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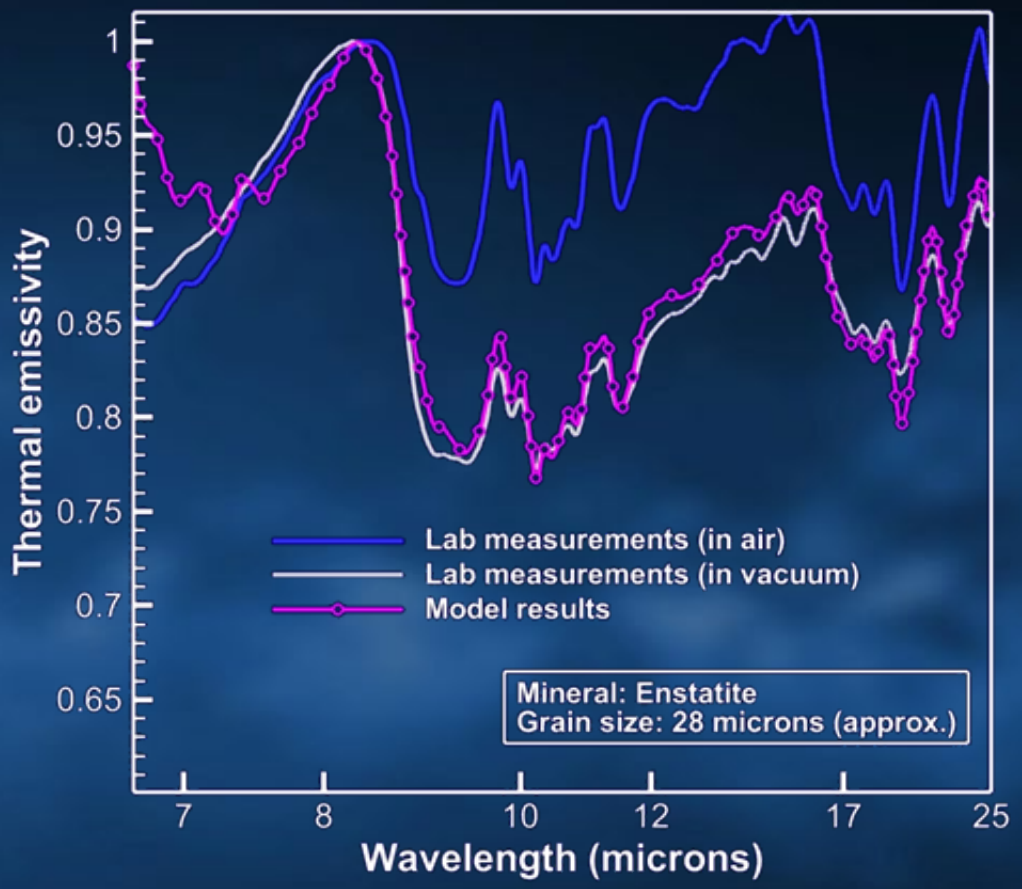
Deciphering Thermal Infrared Emission from the Moon



Lab measurements of thermal emission from an enstatite powder in air and in vacuum, compared to a model prediction. The model assumed a temperature change of 100 Kelvins within the upper 0.36 millimeters of the powder.

Physics-based modeling shows that thermal infrared emission from a rock powder in a lunar-like environment can be explained by dramatic changes in temperature within depths of less than a millimeter.

- The thermal infrared emission spectrum of a fine-grained powder often changes when it is measured in a lunar-like vacuum. This study used a physics-based computer model to explore why this happens.
- Comparing model predictions to lab measurements of rock powders in both air and in vacuum shows that these measurements can be explained if the uppermost grains of rock are much colder than those that are just a little deeper.
- Understanding the physics of thermal infrared emission is important when analyzing observations of the Moon, Mercury, and other airless solar system worlds. Scientists often use thermal infrared observations to determine what planetary surfaces are made of and how dusty they are.

Prem, Greenhagen, Donaldson Hanna, Shirley, and Glotch (2022), *PSJ*