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Type I Progress Report

May 16, 1973 - July 15, 1973

Utilizing ERTS-A Imagery for Tectonic Analysis Through Study of Big Horn
Mountains Region. MMC #256

ERTS Contract #NASS-21852

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We have received some of the color composites ordered in March. Unfortu-
nately, the most important scene (1085-17294) has not been delivered. The
available scenes overlap enough to cover most of the missing area.

All investigators as listed in the last report are now in the field. All
will be back by August 26, 1973. A portable light table which can be connected
to the car battery is being carried by the PI and will be available for a few
days for each investigator in order to use the color transparencies (composites
and U2).

Spring imagery is still being received, but detailed analysis has not
been done. The imagery is currently being used in the field by Baker.

The supporting flights at 30,000' by the Colorado State Flight Facility
are still pending due to the combination of poor weather and very heavy
snow cover.

Two series of winter scenes covering the periods December 6-10, 1972
and January 11-13, 1973 provide superb expression of topography and drainage.
The snow cover was not too heavy but was sufficient to remove all evidence
of lithologies and cultivation patterns on the December scenes. The snow on
the trees resulted in all bands appearing very much alike. Scene 1136-17132
clearly shows the on-line trend of the Hartville uplift--Redbird anticline--
Fanny Peak Lineament. The Cascade anticline and Cretaceous hogbacks south
of Hot Springs, S.D. are beautifully etched and continue as a linear south to
the Niobrara River. This linear is not apparent on snow-free scenes. Scene
1136-17130 of the northern Black Hills clearly shows Bear Butte and Elkhorn
Peak (a dome), which are almost impossible to see on other scenes. Scene
1140-17353 shows the Lake Basin fault zone topography north of Billings,
Montana. Other excellent scenes are 1138-17240 (Powder River, SE Montana),
1139-17245 (Forsyth, Montana), 1139-17301 (Bighorn region) and 1139-17304
(Boysen Reservoir). The January series is much the same except for a lighter
cover in which cultivation begins to show through (scenes 1172-17130, 1172-
17123, 1173-17182, 1174-17243).

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Summary of significant results

Winter imagery in December 6-10, 1972 and January 11-13, 1972 provides optimum snow cover and depth such that, along with low sun angle, topography and drainage are markedly enhanced. Several features are visible that are poorly, or even not distinguishable on clear scenes without snow. Examples are Bear Butte (igneous plug) and Elkhorn Peak (dome) on scene 1136-17130, northeastern Black Hills, (1172-17130) a linear linking the Cascade anticline and Cretaceous hogbacks near Hot Springs, S.D. south to the Niobrara River, and (1140-17353) the Lake Basin fault zone north of Billings, Montana. On the other hand, the extremely heavy snows in April completely blot out all vegetation and topography in the Bighorn, Wind River, and Beartooth ranges.