

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Thermal infrared aircraft scanner data of the area of underground
coal fires, Sheridan, Wyoming, July 1975 and October 1978.

by

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This report is preliminary and has not been edited or reviewed
for conformity with U.S. Geological Survey standards.

Introduction

Thermal infrared aircraft scanner data of the coal region north of Sheridan, Wyoming, were acquired on two aerial surveys conducted in July, 1975, and October, 1978. The purpose of this report is to show the thermal infrared coverage of the underground coal fires that are burning in the area.

Data Acquisition

The U.S. Geological Survey aircraft flew a course from latitude $44^{\circ}52'$ and longitude $106^{\circ}58'$, due north for 6 km, with approximately a 2.5 km swath width. The images in figure 1 were acquired using a Texas Instrument RS14A multispectral scanner^{1/} mounted in a Queen Air, twin-engine aircraft. The scanner has a thermal channel from 7.5 to 12.5 μm and five visible and near-infrared bands: 0.4 to 0.5 μm , 0.5 to 0.6 μm , 0.6 to 0.7 μm , 0.7 to 0.8 μm , and 0.8 to 1.1 μm . All channels have a 3 milliradian instantaneous field-of-view, and a cross-track scan angle of 80° . Gyroscopic compensation ($\pm 8^{\circ}$) was provided and all channels of data were recorded as a frequency modulated (FM) signal on magnetic tape. Hot and cold blackbody-calibration data were recorded for each scan line.

Figure 1C is a film print of the thermal data acquired 22 July 1975, at approximately 19:50 solar time, and the data in figure 1A were acquired 14 October 1978, at approximately 23:30 solar time. Figure 1B is a print of the thermal data acquired 16 October 1978, at approximately 03.35 solar time. The arrow in each image points to the general area of the fires.

^{1/}Use of brand names in this report is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.

Interpretation of thermal-image data require some caution. Ground temperature variations are caused by meteorological factors, physical-property differences, topographic effects, and near-surface geothermal heat flow (Watson, 1975; Kahle, 1977; Miller and Watson, 1977). The scanner records radiance and the light tones on figure 1 indicate high radiance. Figures 1A and 1B show scanline dropouts that occurred during the image processing but are not present in the original data. No interpretation has been applied to these data.

References

- Watson, Kenneth, 1975, Geologic Applications of thermal infrared images: Proceedings of the Institute of Electrical and Electronics Engineers, v. 63, no. 1, p. 128-137.
- Kahle, A. B., 1977, A simple thermal model of the earth's surface for geologic mapping by remote sensing: Journal of Geophysical Research, v. 82, no. 11, p. 1673-1680.
- Miller, S. H., and Watson, Kenneth, 1977, Evaluation of algorithms for geological thermal-inertia mapping: International Symposium on Remote Sensing of Environment, 11th, Ann Arbor, Michigan, 1977, Proceedings, v. 2, p. 1147-1160.

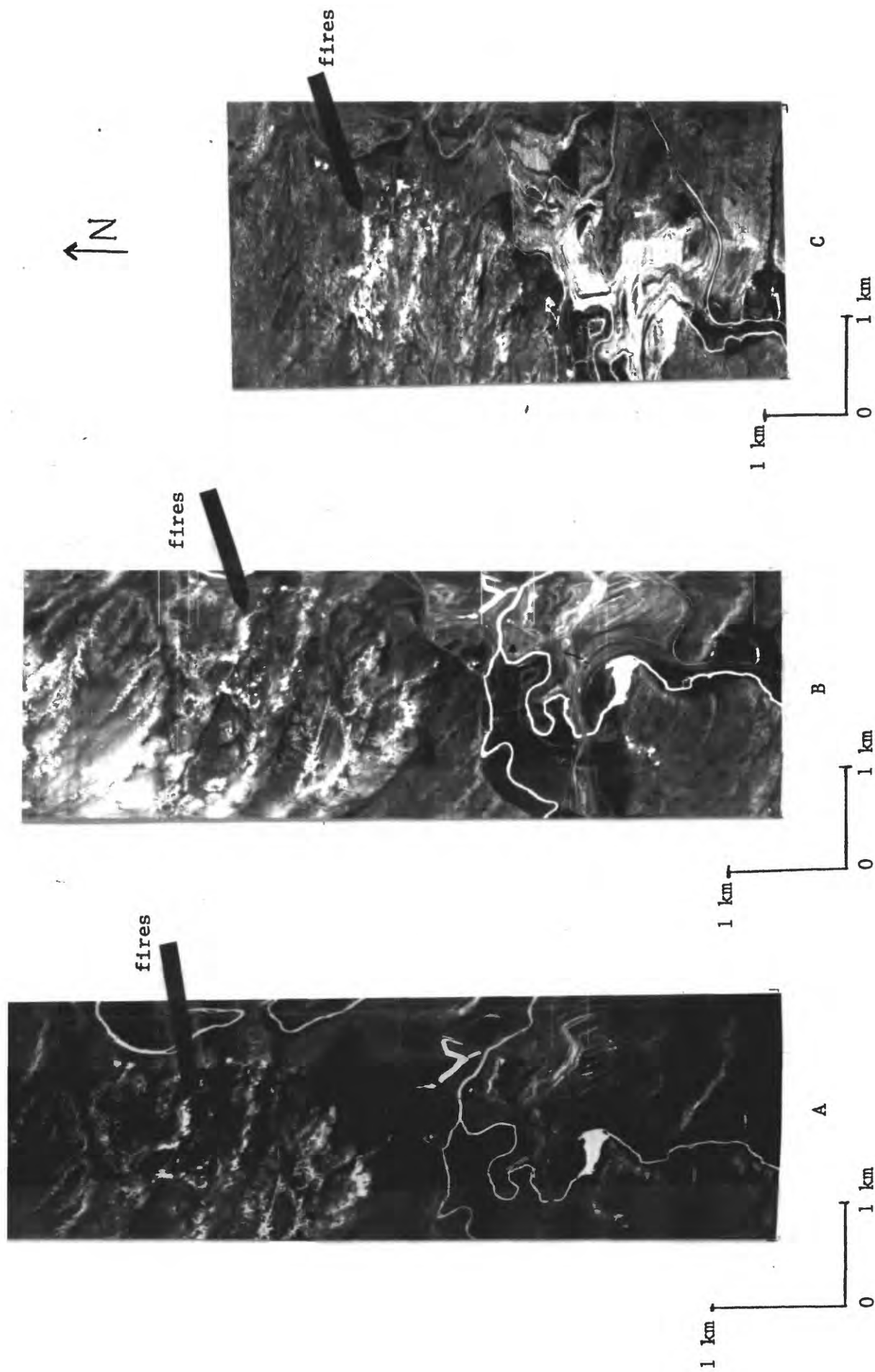


Figure 1.---Thermal infrared scanner images of the Sheridan, Wyoming, coal-fire area.
 A---Thermal data acquired 14 October 1978 at 23:30 solar time
 B---Thermal data acquired 16 October 1978 at 03:25 solar time
 C---Thermal data acquired 22 July 1975 at 19:50 solar time