**THERMAL INFRARED (7-14 μm) SPECTRAL IMAGING OF MARS:** C.M. Rowland (Stetson University and Wyoming Infrared Observatory), T.L. Roush (San Francisco State University and NASA Ames Research Center) G.C. Sloan and J.F. Bell, III (NASA Ames Research Center)

Thermal infrared spectral images of Mars, covering the 7-14 μm wavelength region, were obtained at the Wyoming Infrared Observatory (WIRO) during March 1993 using the Geophysics Laboratory Array Detector Spectrometer (GLADYS). Comparison of these spectra to previous observations [1] indicate the presence of spectral features consistent with martian atmospheric aerosols and dust.

There are ample observational and theoretical reasons to believe that Mars once had a denser atmosphere and liquid water was active on the surface [2-7]. If the atmosphere was composed chiefly of $CO_2$, then weathering of silicate rocks in the presence of water could result in the precipitation of carbonates and formation of hydrates. In addition, $SO_2$ evolved from Martian volcanoes could also undergo a series of chemical reactions to form sulfates [8]. In the absence of crustal recycling, both of these salts provide relatively permanent reservoirs for the removal and storage of these atmospheric gases [9]. If carbonates did form during some early epoch on Mars and have survived until the present, then these deposits would reflect where water was once abundant, such as in ancient rivers, lakes, and/or oceans. Such deposits are likely locations for the evolution of life during Mars' earliest history, and would certainly represent prime targets for future missions to Mars.

In situ analyses performed by the Viking Landers provided direct determinations of the abundances of elements having atomic numbers 12 or greater [10]. Some of the Viking Lander exobiology experiments detected $CO_2$ gas evolved from the martian soils [11]. However, the instruments carried by Viking were incapable of directly determining mineralogy of the martian surface constituents. As a result, the interpretation of the presence of carbonates and sulfates on Mars [10] remains an inference based on the elemental data.

Because the vibrational motions of the atoms comprising these salts give rise to strong absorption of infrared radiation, high spatial resolution infrared spectra of Mars provide a sensitive method of identifying these salts on the surface of Mars. Previous observations from the Kuiper Airborne Observatory (KAO) detected several features which were interpreted as being due to hydrates, carbonates, sulfates, and silicates [1] .

Knowledge concerning the identity and abundance of these volatile-bearing materials can provide valuable insight into the formation and evolution of the Martian atmosphere. The global distribution of such materials can provide insight into both the spatial and temporal occurrence of water on the Martian surface. Maps of the spatial distribution of the 10 μm silicate opacity can be used to address current sources and sinks of martian atmospheric dust. Additionally, knowledge regarding the relative abundance of hydrates associated with surface regions would be invaluable for resource assessment for future missions to Mars.

To this end, long-slit spectroscopic images of Mars, covering the 7-14 $\mu$m region, were obtained on 2 March 1993 at WIRO. The spectrometer uses a prism to disperse infrared radiation onto a $58 \times 62$ Si:Ga detector array. The slit is centered North-South on the sky. Each detector has a rectangular footprint on Mars with E-W dimensions of 2 arc seconds and N-S dimensions of 0.9 arc seconds. Deconvolution of the point spread function, using a maximum entropy reconstruction algorithm, yields spatial resolution of the images of $\leq 1$ arc second. Mars occupies 9 arc seconds in the N-S direction and two observations were obtained at a temporal spacing of about 2 hours. The slit was centered at longitudes of about 210 and 240 degrees. As a result the data sample the Elysium Planitia volcanic regions, the low albedo region of Cerberus, central and eastern Hesperia, and the high albedo region of Utopia Planitia. The data exhibit thermal emission variability that appears to be correlated with the visual albedo features present within the field of view.

**Acknowledgements:** We wish to thank Ron Canterna and the support of the summer undergraduate research assistantship program at the University of Wyoming. GLADYS is maintained by the U.S. Air Force.

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