LUNAR SUBSURFACE STRUCTURE IN THE SULPICIUS GALLUS REGION*

W. E. Brown, Jr., R. S. Saunders and M. Kobrick, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California 91103 and
G. G. Schaber, U.S. G.S. Astrogeology Laboratory, Flagstaff, Arizona 86001

Radar reflections from lunar subsurface features as detected by the 15 MHz radar on Apollo 17 have recently been processed. A preliminary analysis of the region near Sulpicius Gallus 5° to 15°E longitude and about 19° to 20°W latitude shows several distinct layers in the mare and two or three major layers which underlie both the mare and Montes Haemus.

The actual depth of the subsurface features can only be determined when the actual value of dielectric constant is known. By using an estimate (ε=9) based upon measurements made on lunar soil and rock samples returned, the inferred depths of the major layers are 1.2, 2.7 and 4.7 Km below the surface of Serenitatis. The 1.2 Km layer depth varies significantly in the mare and under the Montes Haemus. One interpretation is that this boundary represents the surface just after the Serenitatis event (formation).

The wrinkle ridge near 13°E, 19.5°N appears to be caused by a compressional feature in the 1.2 Km layer. This feature does not appear in the 2.7 and 4.7 Km layers. The apparent compressional features in the 1.2 Km layer under the wrinkle ridge and under the Montes Haemus are similar in some respects to the compressional features in Orientale. The lineaments in the Montes Haemus which are radial from Imbrium appear to extend down to the 1.2 Km layer. The depth of this layer is greater of course under the mountains.

The multiple layers in the mare region just west of Bessel E seem to show a sequence of basalt flows and regolith forming events. Twelve to twenty separate layers can be identified, depending primarily on the definition of layer, between the surface and the 1.2 Km major layer. The resolution of the sounding radar is about 70 meters in the material. The effective loss tangent of the lunar material appears to be quite low, perhaps as low as 0.001.

The preliminary model discribed above is a simplified first estimate. The actual subsurface appears to be quite complex. In addition, the radar response is modified by the surface. For example, the undulations in the surface of the mare tend to focus the radar waves into the surface in some areas

* This paper presents the results of one phase of the research carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract NAS 7-100 sponsored by the National Aeronautics and Space Administration.

and diffract the wave in other areas. Thus, the detection of layers proceeds on an interrupted basis rather than continuous. Correlation between the multiple layers in different locations indicates that these are indeed layers and must be continuous. This interrupted effect is not so apparent when the surface is an ejecta blanket (near Sulpicius Gallus) or when the surface is highland material.

The major layers, however, appear continuous along a path of 300 to 500 Km and are visible on adjacent orbits separated by 1 to 4 Km. This path length is not necessarily the limit of the layers, but at present happens to be the only data processed.