REMOTE SENSING STUDIES OF GEOLOGIC UNITS IN THE EASTERN NECTARIS REGION OF THE MOON.

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INTRODUCTION

The Nectaris basin is a major multiringed impact structure located on the eastern portion of the lunar nearside, and is centered at ~34˚ E, 16˚ S. The eastern Nectaris region contains a number of interesting geologic units of uncertain composition and origin. These include dark mantle deposits, dark halo craters and possible calderas. In order to better understand these features, we have been conducting geologic and remote sensing studies of this region [e.g., 1, 2, 3]. In this study, we have utilized new Galileo and Clementine multispectral images as well as other remote sensing data in an effort to: 1.) determine the origin and composition of the dark mantle deposits in the region, 2.) investigate the processes responsible for the emplacement of the dark mantle material, 3.) explore the relationships among the dark mantling materials and the mare basalt deposits in Nectaris, and 4.) determine the composition and origin of highlands units in the eastern Nectaris region.

METHOD

The primary data used in this study were Clementine UVVIS images. Five-color image cubes for the areas of interest were processed and mosaicked. This image data was used to generate a variety of products including 1.) a TiO_2 map [5], 2.) an FeO map [6], 3.) a UV/VIS ratio image, and 4.) a 0.95/0.75 µm ratio image. In addition, near-IR reflectance spectra (~120 channels between 0.6 and 2.5 µm) were used to provide detailed compositional information [1, 2, 3]. The 3.8-cm radar images presented by Zisk *et al.* [4] provided information concerning the surface roughness of the units of interest.

RESULTS and DISCUSSION

Both regional dark mantle deposits (RDMD) and localized dark mantle deposits (LDMD) have been identified in the eastern Nectaris region [e.g., 1, 2, 7]. Characteristically, dark mantle deposits are low albedo units that appear to cover and subdue features of the underlying terrain. Individual LDMD are typically less than 100 km^2 while coalesced LDMD are, in general, less than 1000 km^2 in area. The more extensive regional dark mantle deposits cover many thousands of square kilometers. LDMD are usually associated with small (<3 km) endogenic dark halo craters (DHC) which may be distinguished from impact craters using a set of criteria established by Head and Wilson [8]. An eruption mechanism similar to terrestrial vulcanian eruptions has been suggested for these deposits [1, 2, 8]. The localized pyroclastic deposits investigated in this analysis included the Bohnenberger DHC, the Gaudibert B volcanic complex (Gaudibert B floor and LDMD southeast of Gaudibert B), the Gaudibert crater LDMD, and a deposit on part of the Daguerre rim.

In general, the LDMD in the eastern Nectaris region have similar spectral characteristics. These LDMD exhibit relatively low values in the Clementine 0.415/0.75 µm ratio image. Near-IR spectra for various portions of the Gaudibert B LDMD fall within Group 1 as defined by Hawke *et al.* [2]. Spectra for these deposits have "1 µm" absorption band centers near 0.93-0.95 µm and the depths are ~4-5%. These bands are asymmetrical and have been described as "checkmark-like," with a straight, steep short-wavelength edge followed by a shallower straight long-wavelength edge [1, 2]. The Group 1 band parameters indicate the presence of feldspar-bearing mafic assemblages dominated by low-Ca pyroxene. Although major amounts of highlands material are present in Group 1 LDMD, the relatively broad, asymmetric "1 µm" bands indicate the presence of one or more additional components such as volcanic glass or olivine. Multispectral and albedo data also indicate the presence of and exotic, non-highlands component in these deposits.

A pyroclastic deposit of regional extent has been identified southeast of Mare Nectaris [1, 7]. This RDMD exhibits a low albedo as well as unusual values in multispectral images and color-difference photographs [1]. In addition, the RDMD has relatively low values in the depolarized 3.8-cm radar backscatter images. Two near-IR spectra were obtained for different portions of this RDMD. They show a relatively symmetric "1 μm" absorption feature centered longward of 0.95 μm and apparently contain a major amount of basaltic material. Much of this deposit is relatively thin and portions appear to have been contaminated with highlands material by vertical mixing.

Spectral studies were conducted for the Bohnenberger crater area because some previous workers had suggested that this unusual smooth-rimmed crater might be volcanic in origin [7]. An analysis of UV-VIS and near-IR spectra as well as Clementine multispectral imagery clearly indicates that Bohnenberger crater exposes highlands materi ial. Hence, it seems unlikely that Bohnenberger was formed by volcanic processes.

The highlands in the eastern Nectaris region are dominated by noritic anorthosite and anorthositic norite [3]. However, near-IR spectra obtained for Bohnenberger F crater indicate that pure anorthosite is exposed in this feature. The Clementine multispectral images and FeO map confirm this interpretation.

REFERENCES

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