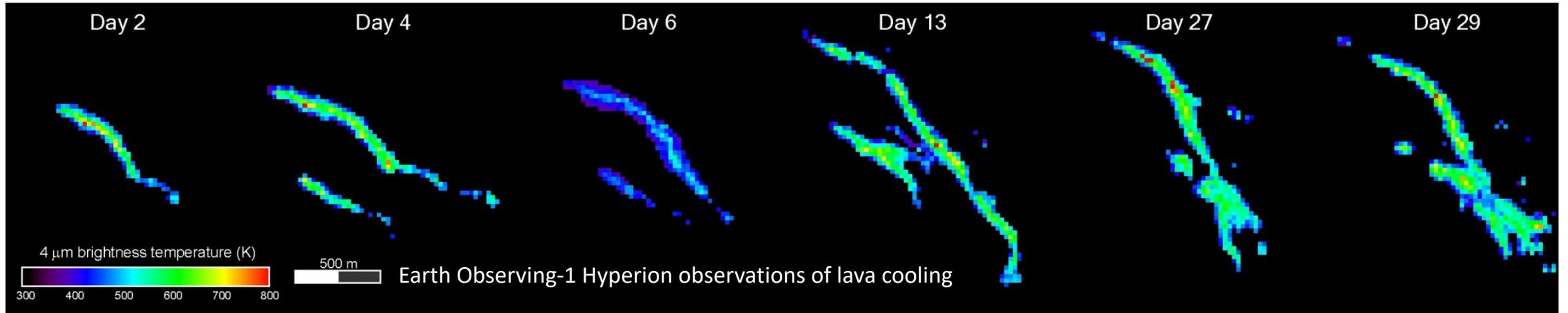
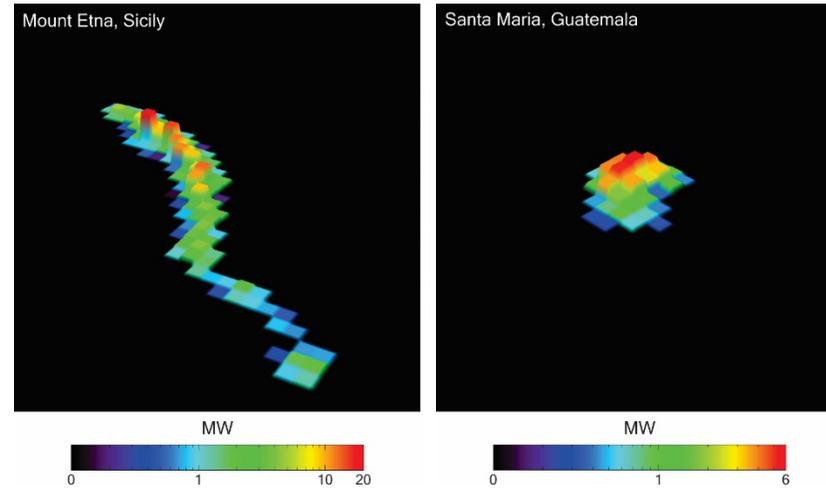
Volcanic ash clouds are a severe threat to global aviation. During an eruption, where is the 2 mg/m^3 "safe" ash concentration threshold exceeded?



WHAT ABOUT LAVA FLOWS?

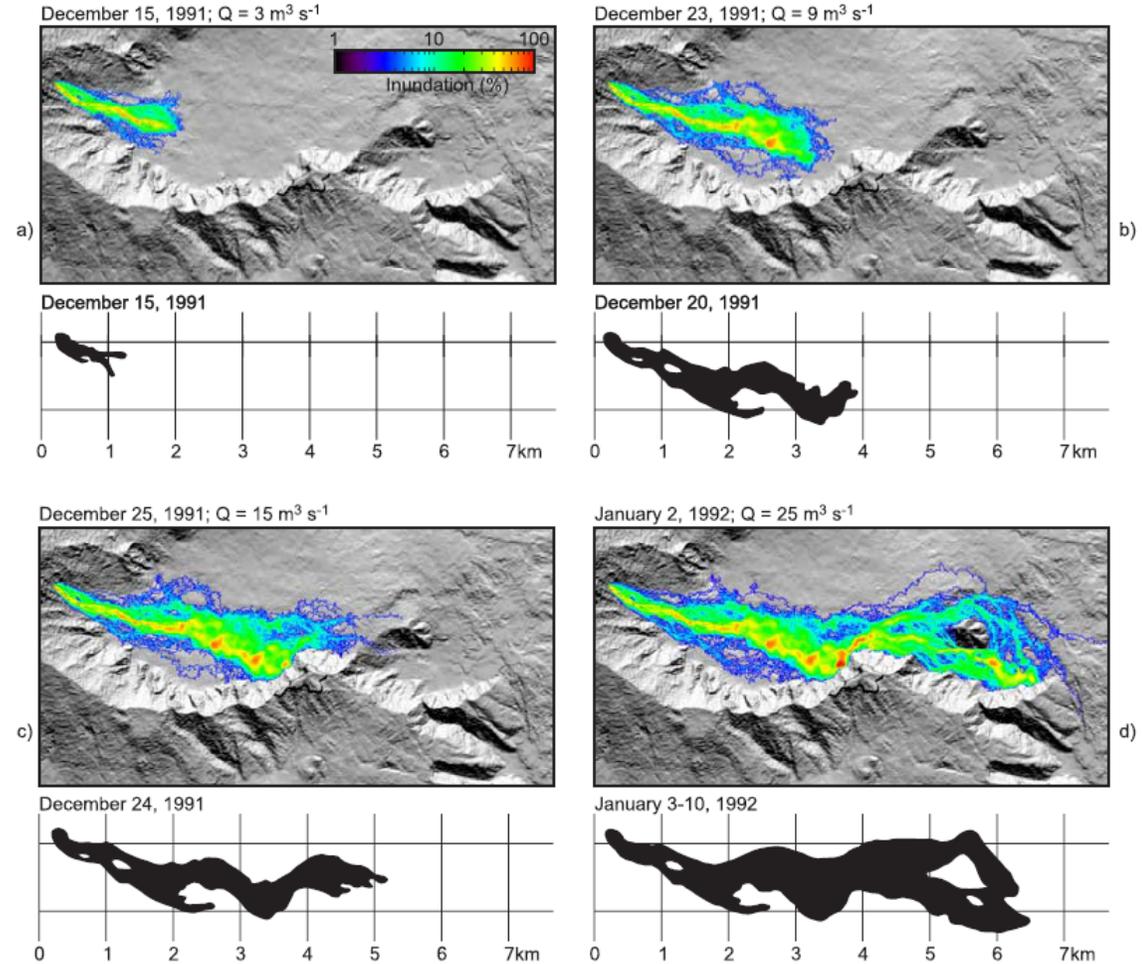
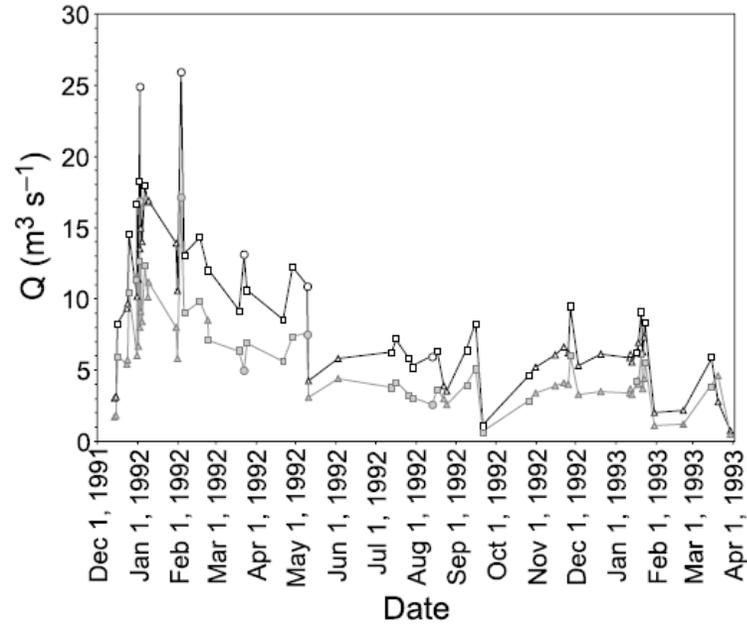


- ECOSTRESS will saturate over most active lava flow surfaces (perhaps not cooler domes)



- ECOSTRESS will be able to accurately quantify how the area of active lava changes during an eruption, which is proportional to the lava effusion rate

ECOSTRESS CAN MAP HOW THE AREA OF ACTIVE LAVA CHANGES DURING AN EFFUSIVE ERUPTION, A KEY INPUT TO LAVA FLOW SIMULATIONS



ECOSTRESS WILL MAKE MEASUREMENTS RELEVANT TO STUDYING A WIDE RANGE OF VOLCANIC PROCESSES AT RESOLUTIONS PREVIOUSLY UNATTAINABLE

