

GROUND-BASED IMAGING OF VOLCANIC PLUMES FOR HYSPIRI CALIBRATION AND FIELD VALIDATION

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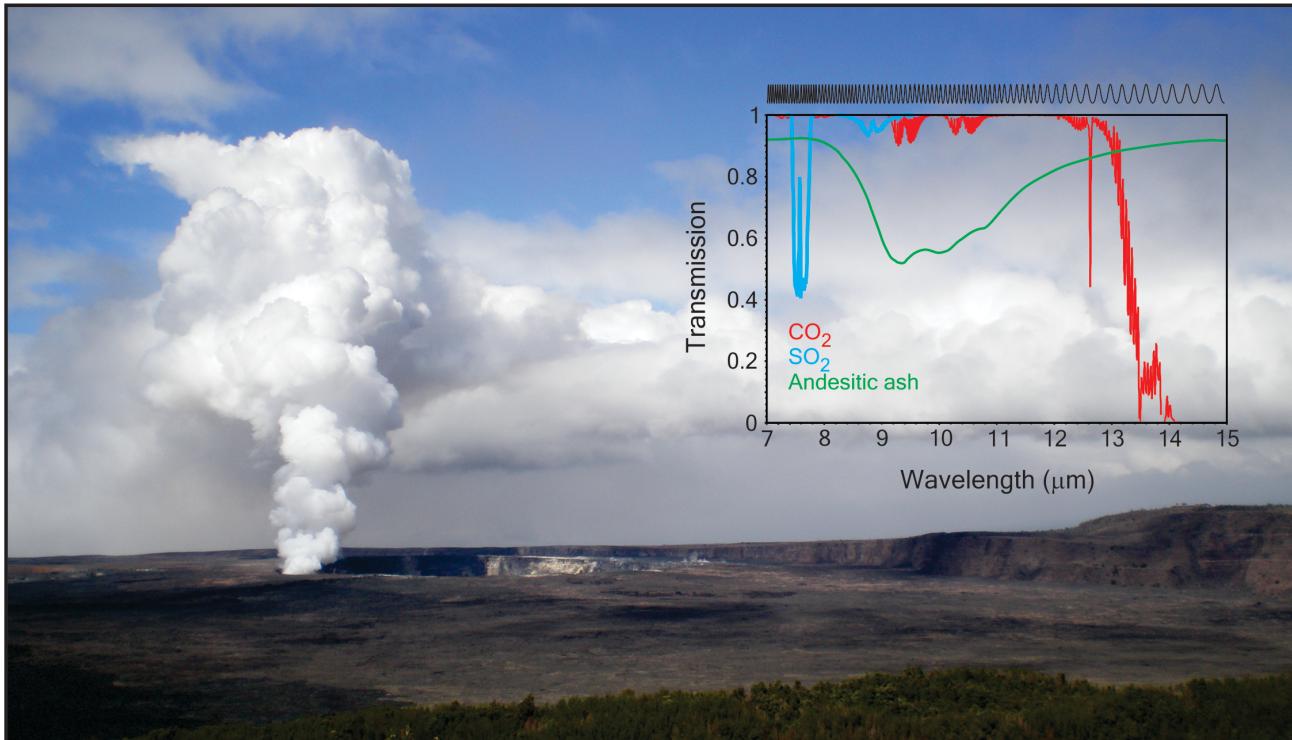
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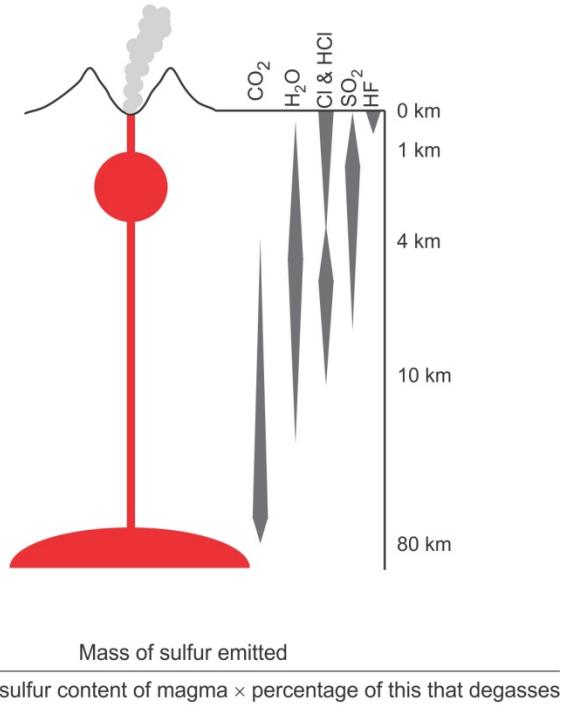
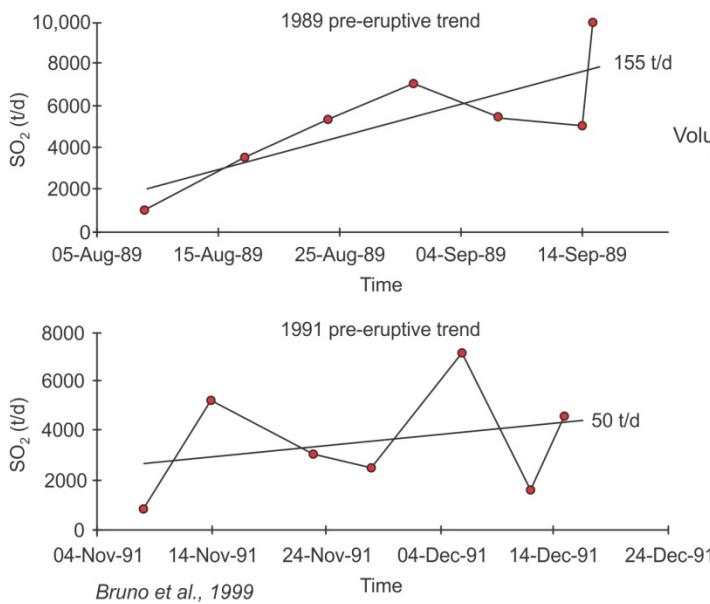
OVERVIEW

- Volcanoes emit gases, and changes in the amount and composition of these emissions provides important clues regarding volcanic processes and hazards
- Volcanoes emit ash during explosive eruptions which are hazardous to aircraft (and inconvenient to passengers)
- HyspIRI will allow for quantification of volcanic gas and ash emissions from orbit
 - But we will need to calibrate and validate HyspIRI measurements in the field



VOLCANIC EMISSIONS INTO THE ATMOSPHERE

Volcanic gases



HyspIRI measurements of volcanic sulfur dioxide will allow us to constrain:

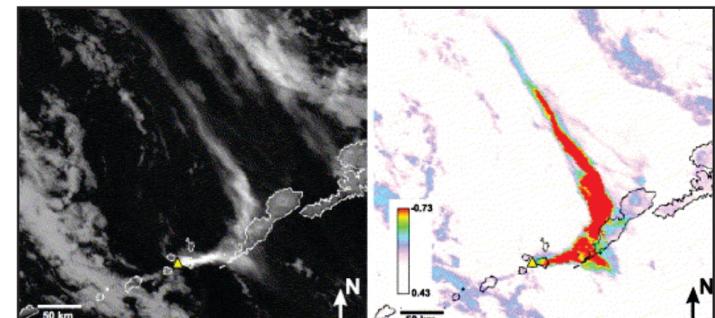
- a) Pre-eruption increases in gas emissions
- b) The volumes of shallow magma bodies

VOLCANIC EMISSIONS INTO THE ATMOSPHERE

Volcanic ash

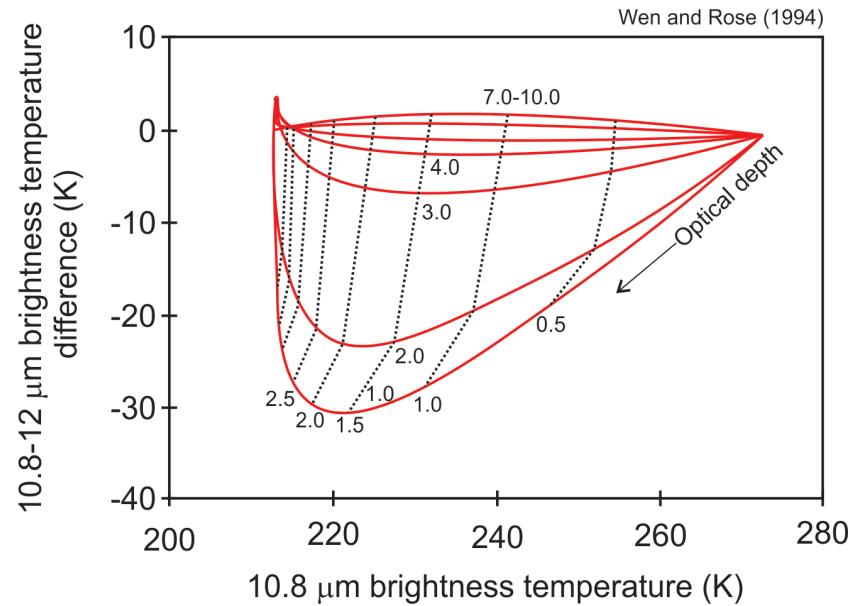


Dean et al. (2004)



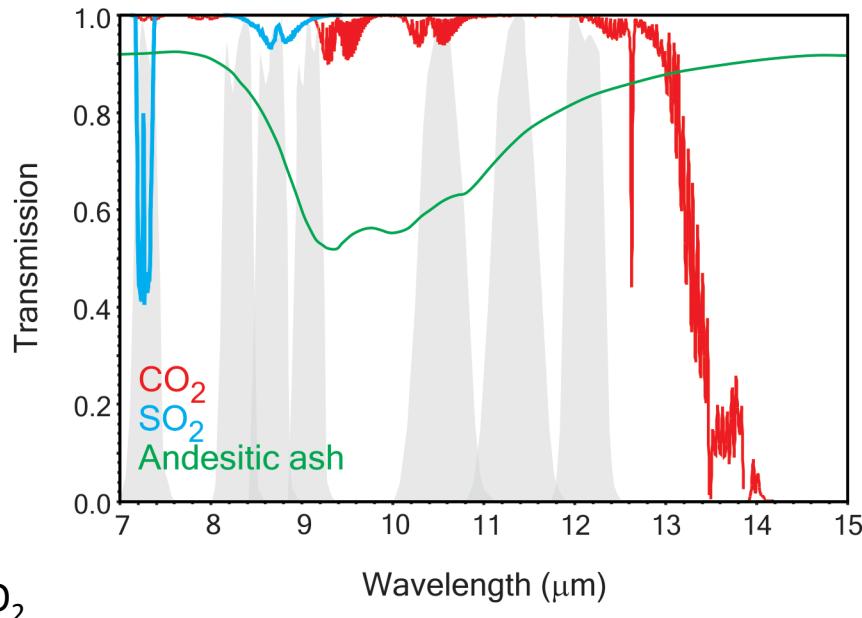
MODIS band 31

MODIS band 31-32



HyspIRI will be able to detect ash; will it be able to measure down to 4 mg/m^3 ?

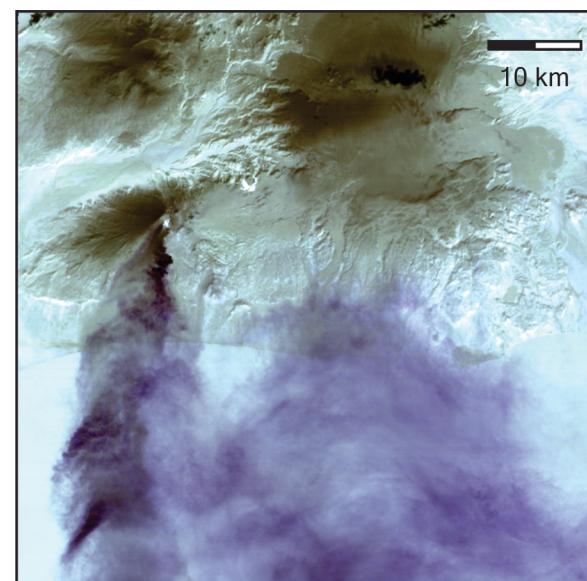
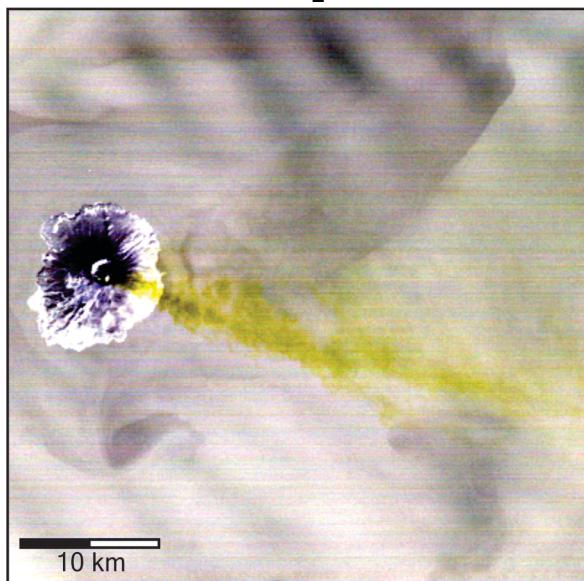
HYSPIRI WILL BE SENSITIVE TO ASH AND SULFUR DIOXIDE



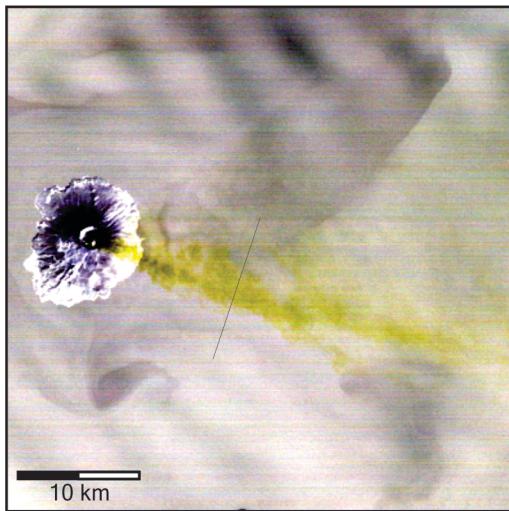
SO_2

Wavelength (μm)

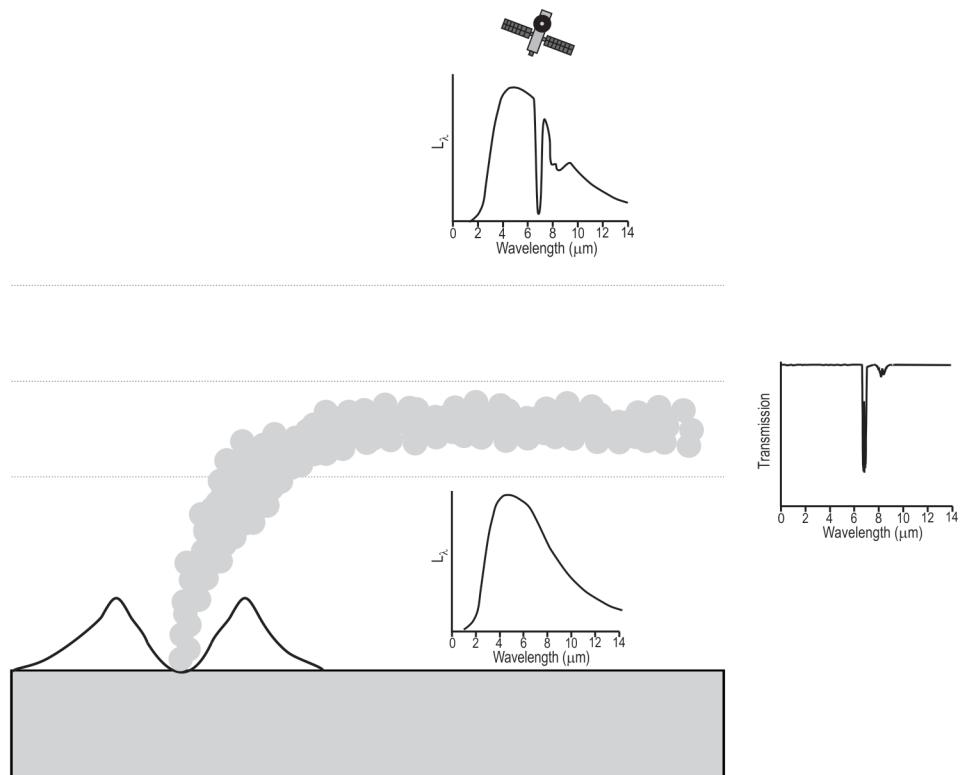
Ash



BUILDING TRUST IN THE WIDER VOLCANOLOGICAL COMMUNITY



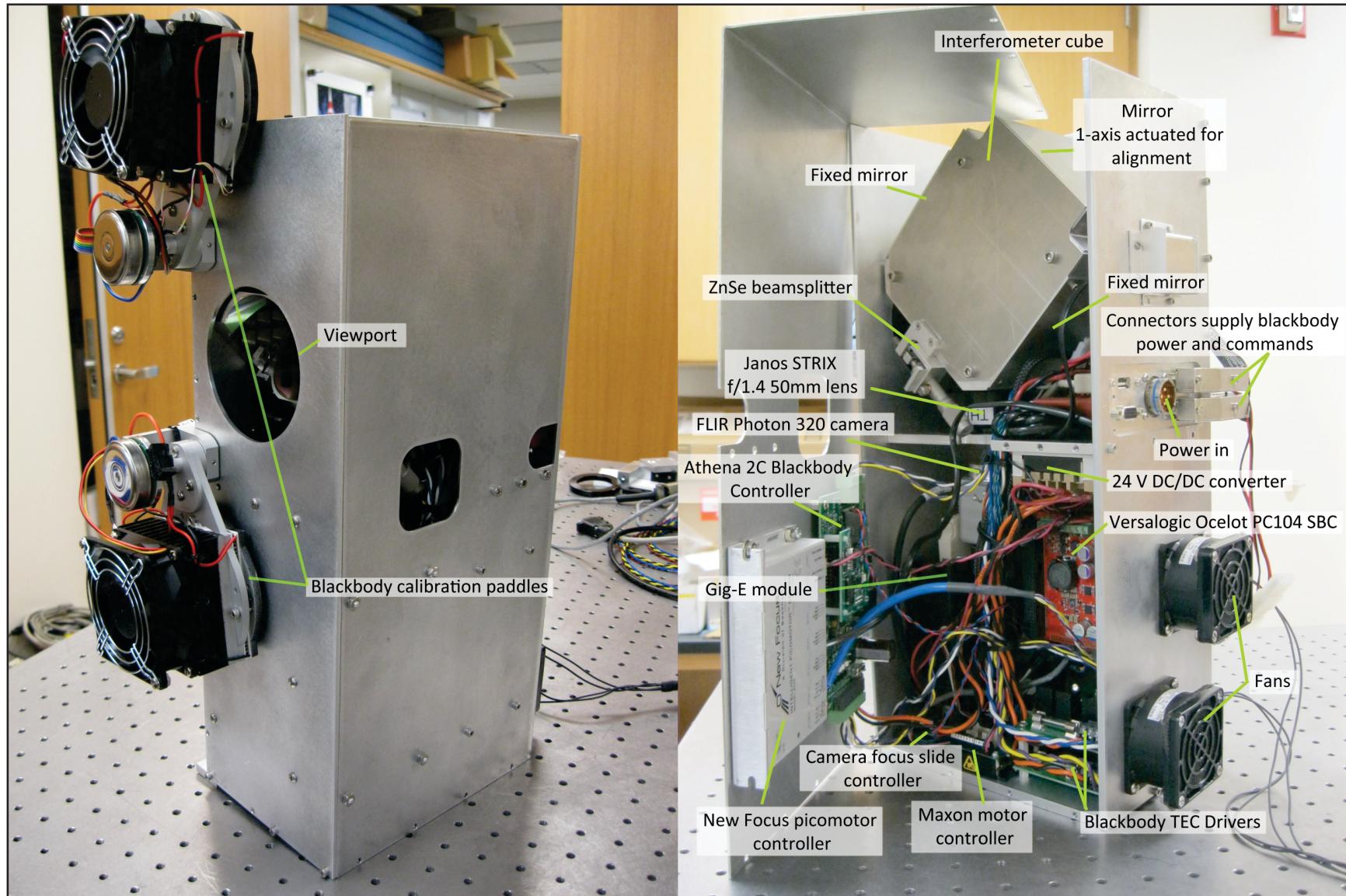
$$\text{ML}^{-2} - \text{ML}^{-1} - \text{MT}^{-1}$$



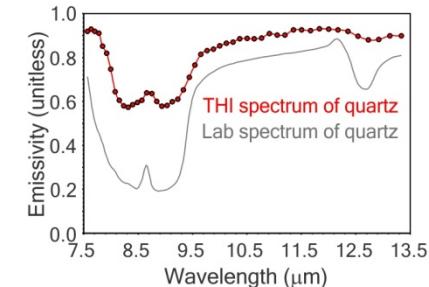
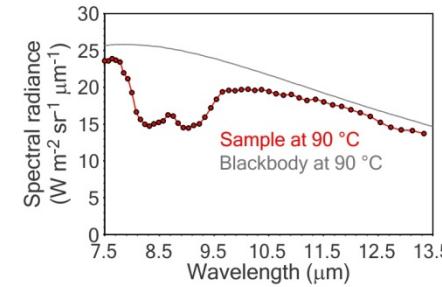
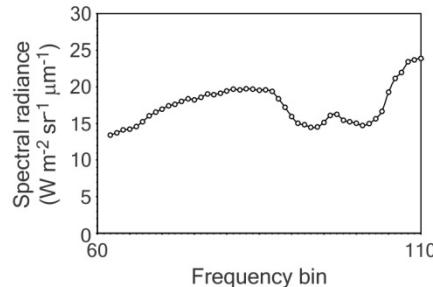
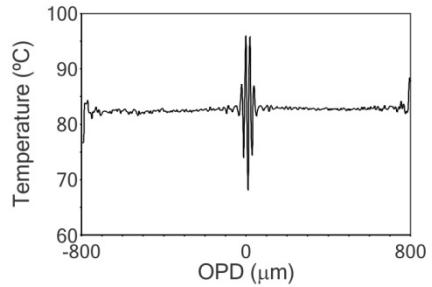
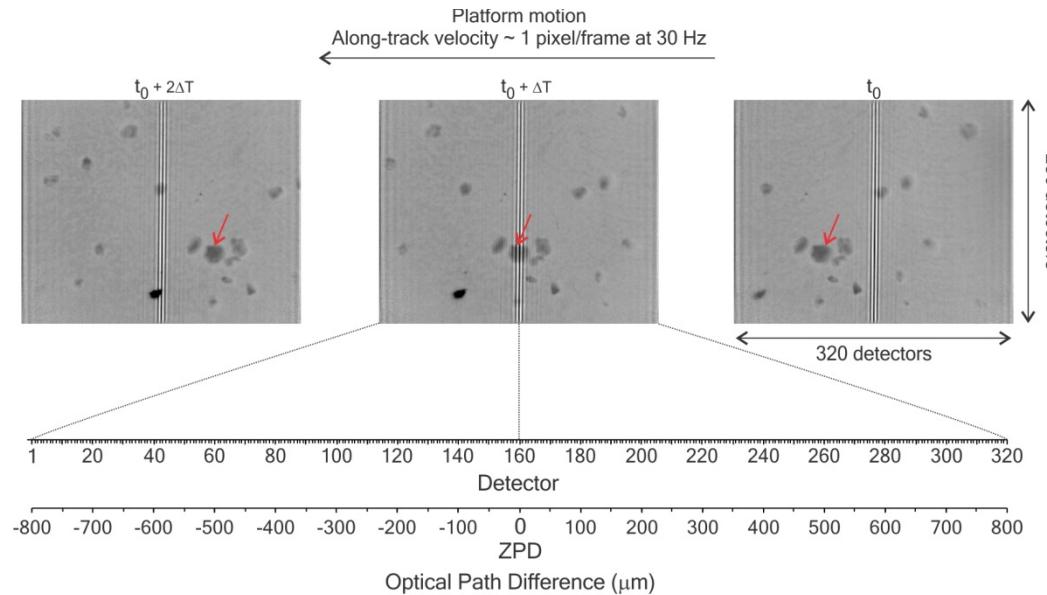
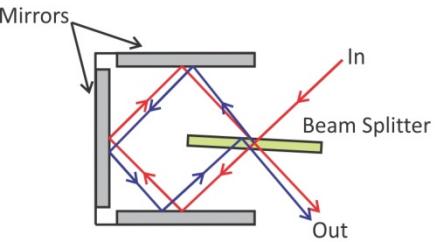
“...it is proving hard to get agreement between ground-based and satellite measurements.” (Sparks et al., 2012)

A concerted effort will be needed to field calibrate/validate the HyspIRI SO_2 measurements

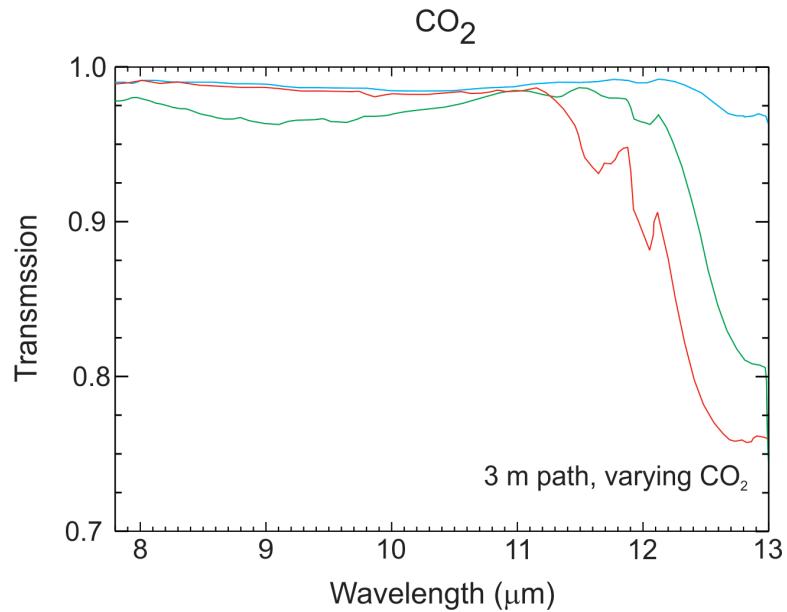
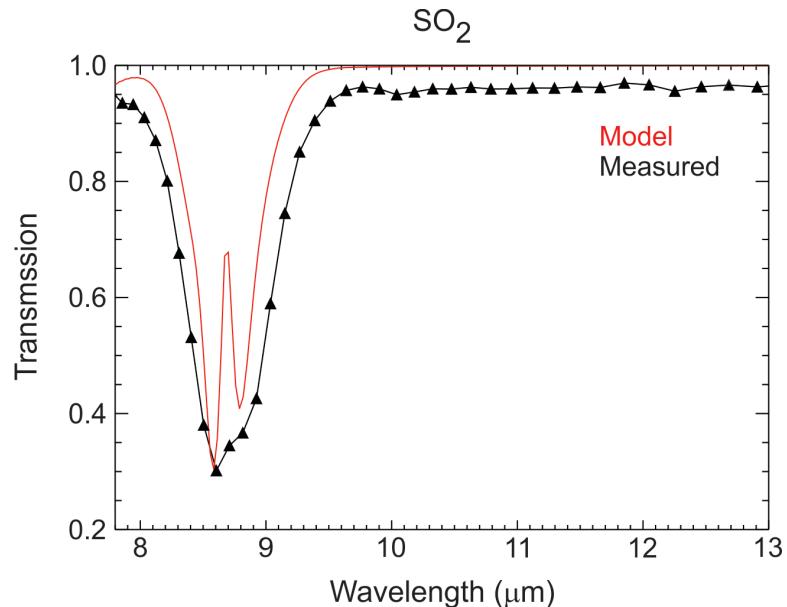
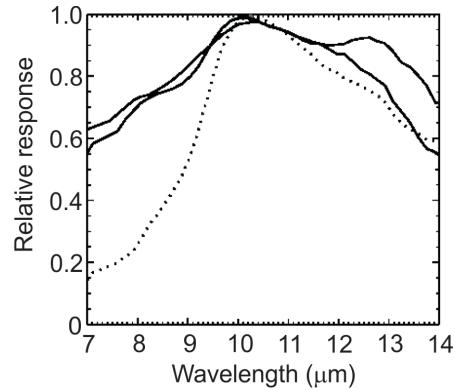
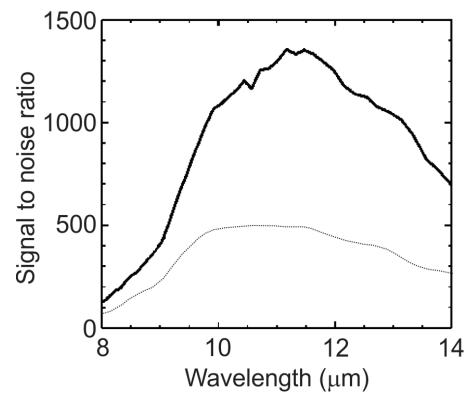
CAL-VAL OF HYSPIRI PLUME OBSERVATIONS, USING A FIELD PORTABLE IMAGING INTERFEROMETER



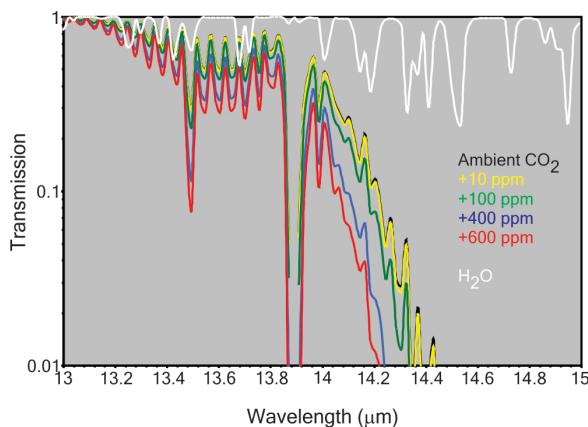
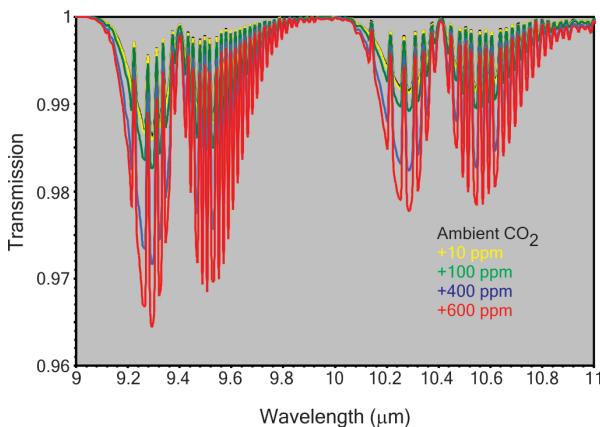
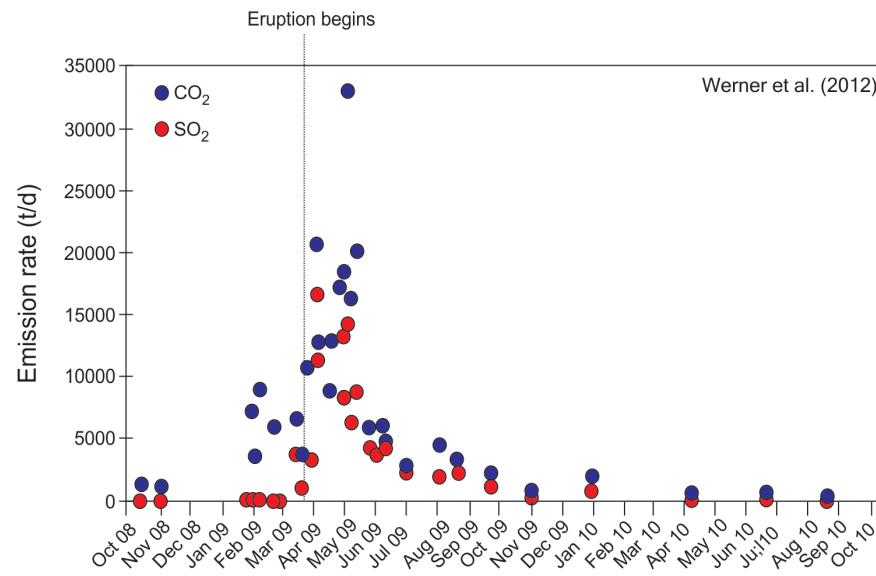
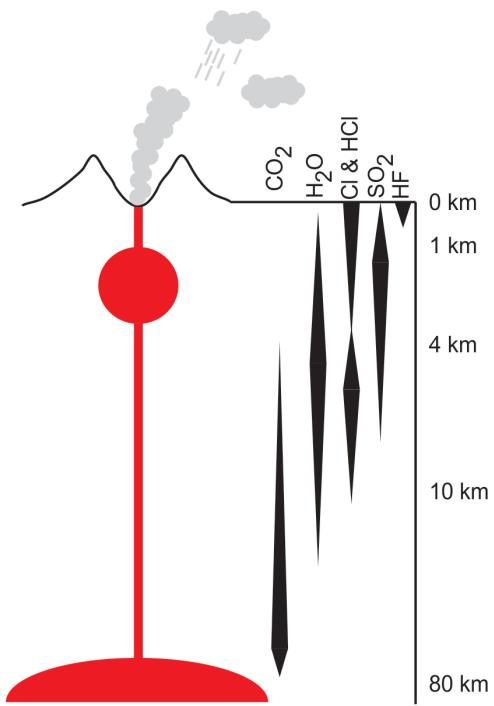
SPECTRAL IMAGING USING A STATIONARY INTERFEROMETER



INITIAL LAB RESULTS: SO₂ AND CO₂

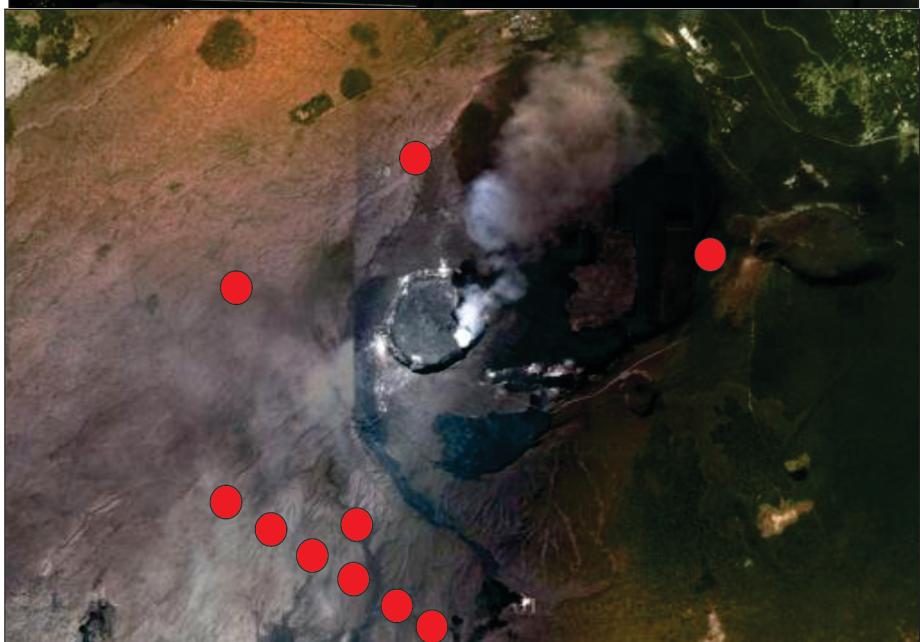


A NOTE ON THE IMPORTANCE OF VOLCANIC CO₂



CO₂ exsolves at greater depth and is relatively inert to scrubbing in the shallow hydrothermal system and atmosphere

PLUME OBSERVATIONS IN SUPPORT OF HYSPIRI SCIENCE FROM THE GROUND OR THE AIR: KILAUEA IS THE IDEAL CAL-VAL SITE



SUMMARY

- HyspIRI will provide measurements of volcanic SO₂ (and ash)
- The HyspIRI community needs to convince the non-remote-sensing volcanology community that the measurements HyspIRI provides are equivalent to (and compatible with) those they currently use and trust
 - This will require a robust field calibration and validation program

