

POLLUTION MONITORING OF ELBE RIVER BY AERIAL THERMOGRAPHY

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Abstract:

Pollution monitoring of the Elbe river on the territory of Czechoslovakia was done by means of the aerial thermography. Scanned flow was 270 km long. Thermal maps of the pollution sources were situated in the aerial photographs of the flow. Used method of interpretation was computer controlled.

Key words: Image Interpretation, Thermal, Water Application, Pollution Monitoring

1. INTRODUCTION

During 80s our Remote Sensing Centre has conducted different experiments with aerial thermography onboard airplanes and helicopters. Our main task is environmental monitoring.

Ground surface temperatures can't be seen directly and measurements only in situ is complicated by the fact, that temperature patterns change rapidly. For thermal mapping of relatively large area is aerial thermography the only one way to get data from the territory of interest as a whole in a short time.

Thermal properties of surfaces are strongly influenced by many factors which must be considered during image interpretation.

In cooperation with the Research Institute for Water Management was done pollution monitoring of the Elbe river on the territory of Czechoslovakia. Scanned flow 270 km long is nearly one quarter of the whole river length.

2. USED METHOD

2.1 Thermographic Equipment

We use thermal scanner THERMOVISION 880 LWB (AGEMA, Sweden) with 20° FOV objective. It senses thermal infrared radiation in the 8 - 12 μm range of spectra. Its sensor is cooled by liquid nitrogen.

Equipment is placed on the board of helicopter at the special platform, together with two HASSELBLAD 500 EL/M cameras. Photographs are used during interpretation (Krizek, 1992).

2.2 Course of the Scanning

Although in past we made some scanings of the water flows (Krizek, 1991), due to extent of this action several test flights were made previous this action during which optimal parameters of the scanning were chosen. Actual scanning was made in two days - from 8th to 9th January 1992.

Originally was planned scanning by night due to better temperature contrast. This solution was after evaluation rejected. Reasons can be summarized as follows:

- a) Navigation of the helicopter by night over the river was problematic
 - b) Some sources of the pollution are out of work during the night
- Because weekends were excluded from the latter reason, scanning was provided in rush hours of the working day.

The height of scanning was 1 200 m with a swathwidth of 400 m.

2.3 Evaluation

Digital data with thermal images were processed by TIC - 8000 computer (IBM-PC compatible). Radiometric correction is done on the basis of temperature measurements in situ simultaneously with scanning. Real temperatures are computed using well known atmospheric model LOWTRAN.

Photomosaic from panchromatic B/W images was done at the scale 1 : 5 000. Every sheet of the photomosaic (50 x 60 cm) is oriented with upper side to the North and has no overlap. The total number of the sheets is 81. For better orientation kilometrage of the flow with its direction is on every sheet.

After identification of the supposed sources of thermal pollution were thermal images processed, printed on the colour jet printer at the same scale as photos and mounted on the sheet at the corresponding places.

Important information about the sheet and the thermal pollution are placed in the table in lower right corner of the every sheet as follows:

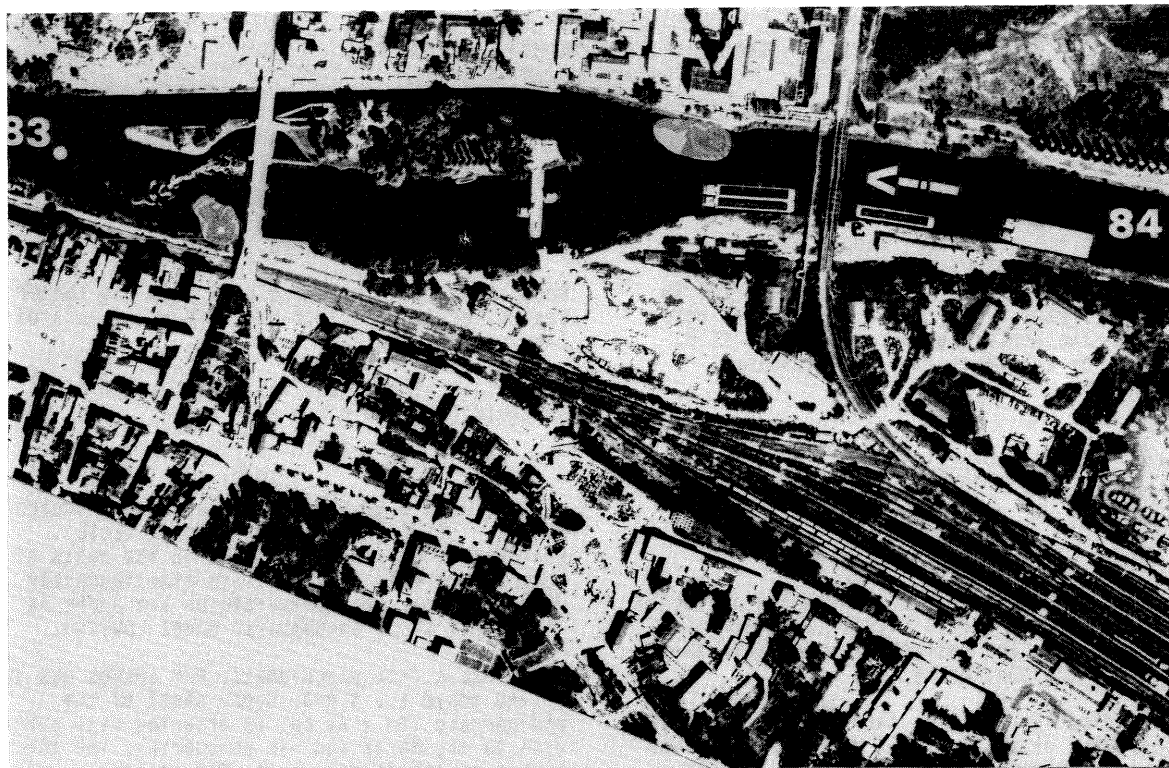
- a) number of the sheet
- b) kilometrage of the presented flow
- c) name of the area
- d) map of the same area 1 : 50 000
- e) position of the sources of pollution
- f) identification of the sources of pollution
- g) temperature scale

In Fig.1 can be seen part of one sheet with the table.

3. CONCLUSION

Aerial thermography is a very useful method for the environmental monitoring. In our case of detection of the thermal pollution together 53 sources of thermal pollution were detected.

Our work was a part of international project Elbe between Czechoslovakia and Germany. Main task of this project is to clean water in one of the main European rivers covering river basin more than 144 000 sq. km.



teplota (°C)	úsek	identifikace vtoku
	82,3	sportovní hala Kolín
	83,1	
	83,6	
ZEMĚMĚŘICKÝ ÚSTAV - Středisko dálkového průzkumu Země		
FOTOMOZAIKA TOKU A TERMOGRAMY VTOKŮ		
úsek (km)	LABE	číslo listu
80,8 84,0		059
snímáno	oblast	měřítko
8. a 9. 1.	...	1:5000

Fig.1 Part of the sheet 059 between 83 and 84 km with two sources of pollution

4. REFERENCES

Krizek.M.,1991.Environmental Monitoring by Means of Aerial Thermography, in:Proceedings of the 11th EARSEL Symposium, Graz, Austria,pp.346-351

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