2. EXPERIMENT S-5, SYNOPTIC TERRAIN PHOTOGRAPHY

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The Synoptic Terrain Photography Experiment (S-5) was successfully conducted during the Gemini V mission, the second of the Gemini flights on which it was carried. This report summarizes briefly the methods and results of the experiment. Interpretation of the many excellent pictures obtained is in progress, and a full report is not possible at this time; instead, representative pictures will be presented and described.

The purpose of the experiment was to obtain a large number of high-quality color photographs of selected land areas for geologic and geographic study. Southern Mexico, eastern Africa, and Australia were given high priority, but it was stressed that good pictures of any cloud-free land area would be useful. The same camera (Hasselblad 500 C) and film (Ektachrome MS) used on the Gemini III and IV missions were carried on the Gemini V flight.

The experiment can be considered highly successful. Despite fuel and power limitations, which prevented spacecraft orientation, approximately 170 usable pictures of land areas were taken; a large proportion of these are of excellent quality, and a few are even usable for stereoscopic study. The locations and times of all 70-mm Hasselblad pictures are listed in reference 1.

Figure 2-1, taken over Iran, shows an area approximately 90 miles on a side of the Zagros Mountains, about 50 miles east of the city of Shiraz. The two large lakes, partly surrounded by salt flats, are the Daryacheh-ye Tashk (to the north) and the Daryacheh-ye Bakhtegan. The northwest-trending ranges are mostly Mesozoic and Tertiary sedimentary rocks folded into a series of anticlines and synclines. The dark hills at bottom center are composed of volcanic rock.

This picture appears to be potentially useful for refining existing maps of the area. It shows considerably more geologic and topographic detail than the Geological Map of Iran (ref. 2) whose scale (1:2 500 000) is close to that of the Gemini photograph. The picture would be especially useful in mapping Quaternary alluvium and evaporite deposits and in delineating major faults.

Figures 2-2 and 2-3, taken over southwestern Iran, show an area of great geologic interest. The mountain ranges are Cenozoic sedimentary rocks folded into anticlines and synclines of remarkable complexity. Of

particular interest is the fault scarp at the left. This feature reflects a recent and probably still active fault of the "scissors" type in which movement has opposite directions at opposite ends. Toward the bottom of the picture, the right-hand fault block has moved up; toward the top, the left-hand side has moved up. The recency of the fault is shown by the virtually negligible amount of dissection of the scarp. The linear features to the left of the fault are probably truncated strata rather than sand dunes, since they can be seen to continue under the alluvium.

Figure 2-4 shows the mouth of the Yangtze River and the East China Sea, looking toward the east. This picture is typical of many taken during the Gemini V mission which show submarine topography and turbidity currents. Such photographs are believed to be of great potential value for hydrologic and oceanographic studies (ref. 3), since they permit a simultaneous view of large ocean areas, with the added advantage of color.

Figure 2-5, taken over New Mexico, is one of the most northerly pictures of the United States obtained on any of the Mercury or Gemini flights. It shows a wide variety of rock types and structures. The white patch at top center (marred by a flaw) is the gypsum sand of the White Sands National Monument. West of the Monument are the San Andres Mountains, which are bordered on the south by the Tertiary volcanics of the Organ Mountains. West of the Rio Grande, at the top left, a series of northerly-trending faults in the vicinity of Magdalena Peak are visible. Finally, at least two units can be distinguished in the Quaternary basalt flows west of the Rio Grande at the left, although the most recent geologic map of New Mexico (ref. 4) shows only one map unit.

The availability of a recent geologic map of this area makes this photograph of particular value for comparison purposes. Preliminary study indicates that many of the major lithologic units and structures (especially faults) shown on the 1:500 000 scale geologic map are visible on the photograph, whose original scale was about 1:2 000 000. The photograph, moreover, shows many features of Quaternary alluvium which are not shown on the map and permits rapid determination of the extent of the pediments surrounding the mountains, features which are not shown clearly on either topographic or geologic maps.

Because of daylight restrictions, photographing southern Africa was not possible during flights prior to Gemini V. However, a large number of excellent pictures of this area were obtained during this mission. One of these is shown in figure 2-6, taken over South West Africa. It includes a considerable part of the Namib Desert, which extends for several hundred miles along the coast of southern Africa, and part of the Precambrian shield. This picture demonstrates the potential value

of hyperaltitude photography for studies of regional sand dune distribution and structural geology. The conspicuous fracture pattern at the right is covered more completely by an adjoining photograph. An interesting circular feature is shown at the top right, vaguely suggestive of the Richat structure photographed on the Gemini IV mission.

CONCLUDING REMARKS

This report covers only a very small part of the immense amount of geologic and geographic information contained in the terrain photographs taken during the Gemini V mission. Further detailed studies are in progress to evaluate the results of the experiment. The crew are to be commended for their interest and competence in carrying out the terrain photography under difficult conditions.

REFERENCES

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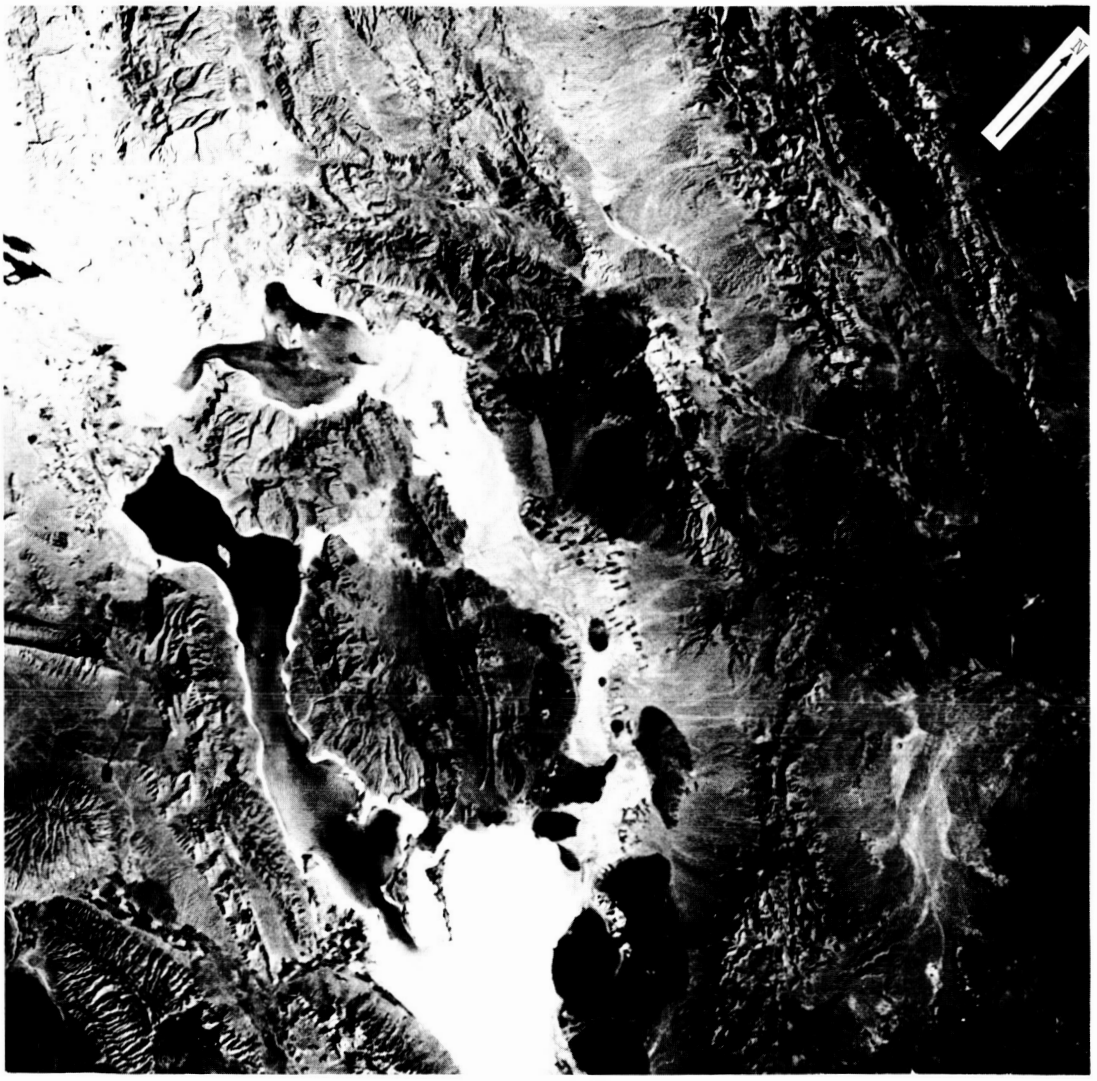

Figure 2-1.- South-central Iran, showing the Zagros Mountains.

Figure 2-2.- South-eastern Iran, showing folded mountains cut by scissors fault (left).

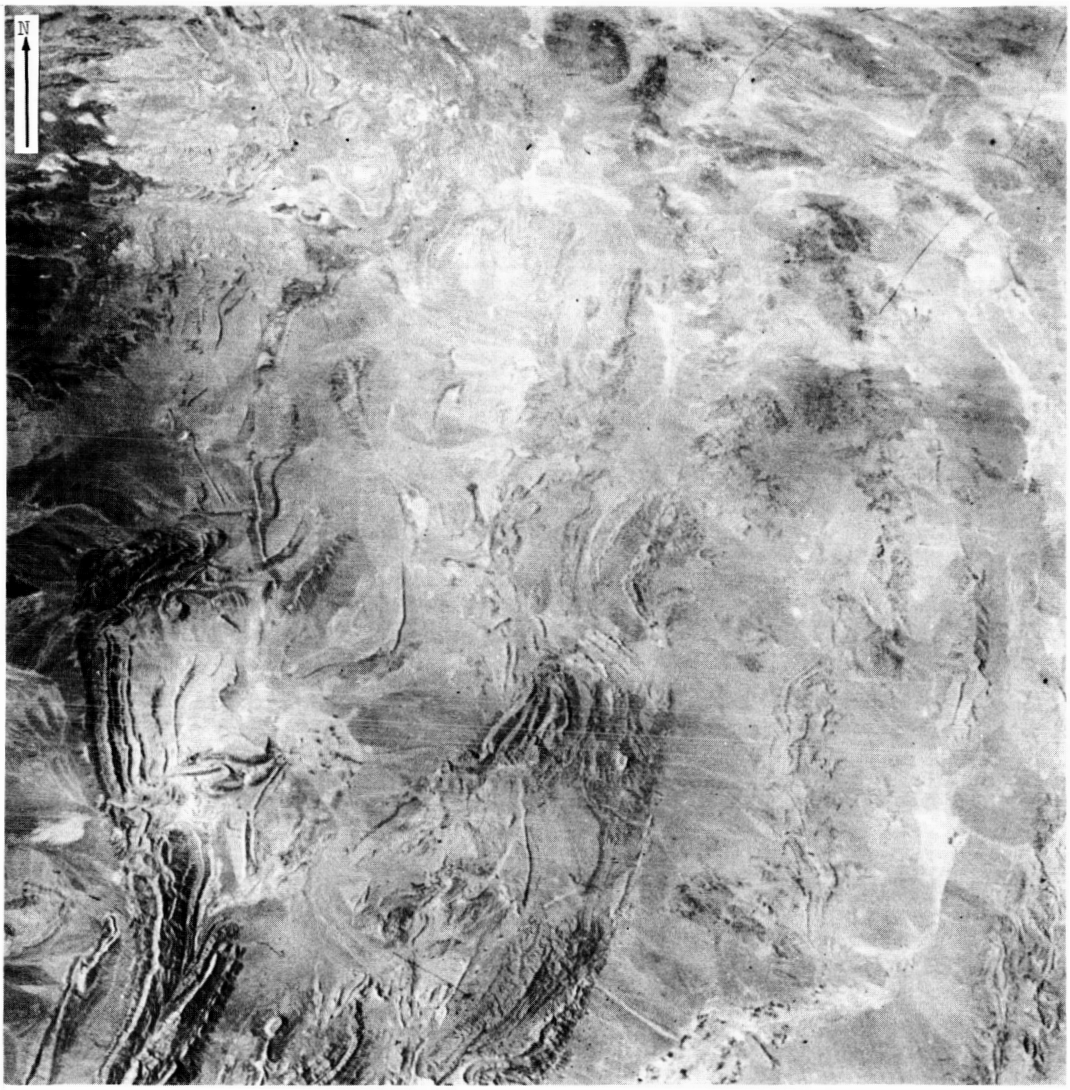

Figure 2-3.- South-eastern Iran, showing an area of folded mountains overlapping the area shown in figure 2-2.

Figure 2-4.- Mouth of the Yangtze River, showing bottom topography and/or turbidity currents.

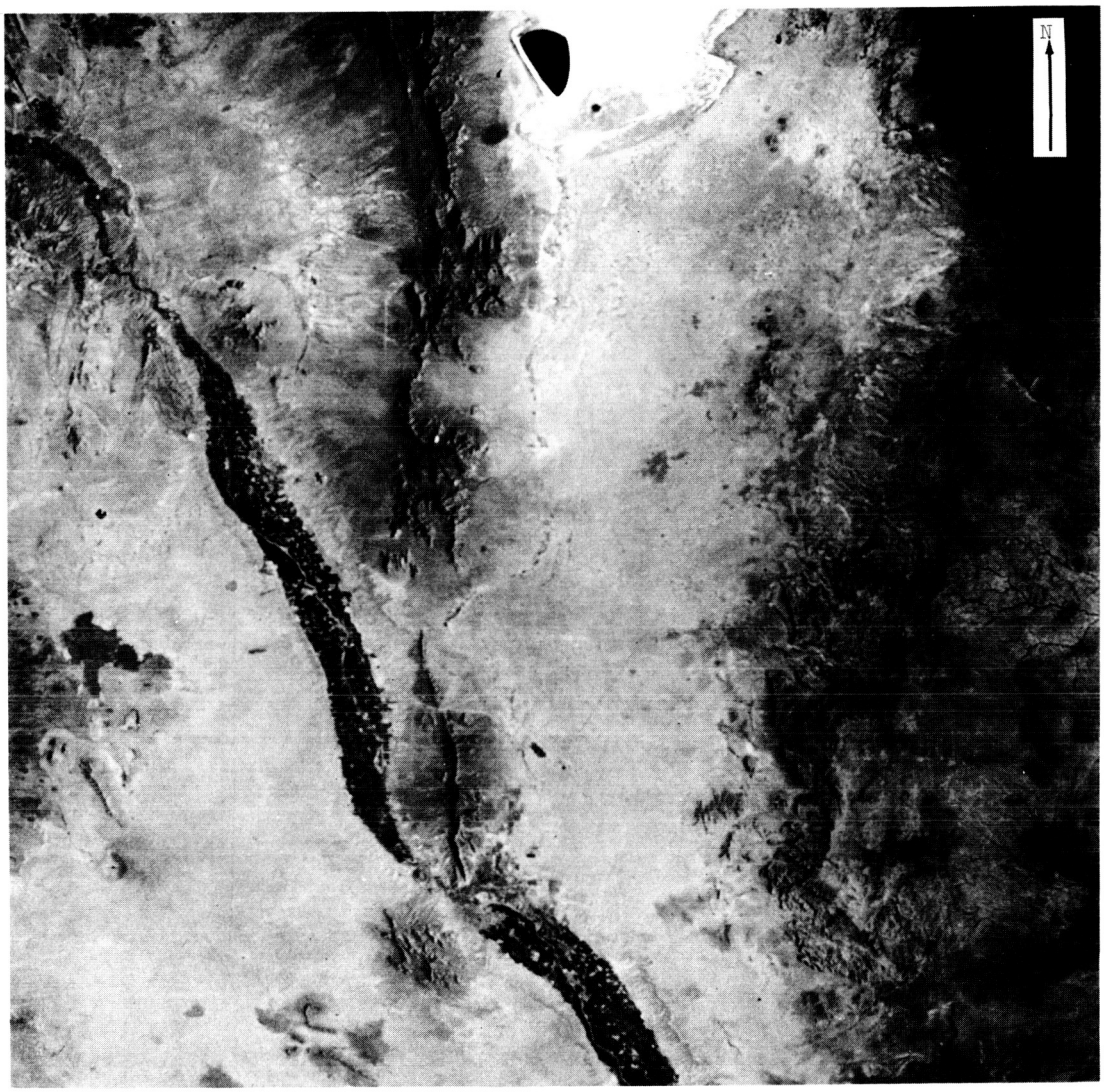

Figure 2-5.- South-central New Mexico, showing the Rio Grande valley, the San Andres and Organ Mountains, and the White Sands National Monument (top).

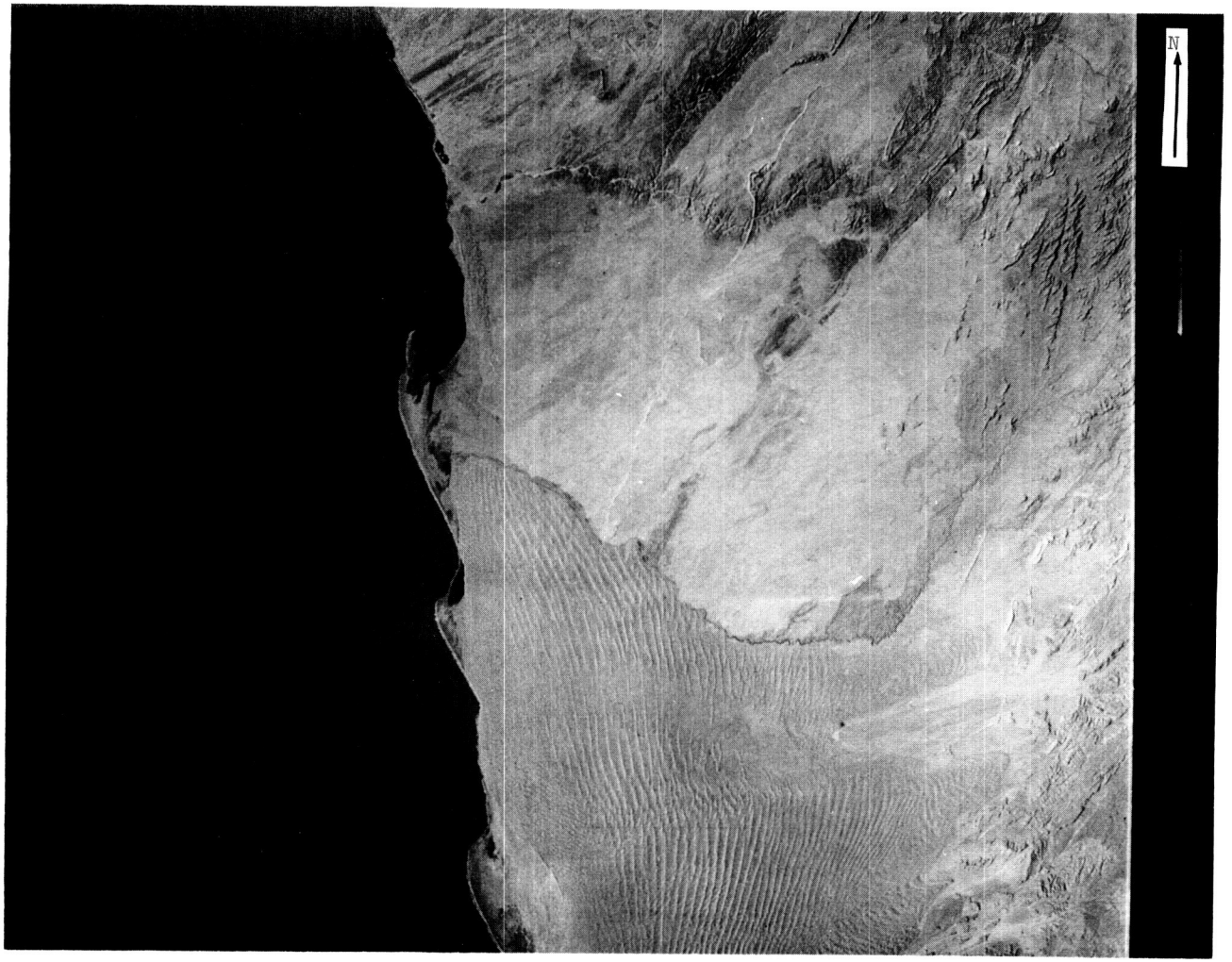

Figure 2-6.- South West Africa, showing part of the Namib Desert and structure in Precambrian rocks (right).