CHARACTERIZATION OF A MOUNTING TRIPOD FOR THE MARS INSIGHT SEISMOMETER PAYLOAD. J. Taylor[1] , M.C. Sorgenfrei[2], and N. Teanby[3], [1]PhD Candidate, Department of Earth Sciences, University of Bristol, UK, jennifer.taylor@bristol.ac.uk, [2]Research Engineer, Intelligent Systems Division, NASA Ames Research Center, Moffett Field, CA, 94035, matthew.c.sorgenfrei@nasa.gov, [3]Professor, Department of Earth Sciences, University of Bristol, UK.

Abstract: In 2016 NASA will launch the Interior Exploration using Seismic Investigations, Geodesy, and Heat Transport (InSight) mission to Mars. This lander will be tasked with studying the deep interior of Mars, not only to contribute to our knowledge of that planet but also to help elucidate the processes that helped shape the rocky planets of the inner solar system. To accomplish these goals, InSight will place an instrument package called the Seismic Experiment for Interior Structure (SEIS) on the Martian surface. In order to protect this instrument when deployed, SEIS will be mounted on a tripod-type frame that will provide clearance from small rocks on the surface. Prior to launch, it will be important to carefully quantify the dynamic response of the tripod frame to better understand the seismometer-to-ground coupling that will be measured by SEIS.

In this paper we will present simulation and experimental results for a number of free- and forced-vibration tests that are undertaken on a variety of candidate tripod designs. The model tripod is comprised of an aluminum platform and aluminum legs of varying sizes. The same tripod platform will be used throughout the experiment; however the mass of this platform will be varied along with a number of parameters associated with the tripod legs. The input-output relationship of the experimental tripod platform is deduced from two seismometers similar in performance to those that will be used in the SEIS payload. One seismometer is buried in a Mars-analog regolith below the test appparatus, and one is mounted on top of it.

The vibrational response collected at the input seismometer in the regolith is used as an input to a numerical simulation developed in MATLAB. This simulation approximates the SEIS tripod as a mass-spring-damper system, taking into account the mechanical properties of the aluminum used for the tripod. The output-response of the simulated tripod is compared to that of the experimental tripod, and key parameters of the simulation are tuned accordingly, thereby allowing for possible use of this simulation during SEIS operations on Mars.