GALILEO'S NEAR INFRARED MAPPING SPECTROMETER (NIMS) SCIENCE AT IO: OBJECTIVES, PLANS, AND PREDICTIONS W. Smythe, R. Lopes-Gautier, A. Davies, R. Carlson (Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109), L. Soderblom (U.S. Geological Survey Branch of Astrogeology, Flagstaff, Arizona) and the Galileo NIMS Team.

One of the primary objectives of the Galileo mission is to investigate the nature of Io's dynamic volcanism. The Near Infrared Mapping Spectrometer (NIMS) is a remote sensing instrument aboard Galileo which combines imaging and spectral capabilities and will be used to map the composition and temperature of Io's surface and plumes. NIMS has the unique capability to image and obtain spectral data simultaneously and is the first instrument of its kind to be flown in a planetary mission. The spectral range of NIMS is from 0.7 to 5.2 microns, which spans two regions: surface reflected light and emitted thermal radiation. NIMS will be able to investigate both the surface mineralogy and the temperature of Io's surface features.

The loss of all remote sensing Io observations during Jupiter Orbit Insertion, the only close fly-by of Io planned for the mission, plus new constraints on using the spacecraft's tape recorder during the orbital tour have made it necessary to revisit our Io science plans. In this paper we present our revised observing plans for Galileo's two-year orbital tour and discuss some expected results.

Our major observing objectives can be summarized as: (i) mapping the composition of the surface units at scales of 100 to 200 km; (ii) measuring the temperatures of hot spots and other active volcanic areas; (iii) mapping shifts in surface composition and temperature with time; (iv) identifying major and minor spectral species; and (v) measuring cooling of hot spots during eclipses. Our major observation types are global or part-global maps which will enable NIMS to monitor changes in surface composition and temperature with time. Observations of both the dayside and nightside will be made, most acquiring 204 wavelengths and covering a wide range of longitudes. Additional observing opportunities during the tour will be provided by eclipses of Io by Jupiter, which will allow NIMS to investigate the cooling of hot spots (down to about 180 K).

Our expected results include the detection of temporal shifts in the distribution of surface deposits of SO_2, using 4.1 micron band global maps. NIMS will also be able to detect minor species, if they are present, such as H_2S, H_2O, CO_2, sulfides, sulfates, and the higher oxides of sulfur. In terms of volcanic activity, we estimate that there is a 60% probability of NIMS seeing a giant outburst. NIMS will also be able to detect fainter events and construct thermal maps of the surface, down to the 180 K detectability limit.