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A GEOLOGIC ATLAS OF TIMS DATA

Elsa Abbott

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California 91109

In the three years since the first data were taken, it has been well demonstrated that TIMS, properly used, can be a most valuable tool for the geologist. We feel that it would be useful to compile the TIMS data available to us at JPL into a geologic atlas. Several data sets have been extensively studied to establish TIMS as a geologic tool and to explore the optimum enhancement techniques. It was found that a decorrelation stretch of bands 1, 3, and 5 enhance the data to a form that is very useful and this enhancement will be used in the geologic atlas along with an accompanying geologic map and description.

Many data sets are well published and familiar to TIMS users, but there are some sets that, for lack of time and funds, have not been thoroughly studied or published. The following is a short description of these least studied sets of data.

In August 1983, two sets of TIMS data were taken over the Valley of Fire area north of Lake Mead in Arizona. A north-south line covers the North Muddy Mountains, an upended section of primarily Mesozoic sediments, including Aztec sandstone; Chinle and Moenkope shales, sandstones and limestones; and Kaibab limestone. Overlapping this data to the south is an east-west line which includes the Valley of Fire and the block of heavily faulted Paleozoic marine carbonates and shales which make up the Muddy Mountain thrust plate.

There are three TIMS data sets of the Southern California batholith taken July 23, 1983. The granitic rocks of this batholith are known to have a small but systematic variation in silica content from southwest to northeast and these data sets include rocks across the range of variation. The most southwesterly set is just inland from the coastal city of Oceanside on the Santa Ana fault block. The area is heavily vegetated with chaparral, but it is possible to distinguish some rock types on the image. In addition to the granitic rocks, which here range from granodiorite to tonalite, the image includes sandstones, gabbro, and undifferentiated metavolcanics. An adjoining data set to the northeast is processed separately across the fault zone which separates the Santa Ana from the Perris fault block. This image, which is also quite vegetated, includes rocks of the batholith, as well as metasediments and older unrelated granitic rocks. Perhaps the most useful data set over this batholith, because it is the least vegetated, is an image covering part of the Little San Bernardino Mountains and Joshua Tree National Monument. The image includes quartz monzonite (partly leucocratic), granodiorite, a gneiss which is very rich in quartz, diorite, gabbro, tonalite, and a pre-Cambrian mixed igneous-metamorphic unit.

A day-night TIMS data set of Pisgah crater area in California's Mojave Desert was taken in July 1983, and added to a rather large collection of infrared data in this area. The TIMS data did not prove as useful as planned because the nighttime data is nearly useless. The daytime data, however, is excellent. The area includes basalts of the Pisgah and Sunshine flows and the older Miocene basalts of Lava Bed Mountains, as well as other igneous rocks of varying compositions, fanglomerates derived from local sources, and the dry bed of Lavic Lake.

Pico anticline in Southern California is a producing oil field in the Santa Susana Mountains just north of San Fernando Valley. It is an area of folded Tertiary sediments made up of sandstone, conglomerate, shale and clay. However, the TIMS image, which was taken in August 1983, is dominated by the heavy cover of chaparral.

There are three TIMS data sets covering the Goldfield mining district in western Nevada. A daytime set was taken in July 1982 and a day-night (5 AM and 12:30 PM) pair were taken in July 1983. Goldfield is a Tertiary volcanic center, possibly a cauldera, which has been altered hydrothermally and enriched in the precious metals which made it one of the richest mining districts in Nevada. Rocks exposed in the area include Mesozoic granitic rocks and shales overlain by Tertiary volcanics, air-fall and ash-flow tuff, intrusive andesite, dacite, rhyo-dacite, quartz latite and rhyolite capped by basalt and welded tuff.

Death Valley has proved to be an excellent study area for TIMS because of the sparse vegetation and varied lithologies exposed, and several well-studied data sets exist of the valley floor and outcrops and alluvial fans west of the valley. East of the valley floor, however, in the Black and Funeral Mountains, there exist TIMS data which has not been fully investigated. There are two day-night sets taken in July 1983 - one north-south and one east-west, covering parts of these mountain ranges. The more northerly Funeral Mountains are predominantly dolomite, quartzite and shale. The Black Mountains are composed of Tertiary volcanic rocks and playa deposits, rhyolite, pre-Cambrian schists and gneisses and basic intrusive rocks.

The images presented along with the many previously studied and published TIMS images constitute an enormously useful set of information for the geologist in the 8-10 μm range. They only await the geologists time and effort.

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