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THE ADVANTAGES OF SIDE-LAP STEREO INTERPRETATION OF ERTS-1 IMAGERY IN NORTHERN LATITUDES

by

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These comments are based on work done by the author and his graduate students on Apollo VI stereo photography, on the SO-65 Experiment aboard Apollo IX, and on work done in the quick assessment of ERTS-1 imagery being evaluated in an Earth Satellite Corporation project. In this latter investigation the author, as a Principal Associate with EarthSat, and other colleagues in the company are performing an experiment to determine the inter-regional repeatability of the signatures of vegetation analogues and to further develop and test a standard legend system devised by the author for the inventory and monitoring of natural vegetation, environmental complexes, and the cereal crop, rice, a key food crop of the world.

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Since working with stereo interpretation of Apollo VI photography in southern Arizona, a number of us associated with that project and the S-065 experiment were convinced that the paralax in space photography was great enough to justify serious consideration of its exploitation for human interpretation. Thus one of the first things we examined upon receipt of both RBV and MSS imagery from ERTS-1 was the possible enhancement of interpretability of these new systems by exploiting binocular reinforcement and true or "apparent" stereo.

We found benefits significant although at this point we have not had time to experiment and determine the true information gain from stereo interpretation by human PI's. The results are sufficiently encouraging, however, to cause us to urge NASA to continue to acquire all possible side lap up to 50 to 60 percent and to urge that all participants who are in any way using the human PI approach to image analysis fully exploit the stereo capability of the system to the extent that side-lap is provided at their latitudes.

In one of our EarthSat test sites between latitude 38° and 40° N with which I am involved the system is giving us slightly over 50 percent sidelap (Slide 1). Thus we could have complete

stereo coverage. Those working farther north will be even better off. This capability is particularly important when interpreting natural vegetation, geological and landform features. In flat country obviously the only advantage comes from binocular reinforcement but even this is significant. In strongly rolling to hilly relief, the gain in reinforcing the tone patterns is significant and in mountainous terrain is is very substantial.

This slide (Slide 2) shows a stereo model from ERTS-1 RBV-2 in a moderately hilly relief. Those of you who can independently focus your eyes should be able to see the stereo from where you sit. Others can see me after the meeting if you wish to examine the models under a pocket stereoscope. This next slide (Slide 3) shows the side-lap stereo with MSS-5 in a mountainous area. Following are my main conclusions at this time:

1. Side-lap registry from stereo viewing of bulk processed data is good. As you move about the model some repositioning is required.

2. For quick-look evaluation the red band is near ideal for evaluation of vegetational, soil and landform features as we predicted. The 9 x 9 format is highly useable although some greater enlargement may be desirable.

3. While we have not had the opportunity to examine color reconstitutions in stereo, we believe the combination will have tremendous possibilities for human interpretation.

4. With stereo viewing, in mountainous and hilly relief, and even strongly rolling relief of arid areas, vegetational and/or soil differences and type boundaries are more easily seen, and

one can capitalize on associated evidence of relief and landform relationships in identifying vegetational analogs, if of course one knows what to expect.

5. With stereo, ground locations in all but flat relief are made much more quickly than when the often uncertain or "apparent" relief suggested by tone patterns is viewed monocularly. As one approaches minor drainages and the heads of major drainages, they can be traced with much greater reliability and accuracy with stereo viewing.

6. Both end-lap and side-lap in the RBV provides stereo paralax but the MSS provides true stereo paralax only in the side-lap area so that the only apparent advantage in the MSS end-lap area is from binocular reinforcement.

On the basis of these limited observations, strongly supported from experience in depth with Apollo VI and S-065 imagery, I would urge NASA to continue to provide up to 50 or 60 percent sidelap imagery at every opportunity; and I would urge investigators who are interpreting imagery with human interpreters to take advantage of this feature even if it is limited to only 10 or 15 percent sidelap. That much provides a stereo sample far superior to none.

It is highly probable that interpretation by most of the users of ERTS-1 imagery will be done with a minimum of sophisticated instrumentation, perhaps nothing but a color combining device if that much. It is now obvious that stereo viewing and binocular reinforcement hold just as much advantage for the interpretation of space imagery in the photographic mode as has long been recognized for conventional aerial photography.

I had a geologist friend of mine, who had never before tried to interpret space imagery, examine some of this same material with absolutely no prompting. He was given first a monocular view in the Sierra mountains and then the stereo overlap for the same area. His immediate reaction was "Give me side-lap imagery every time, I can see a real saving in time required for interpretation and a substantial increase in the potentially derivable information."