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UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
Washington, D.C. 20242

Technical Letter
NASA-63
November 1966

Dr. Peter C. Badgley
Chief, Natural Resources Program
Office of Space Science and Applications
Code SAR, NASA Headquarters
Washington, D.C. 20546

Dear Peter:

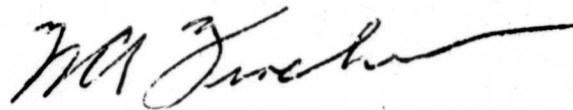
Transmitted herewith are 3 copies of:

TECHNICAL LETTER NASA-63
PRELIMINARY STUDIES OF SOIL PATTERNS OBSERVED IN
RADAR IMAGES, BISHOP AREA, CALIFORNIA*

by

Michael F. Sheridan**

Sincerely yours,



William A. Fischer
Research Coordinator
Earth Orbiter Program

*Work performed under NASA Contract No. R-09-020-015

**Department of Geology, Arizona State University, Tempe, Arizona

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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PRELIMINARY STUDIES OF SOIL PATTERNS OBSERVED IN
RADAR IMAGES, BISHOP AREA, CALIFORNIA*

by

Michael F. Sheridan**

These data are preliminary and should
not be quoted without permission

Prepared by the Geological Survey
for the National Aeronautics and
Space Administration (NASA)

*Work performed under NASA Contract No. R-09-020-015

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Geological Survey Libraries (Denver, Menlo, Washington, Flagstaff).

Preliminary studies of soil patterns observed in
radar images, Bishop Area, California

by

Micheal F. Sheridan

INTRODUCTION

Evaluation of radar imagery of the central Sierra Nevada was recently conducted by P.C. Bateman (1966). Bateman noted that in the Bishop area contrasting tonal patterns of soils ranged from very light gray to very dark gray in broad alluvial plains and outwash fans. He concluded, (p. 3) that "the topographically lower, finer grained alluvial deposits have a darker shade than the alluvial deposits in fans and raised terraces, presumable because of a higher near-surface water content." In order to verify this conclusion Bateman suggested that the author of this letter field check some of the localities in his Area 2, within the Mt. Tom and Bishop quadrangles, to determine the relative moisture content and grain size of soil samples in the light and dark areas of the imagery. The following brief report describes the methods and results of this preliminary investigation.

Investigation

Nine localities were visited and sampled south and west of the City of Bishop, California, (Fig. 1, Index Map). Of these, five localities (Sample Sites 2, 3, 4, 5 and 8) were in areas underlain by dark tones on the radar imagery and four (Sample Sites 1, 6, 7 and 9) were underlain by light tones (Fig. 2). Each site was located approximately to quarter section, section, township and range on standard topographic maps of the area. Qualitative evaluation of the soils was made at each site and shallow pits were dug to determine if soil moisture was present near the surface. A detailed list of the site locations and sample determinations are contained in Table 1.

CONCLUSIONS & RECOMMENDATIONS

Although only nine locations were examined, certain conclusions can be drawn. None of the samples showed any moisture at the surface or to a depth of about 6 inches. Therefore, moisture did not seem to be a factor in producing the dark imagery patterns. However, there is a very good correlation of grain size with darkness. The soils with predominately gravel-sized fragments display a light color pattern. Those with silt- and clay-sized particles display a dark pattern. Those with intermediate-sized grains show either light, dark, or intermediate patterns. There seemed to be a strong tendency for the dark areas to be irrigated and thus to have a much heavier cover of vegetation. Where the vegetation was heavy the imagery pattern would be darker than the grain size of soil had produced in areas with no vegetation or little vegetation. It should be emphasized that only a few samples were examined and the results are only qualitative, so that a more detailed study should be made to support these conclusions. It does appear that grain size is the dominant factor in determining the darkness of the color patterns in the Bishop area.

TABLE I

Soil Samples
Bishop Quadrangle, California

1. Collins Rd., SE1/4 NW1/4 sec 5, T8S, R33E : soil dry, alluvial fan deposit some boulders several feet in diam., pebbles 1/4-1/2 inch common, coarse to fine sand matrix, no moisture
2. SW1/4 NE1/4 sec 4, T8S R33E : Some irrigation in flats and swampy appearing areas. Soil dry everywhere tested, even in areas with dark green veg. Soil fine-grained sand, silt and clay. Mostly silt.
3. Road jct. NE corner sec 24, T7S, R33E : Soil dry, many pebbles 1/4-1/4 inch diam. Fine to medium sand matrix.
4. NW1/4 NW1/4 sec 18, T7S, R33E : Irrigated pasture, soil dry, land flat, thick grass growth, coarse sand matrix, pebbles up to 1/4 inch common, no moisture despite recent irrigation (day before ?)
5. NE1/4 NW1/4 sec 13, T7S R32E : very dry soil, irrigated pasture, fine sand with a few pebbles up to 1/4 inch, thick grass growth.
6. SE1/4SE1/4 sec 14, T7S, R32E : Soil dry, large and small boulders up to several feet in diameter, pebbles in coarse sand matrix, little vegetation.
7. SE1/4SE1/4 sec 4, T7S, R32E : Soil dry, coarse sand with cobbles up to 1 inch, matrix very coarse sand, little or no vegetation.
8. NE1/4 NE1/4 sec 10, T7S, R32E : Soil medium dry, some moisture, matrix silt size, larger boulders up to a foot common, organic soil layer present, thick grass cover, soil very dry except in field recently irrigated. Moisture dries in about one day.
9. NW1/4 sec 14, T7S, R32E : Boulders up to 3 ft, matrix very coarse sand with a little fine material, very dry, little to no vegetation

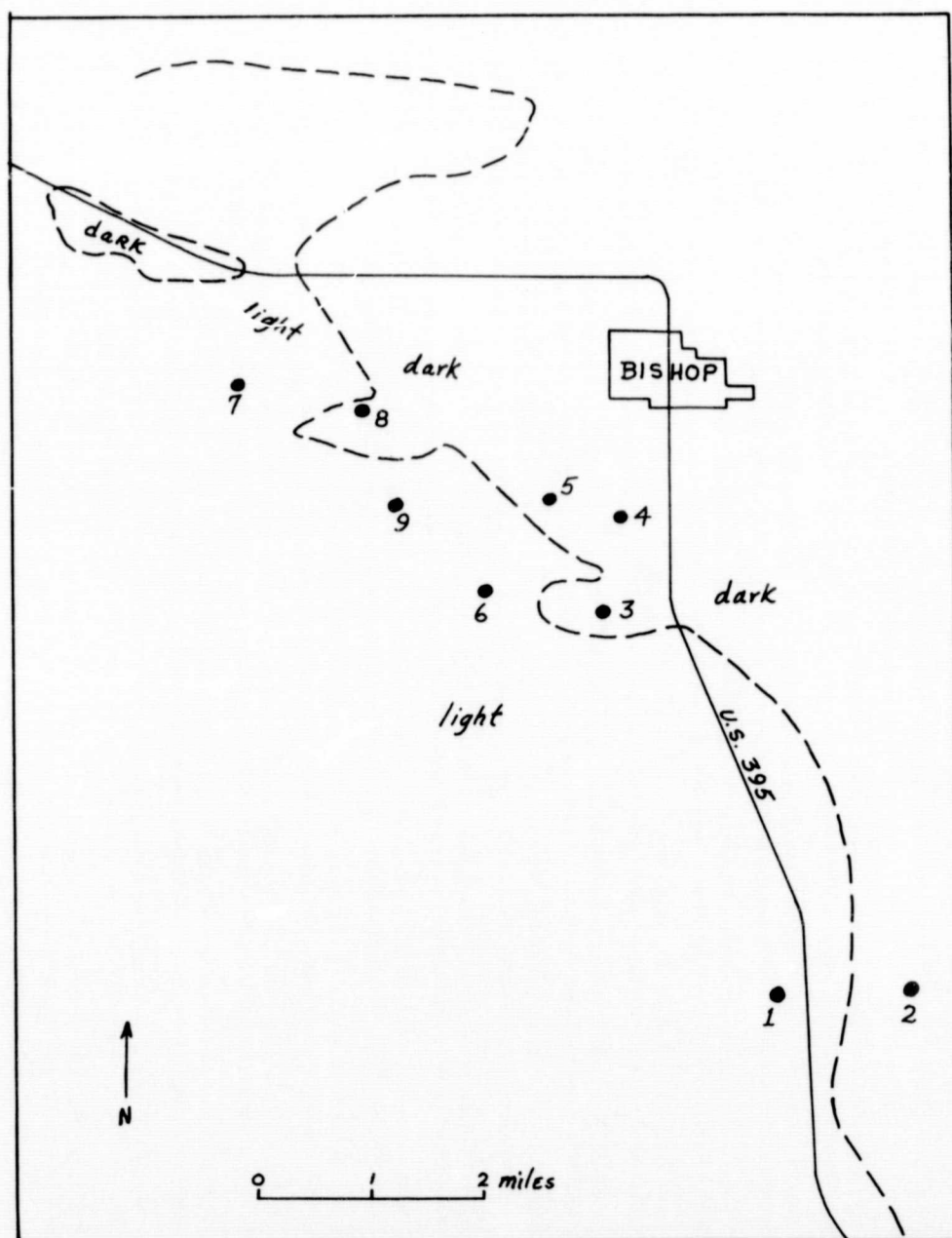


Figure 1. Index map showing location of samples, Bishop area, California.

g - Granitic rocks

j - Joints in granitic rocks

m - Moraines, crests shown
by dotted lines

f - Alluvial fans

al - Valley alluvium

 - Fault, ball shows downthrown
side



Figure 2. Radar image of Bishop area, California. Sample area is fan and alluvial plain in upper right corner.