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UNITED STATES
(DEPARTMENT OF THE INTERIOR)
GEOLOGICAL SURVEY,



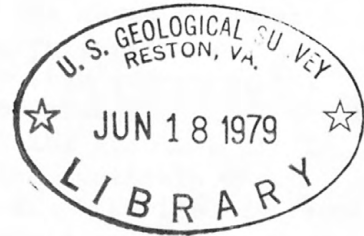
[Reports - Open file series]

GEOMETRIC FIDELITY OF NEW DIGITALLY
PROCESSED LANDSAT IMAGES

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By Alden P. Colvocoresses, 1918 ✓

Open-File Report 79-1057



Reston, Virginia

June 1979

297678



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092
National Center 522

June 6, 1979

Memorandum for the Record (EC-71-Landsat)

By: EROS Coordinator, Topographic Division

Subject: Geometric fidelity of new digitally processed Landsat images

The enclosed memo of May 3 from Chief, Branch of Field Surveys, Office of Research and Technical Standards, describes the first accuracy test made of IPF/EDIPS Landsat images. This acronym stands for Image Processing Facility (the NASA/Goddard part of the process) and the EROS Digital Image Processing System (the EROS Data Center, U.S. Geological Survey, part of the process).

Although the images measured (1:1,000,000-scale transparencies) were obtained from NASA/Goddard, the products to be sold by EROS should have the same geometric characteristics.

As the memo indicates, both the internal geometric fidelity and the approximate fit to the Earth are quite good. As expected there is little difference between the images as cast on the Universal Transverse Mercator (UTM) or Hotine Oblique Mercator (HOM) projections. The virtual elimination of the affine condition along the diagonals is particularly significant although an alongtrack-to-crosstrack affinity of over 0.4 percent still exists. It is believed that the processing system, even without the use of ground control, can produce images with no more than 0.1 percent affinity if systematic errors are identified and eliminated.

NASA's ability to register Landsat images to the Earth's projection without ground control is well illustrated by this report. The indicated error of 1.4 km (average) is better than expected, but this one case may be an exception. The use of ground control should materially improve both internal geometry and the absolute fit to the Earth's projection. As soon as samples are available where ground control was used, they will be reported. Likewise additional IPF/EDIPS images (from both multispectral scanner and return beam vidicon sensors) processed without benefit of ground control will be analyzed.

Assuming that Landsat IPF/EDIPS products have as good geometry as those measured, the images will provide a usable fit to any of the standard conformal map projections except those with excessive scale distortion.

Alden P. Colvocoresses
Alden P. Colvocoresses

Enclosure



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092
National Center #521

3 MAY 1979

Memorandum

To: Cartography Coordinator, EROS Program

From: Chief, Branch of Field Surveys

Subject: LANDSAT - image geometry and grid tick placement,
Upper Chesapeake Bay, EDIPS

Two versions of the scene were analyzed for geometric anomalies, one cast on the UTM, and the other on the Hotine Oblique Mercator (HOM). Results were similar (diagrams enclosed). The along-track/cross-track affine condition was about 0.4%, which has been average for the EBR processing. Across diagonals was only about 0.1%, compared with over 0.9% average for EBR work.

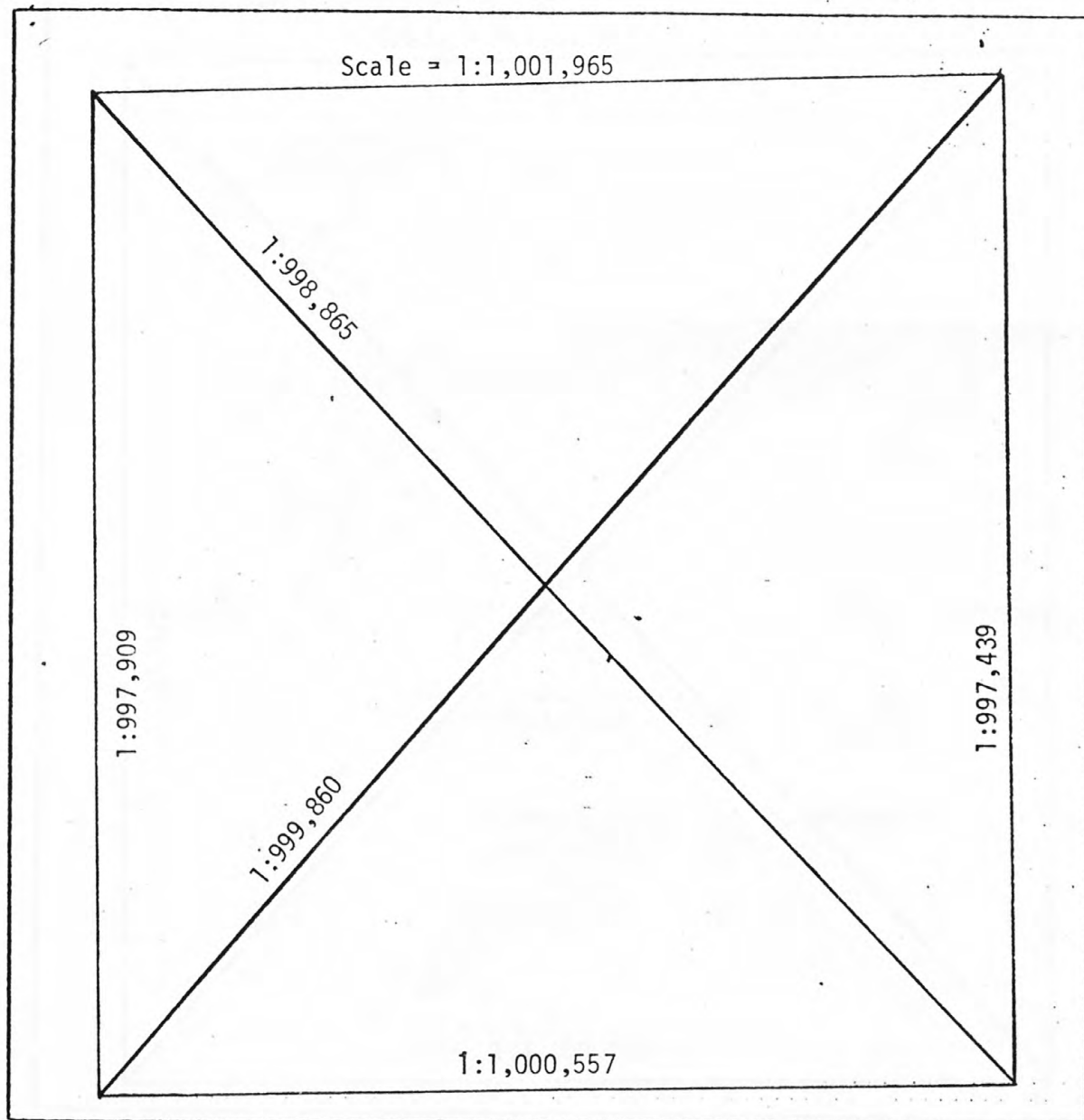
The placement of the grid ticks was also checked on each version of the image. This was done by connecting the grid ticks and measuring the control points from these lines (vector diagrams enclosed). Note that the grid ticks are considered to be displaced in the direction opposite these vectors. The amount of this displacement seems reasonable, since no ground control was used in placing the grid.

Clifton J. Fry, Jr.

Enclosures

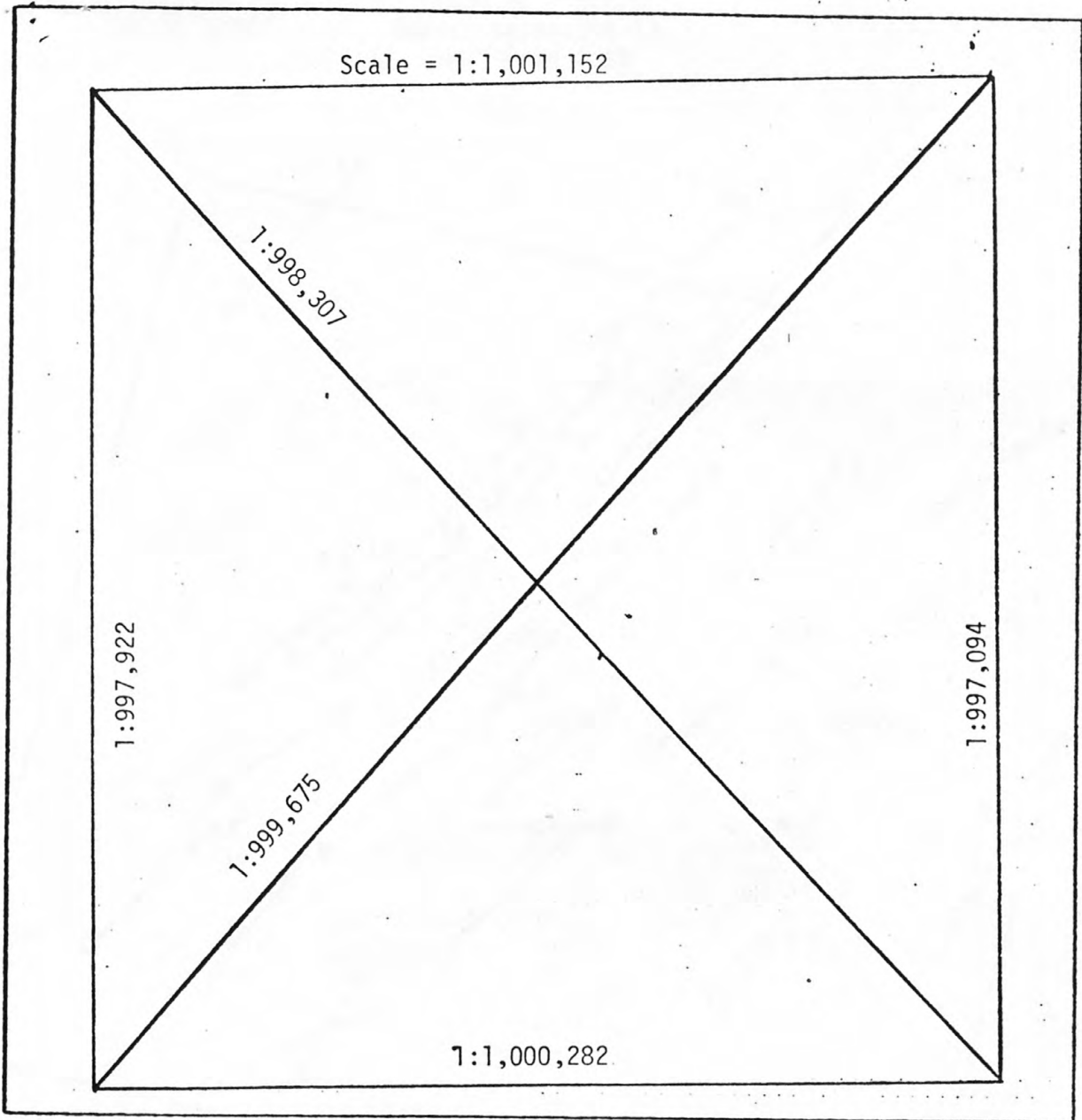


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EDIPS with UTM grid ticks

FIGURE 30117-15075 SCALE VARIATIONS IN LANDSAT SCENES _____
 TITLE Upper Chesapeake Bay 6/30/78 NOMINAL SCALE 1:1,000,000
 CONTROL POINTS 32 RMSE 47 m MAXIMUM AFFINE 0.45%
 COMMENTS Maximum affine crosstrack/alongtrack. Affine 0.10% across
diagonals. Larger diagonal scale NW-SE. Scale varies 0.14% alongtrack;
0.05% crosstrack.



EDIPS with HOM grid ticks

FIGURE 30117-15075 SCALE VARIATIONS IN LANDSAT SCENES _____

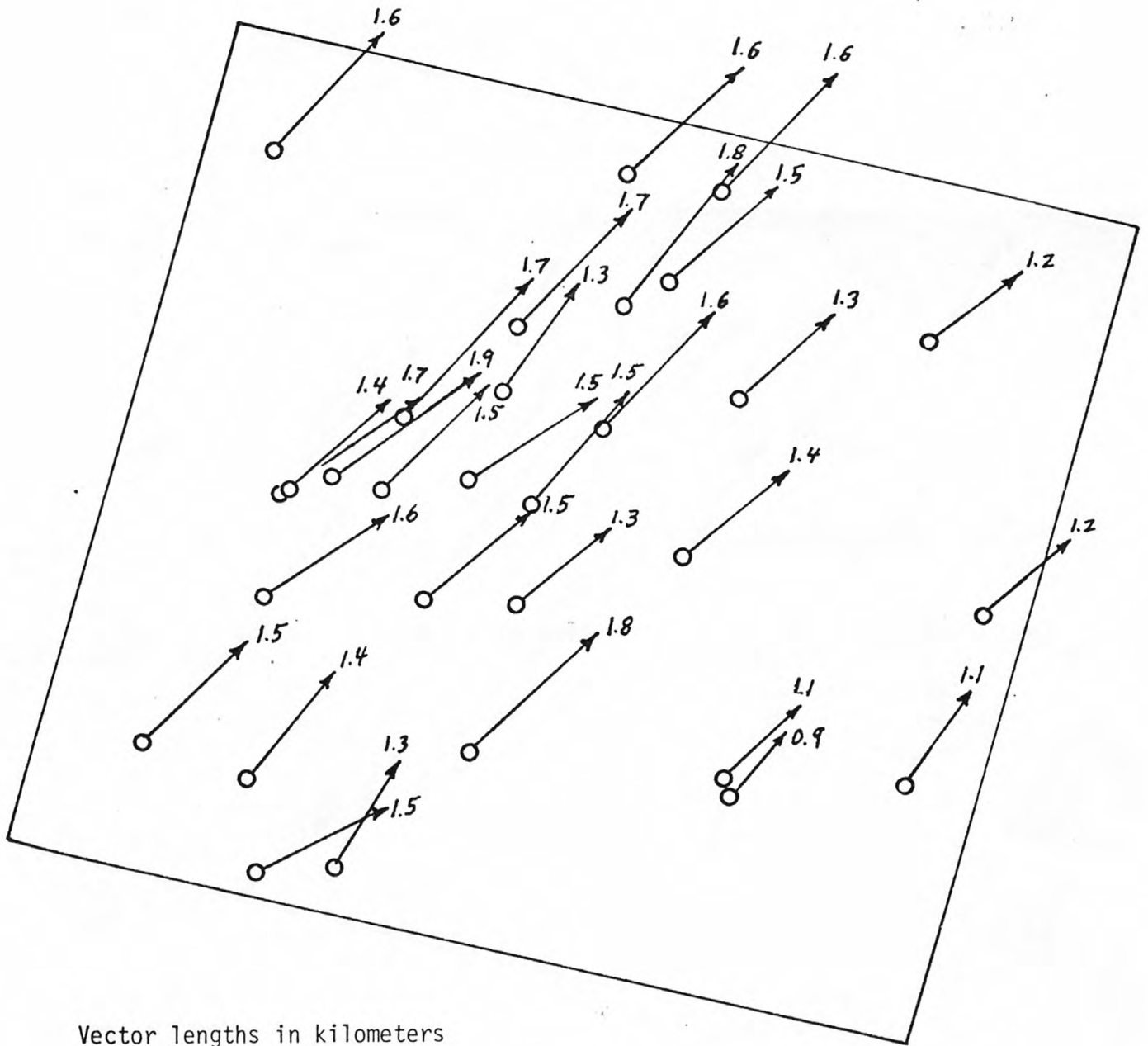
TITLE Upper Chesapeake Bay 6/30/78 NOMINAL SCALE 1:1,000,000

CONTROL POINTS 32 RMSE 54 m MAXIMUM AFFINE 0.41%

COMMENTS Maximum affine crosstrack/alongtrack. Affine 0.14% across diagonals.

Larger diagonal scale NW-SE. Scale varies 0.09% alongtrack; 0.08% crosstrack.

LANDSAT - EDIPS
Upper Chesapeake Bay
HOM Grid Test

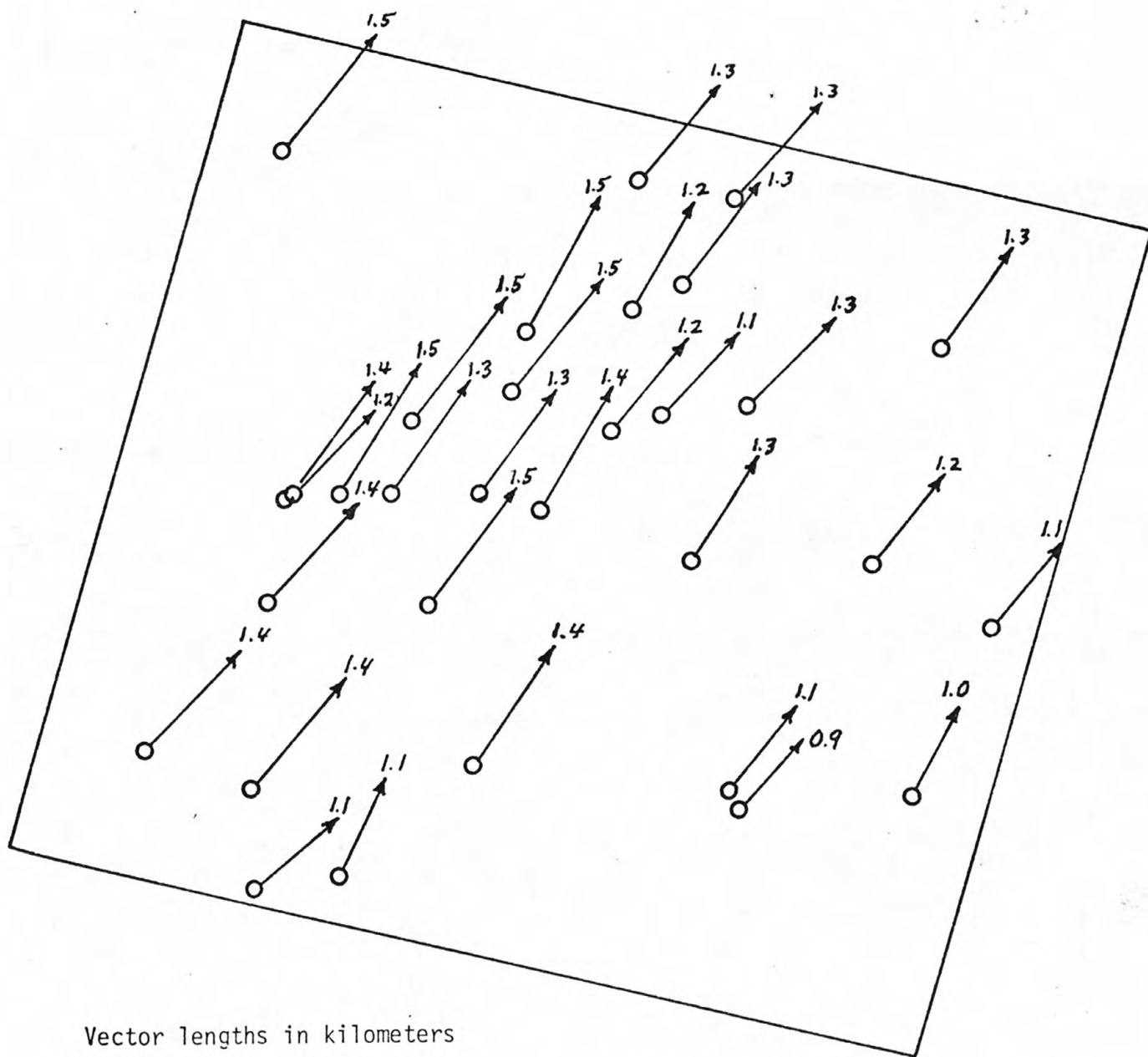


Vector lengths in kilometers

Average $v = 0.8$ km
Average $u = 1.0$ km
Average vector = 1.3 km

Image 30117-15075

LANDSAT - EDIPS
Upper Chesapeake Bay
UTM Grid Test



Vector lengths in kilometers
Average E = 0.8 km
Average N = 1.2 km
Average vector = 1.5 km

Image 30117-15075

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