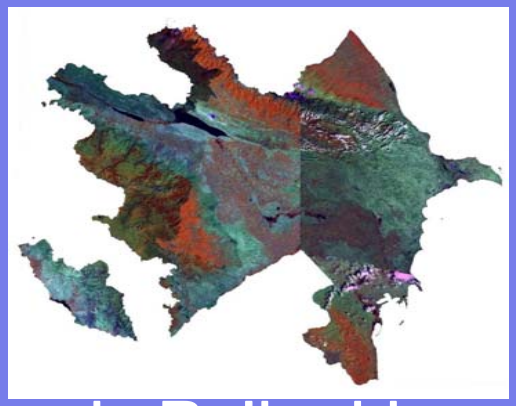
United Nations/Azerbaijan/United States of America/European Space Agency
Workshop on the Applications of Global Navigation Satellite Systems
Baku, Azerbaijan, 11 – 15 May 2009

GNSS TECHNOLOGY AND HIGH RESOLUTION SATELLITE DATA FOR DETECTION AND ASSESSMENT WARNING VULNERABILITY RISK



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National Aerospace Agency of Azerbaijan

Azerbaijan – Russia transboundary transport corridor is an important part of the "Silk Way"s global infrastructure and the width of the corridor and its density is defined by the relief of the region. Due to various objective and subjective reasons there are a lot of vulnerable points on the Azeri part of the corridor. This stable functioning depends on various factors determine a necessity of the digital mapping of the landscape components of the corridor on the basis of high-resolution space information and it's processing using GIS-technology.

Along with the traditional methods of ground-based observations and investigations it is proposed to develop a 3D-digital model of the region on the basis of the surface's space images. The essence of the space information processing based on spectral brightness of the objects is often incorrect due to spatial changeability of the reflective characteristics of the ground surface classes.

The offered method of space images analysis brings to the forefront an accounting of the context information in the algorithms of pattern recognition. Use of methods of the fractal analysis and various Wavelet-transformations allow increasing the accuracy of the space information recognition.

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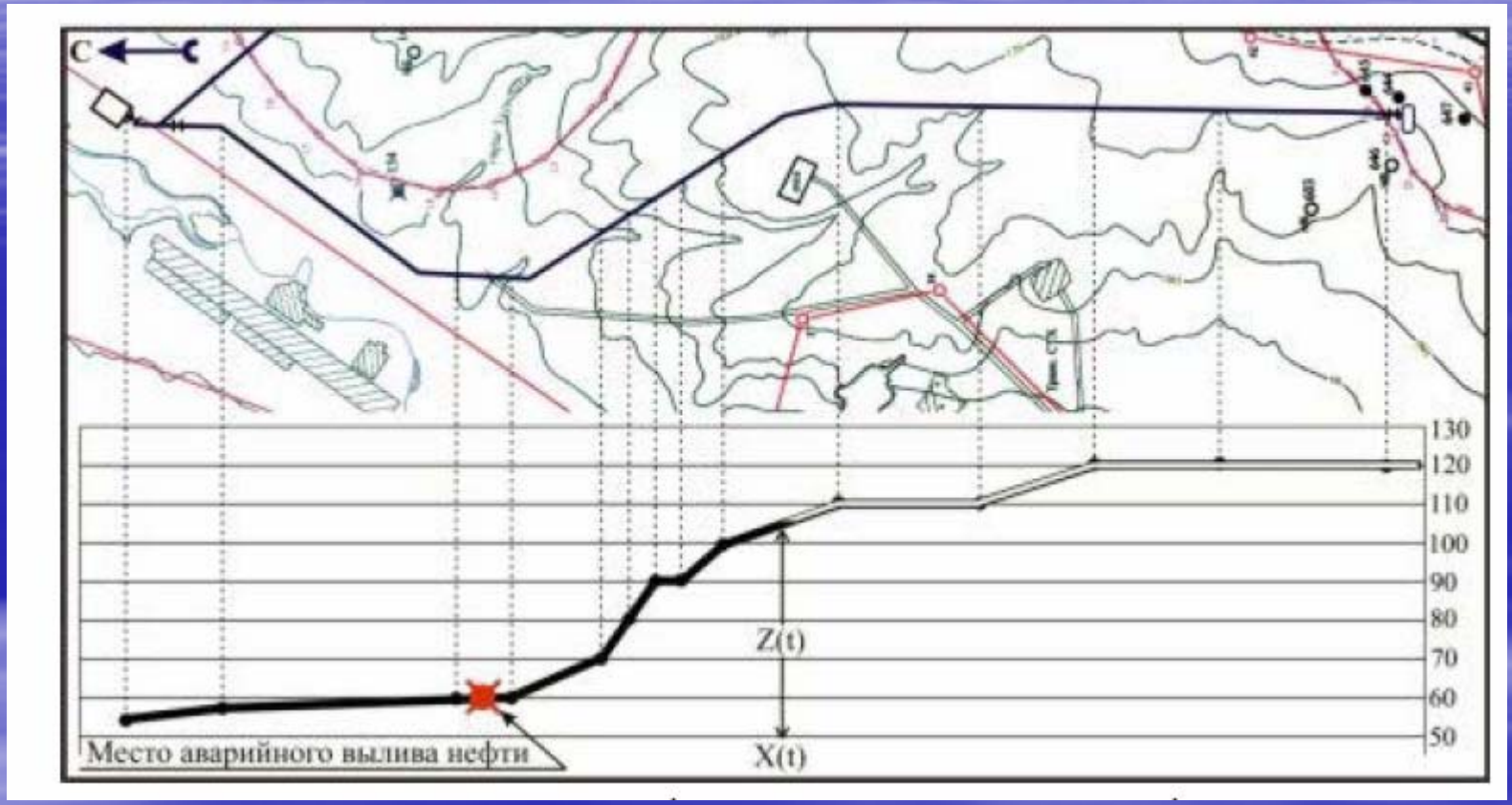
(4)

THE GIS PROCESSING PHASE

- Digitization of the thematic layers (Vegetation, Climatic, Administrative, Physical, Geomorphology, General) ;
- Creation of the general sketch of the project (topographical sheets and satellite images)
- Visual interpretation and manual digitization, creation of the attribute data base according to the legend

Fragment shown medium crossing oil-pipeline with other transport communications

Sevda Ibrahimova, Azerbaijan National Aerospace Agency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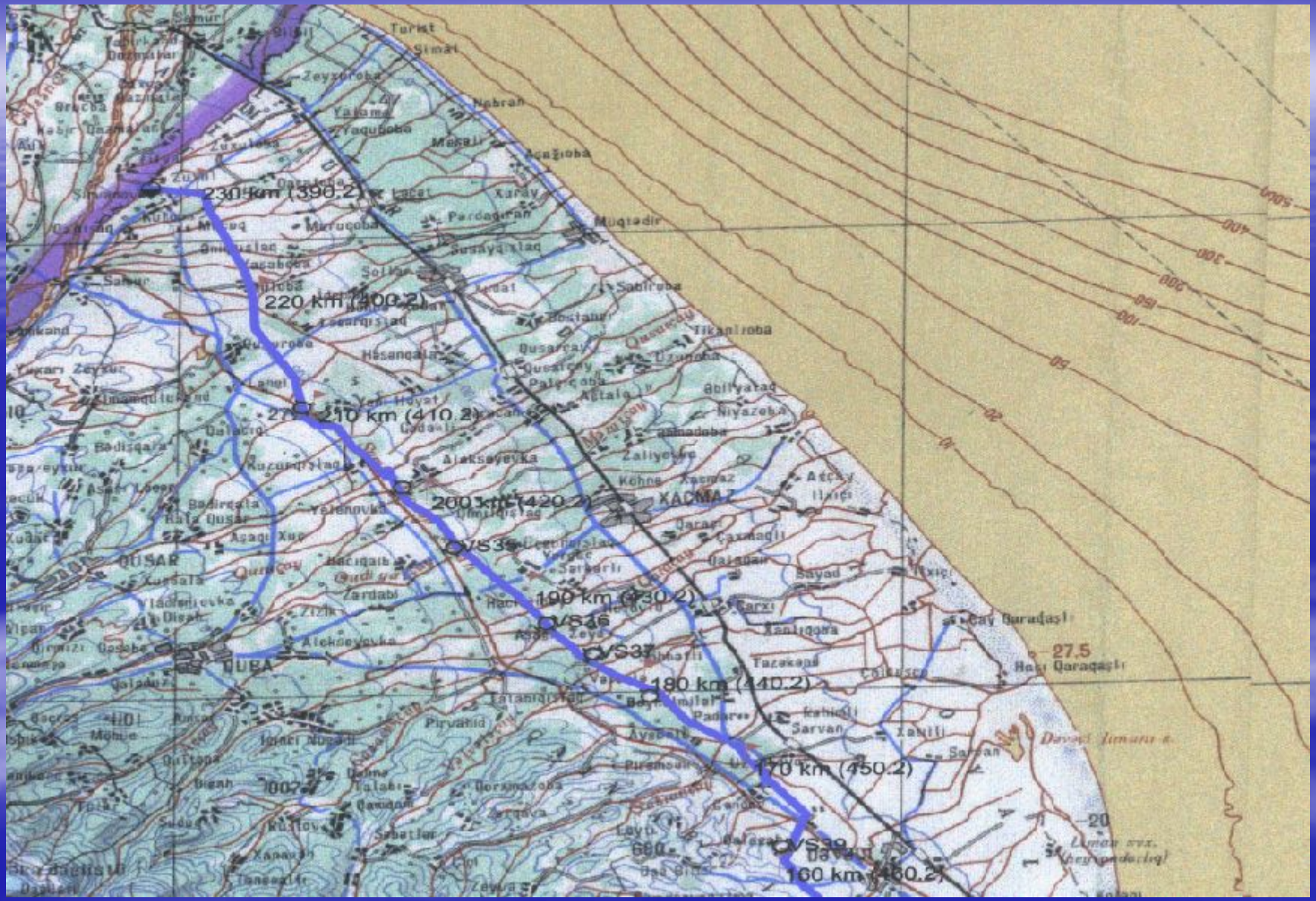
Z(t)
X(t)
Место аварийного вылива нефти


230 km (390.2)
220 km (400.2)
210 km (410.2)
200 km (420.2)
190 km (430.2)
180 km (440.2)
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QUSAR
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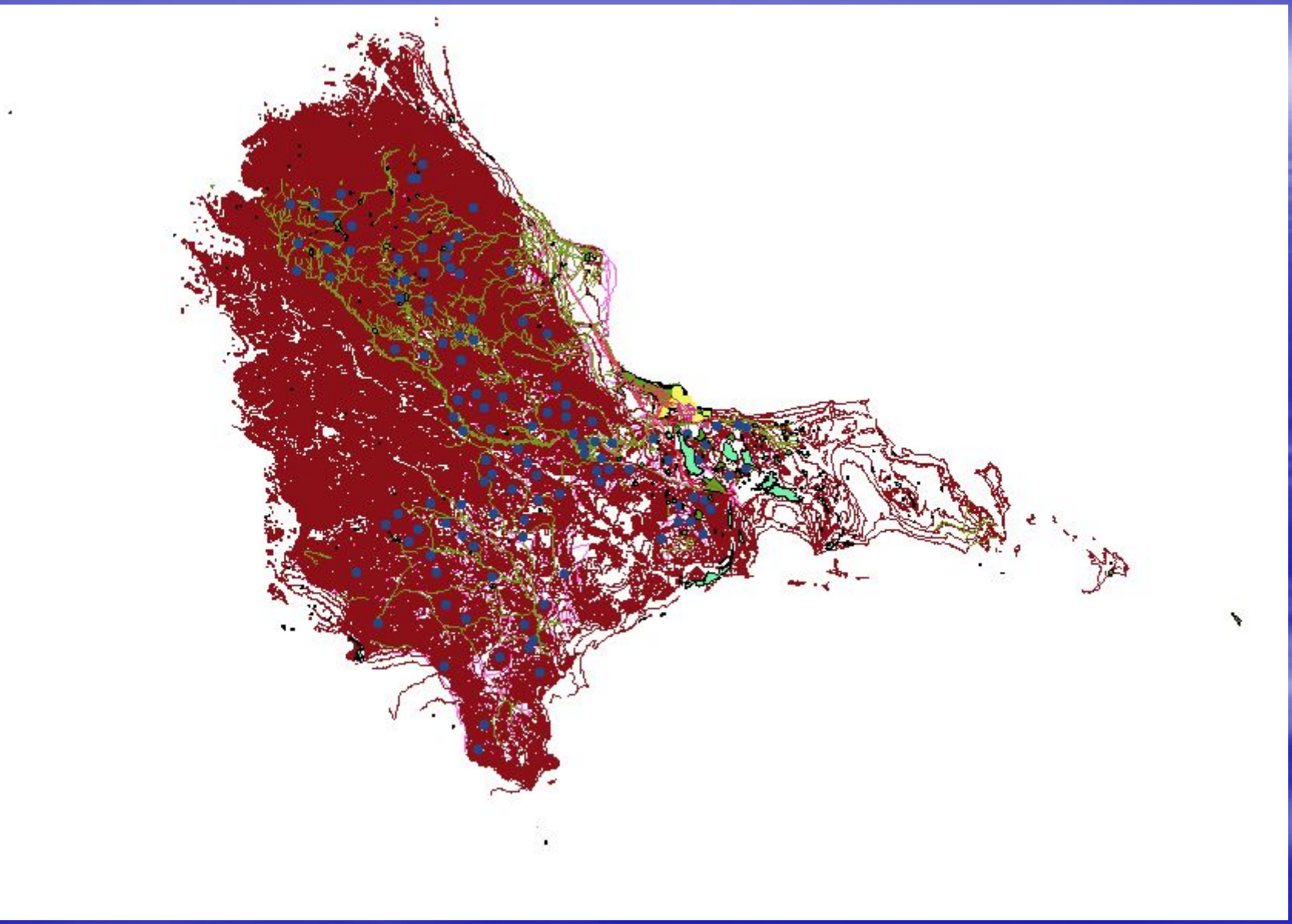
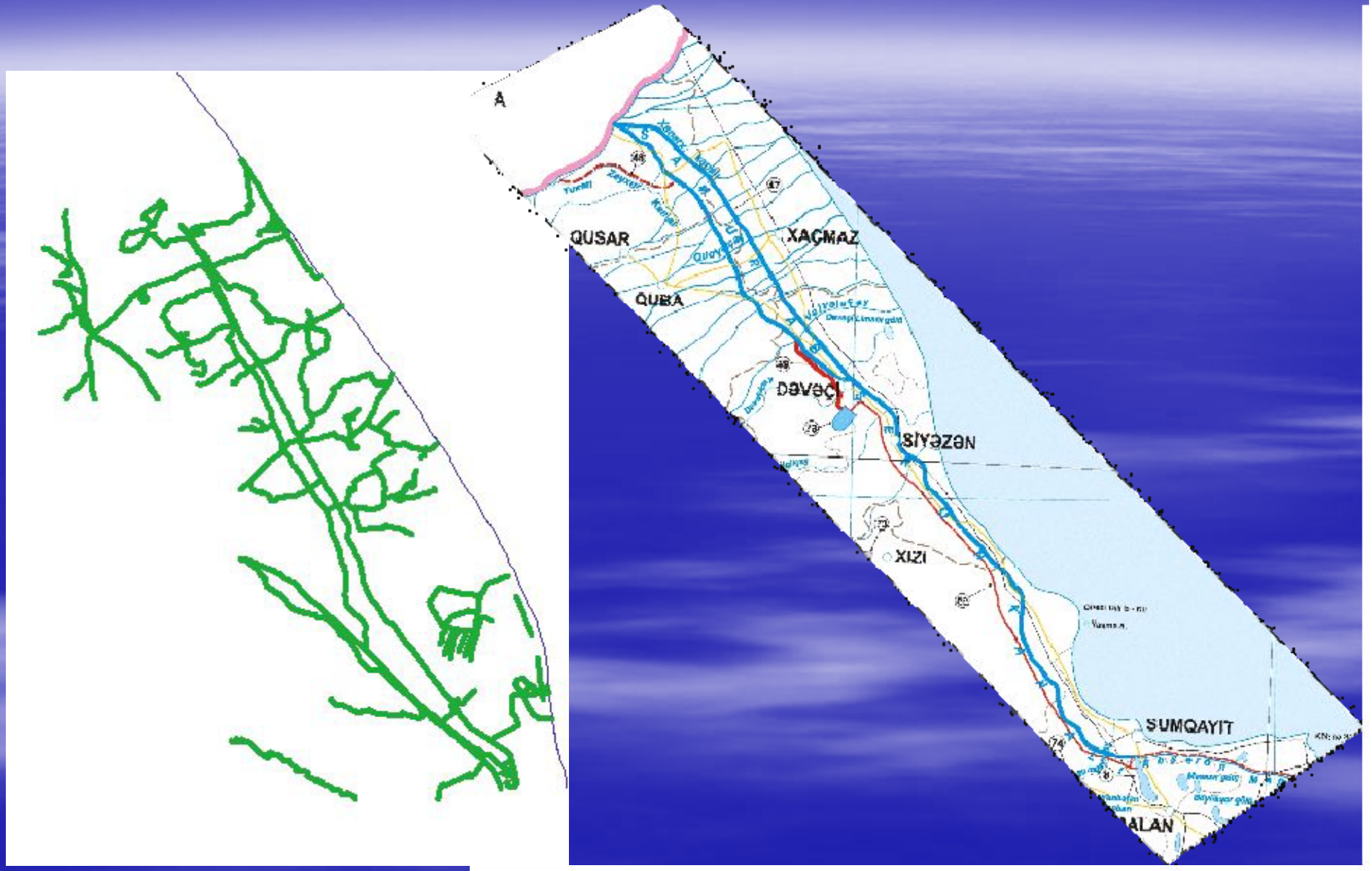
27.5
20

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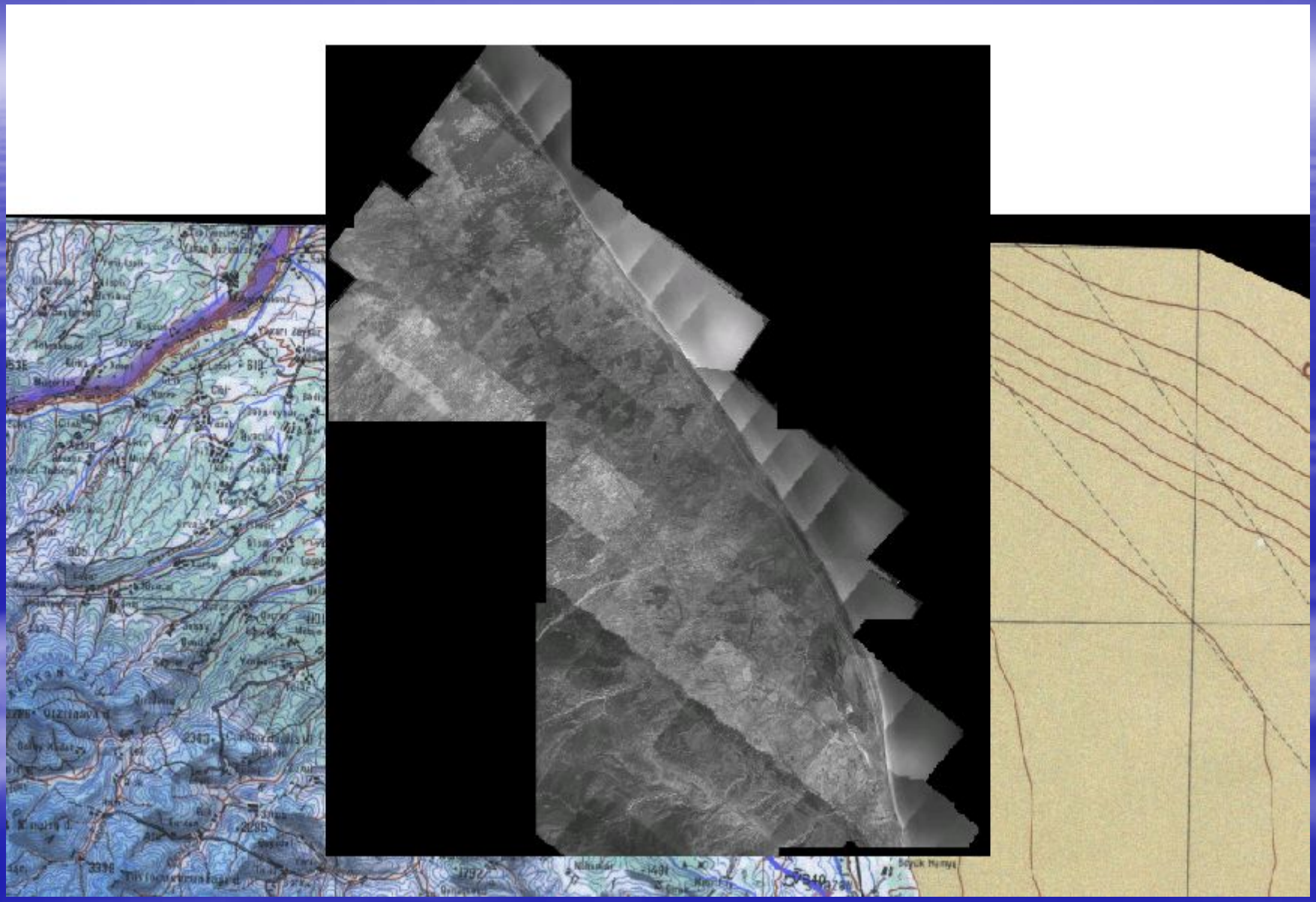

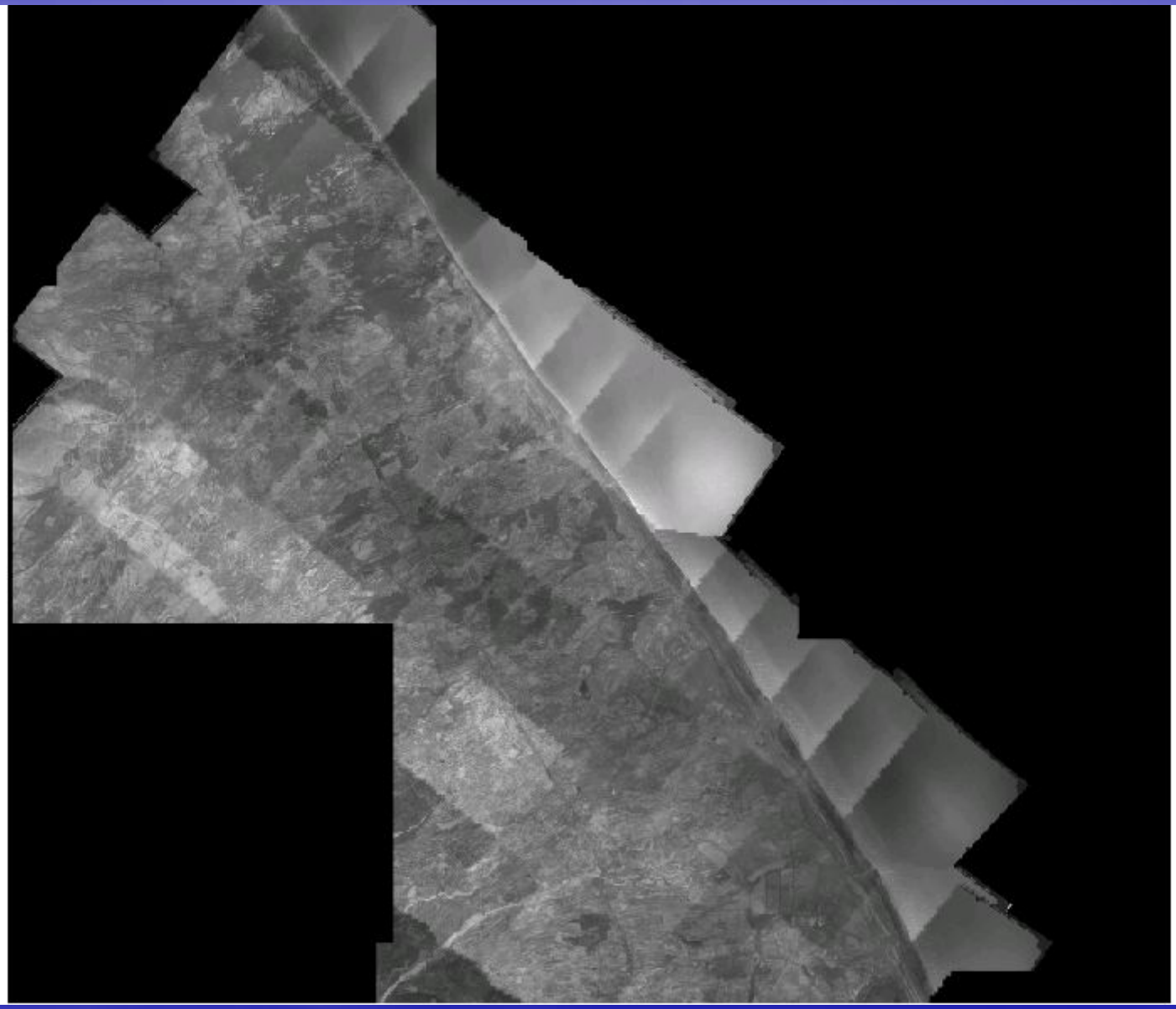

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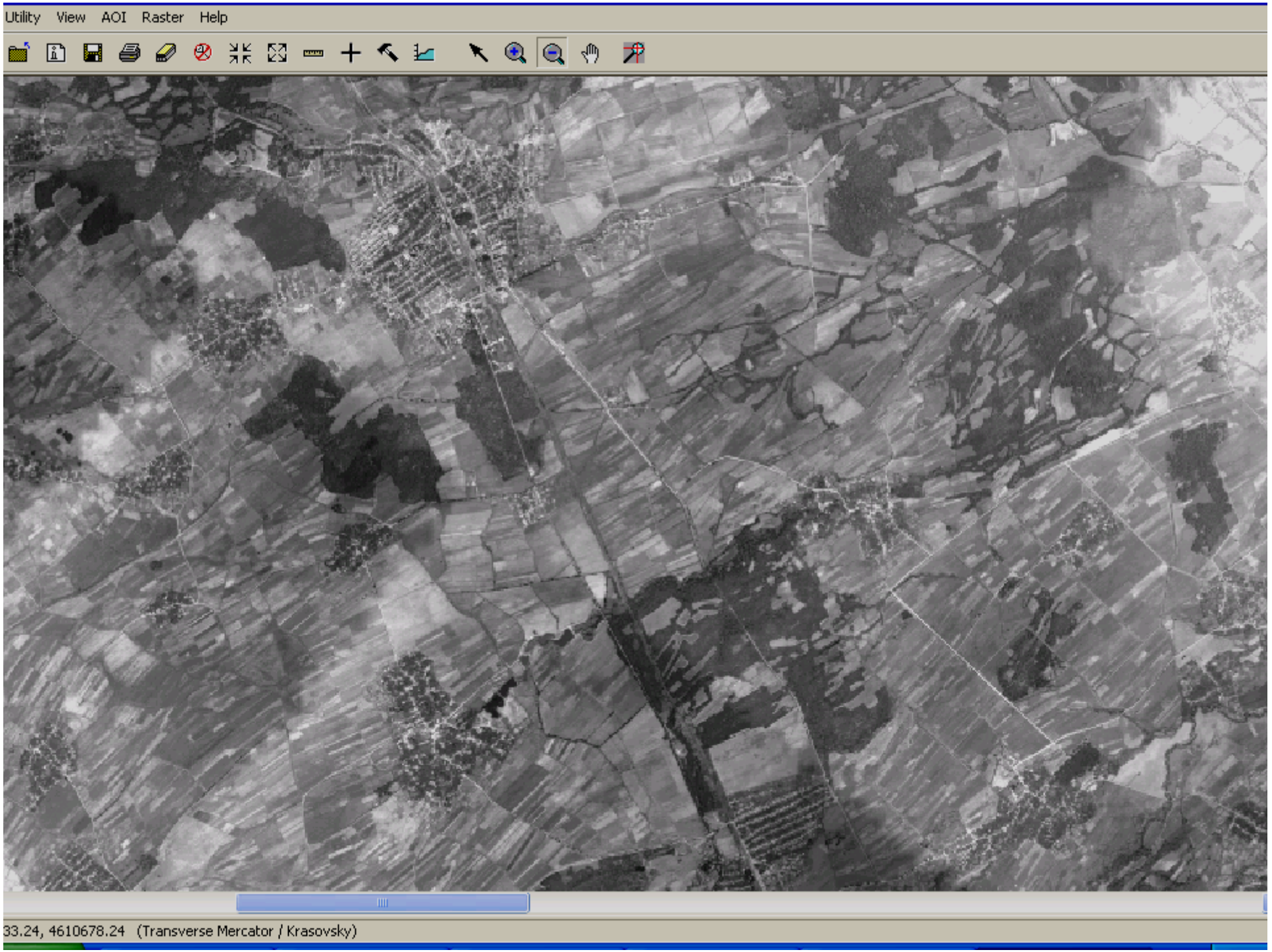
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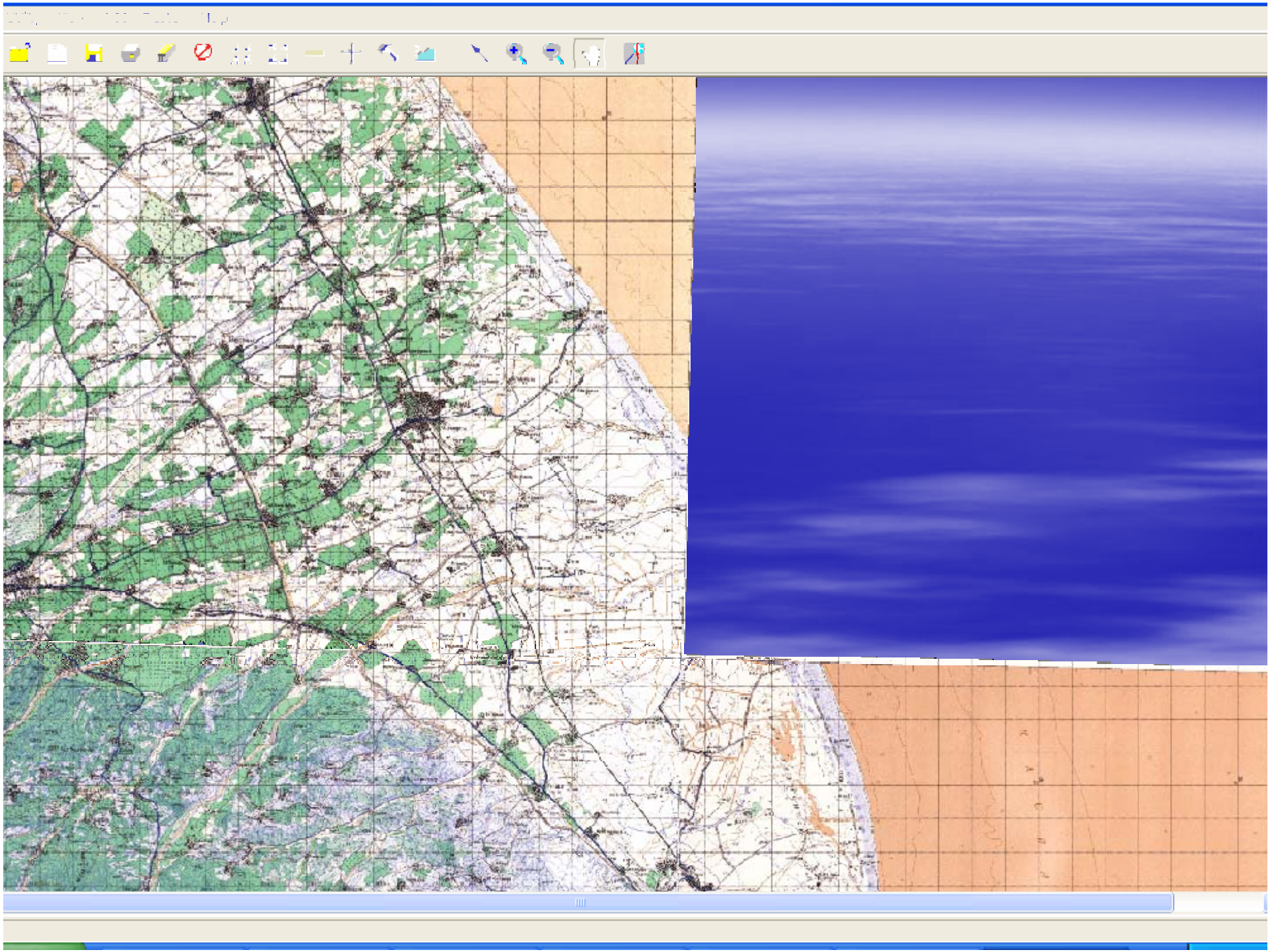
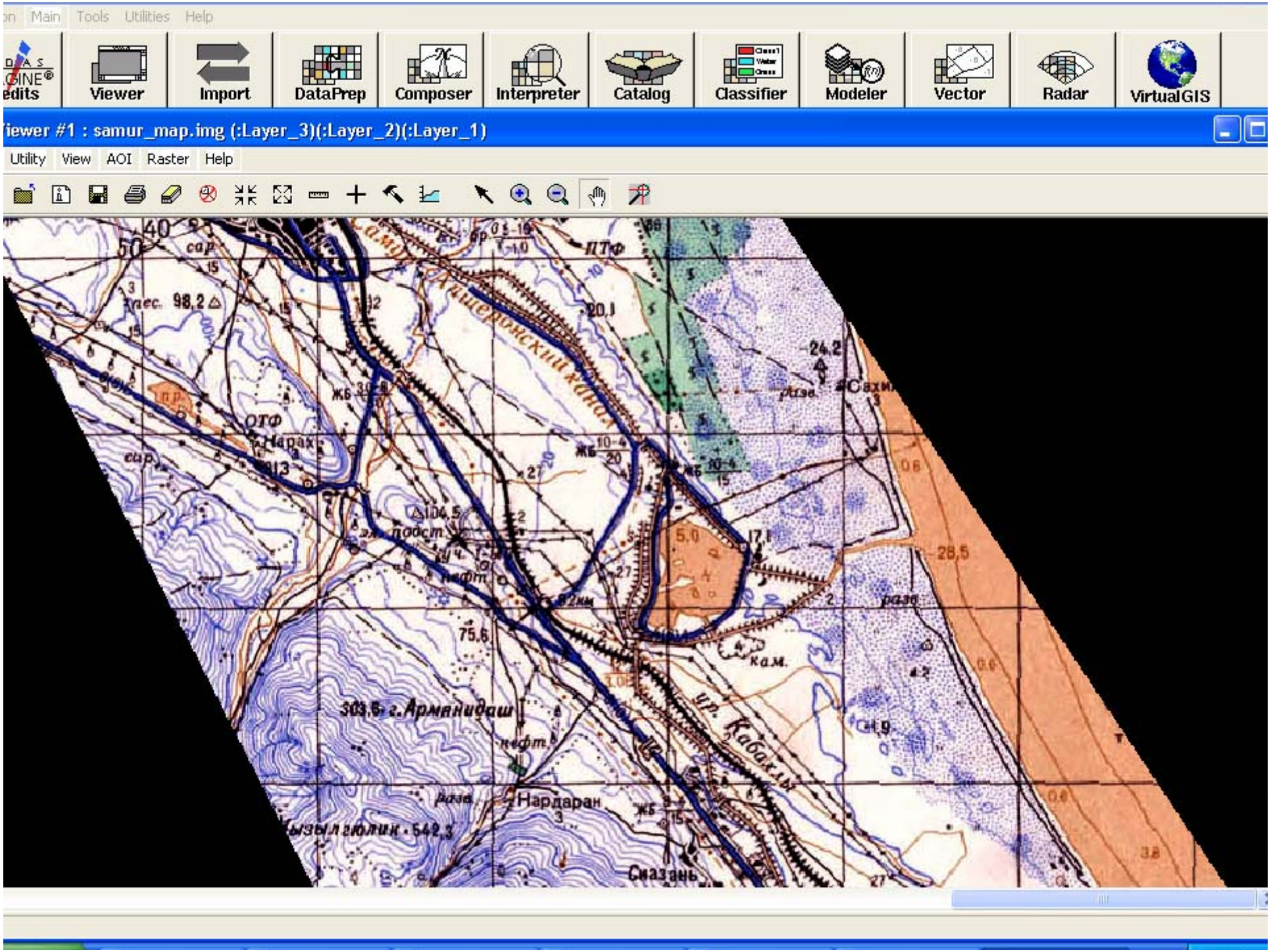
33.24, 4610678.24 (Transverse Mercator / Krasovsky)

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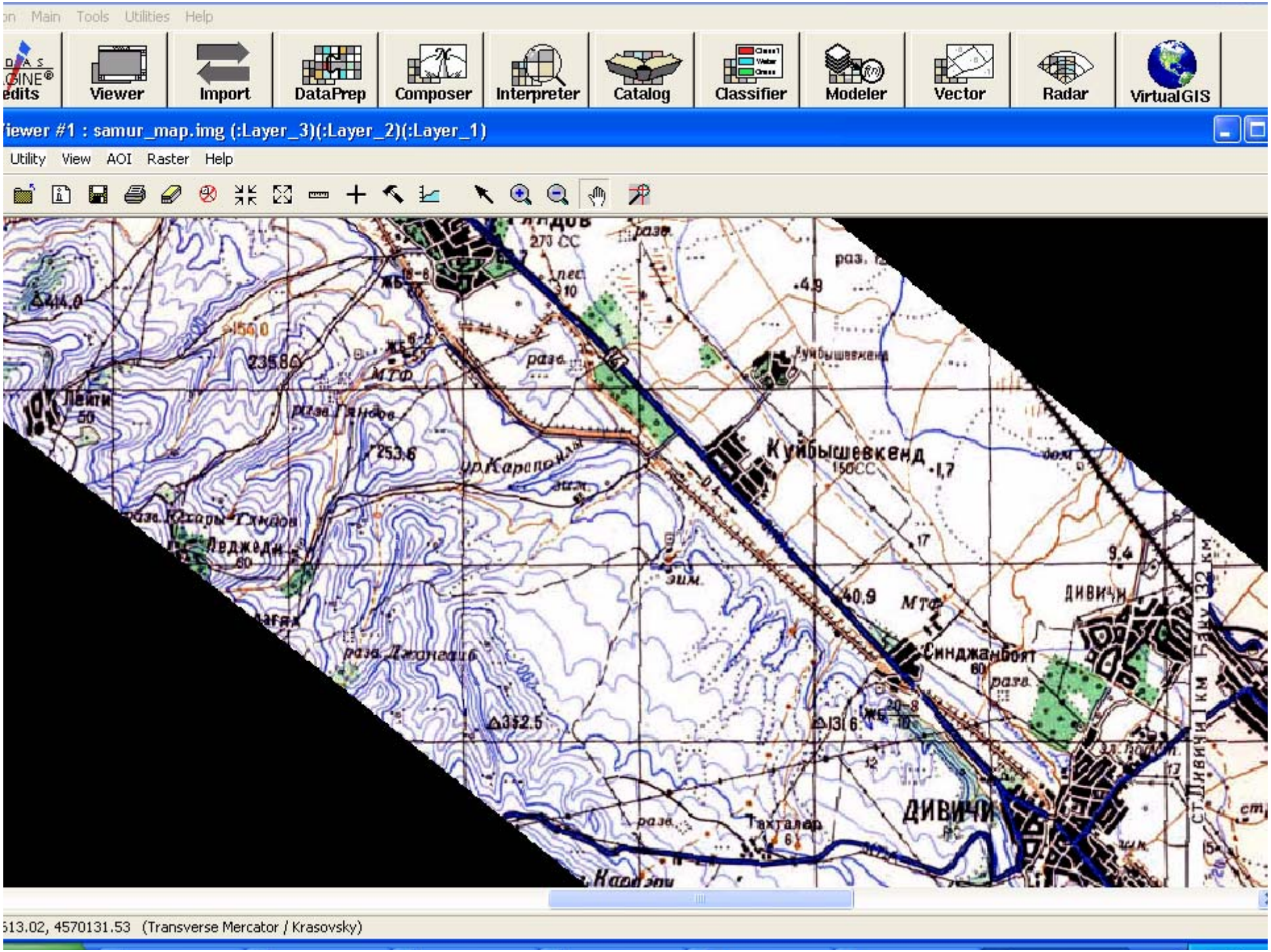

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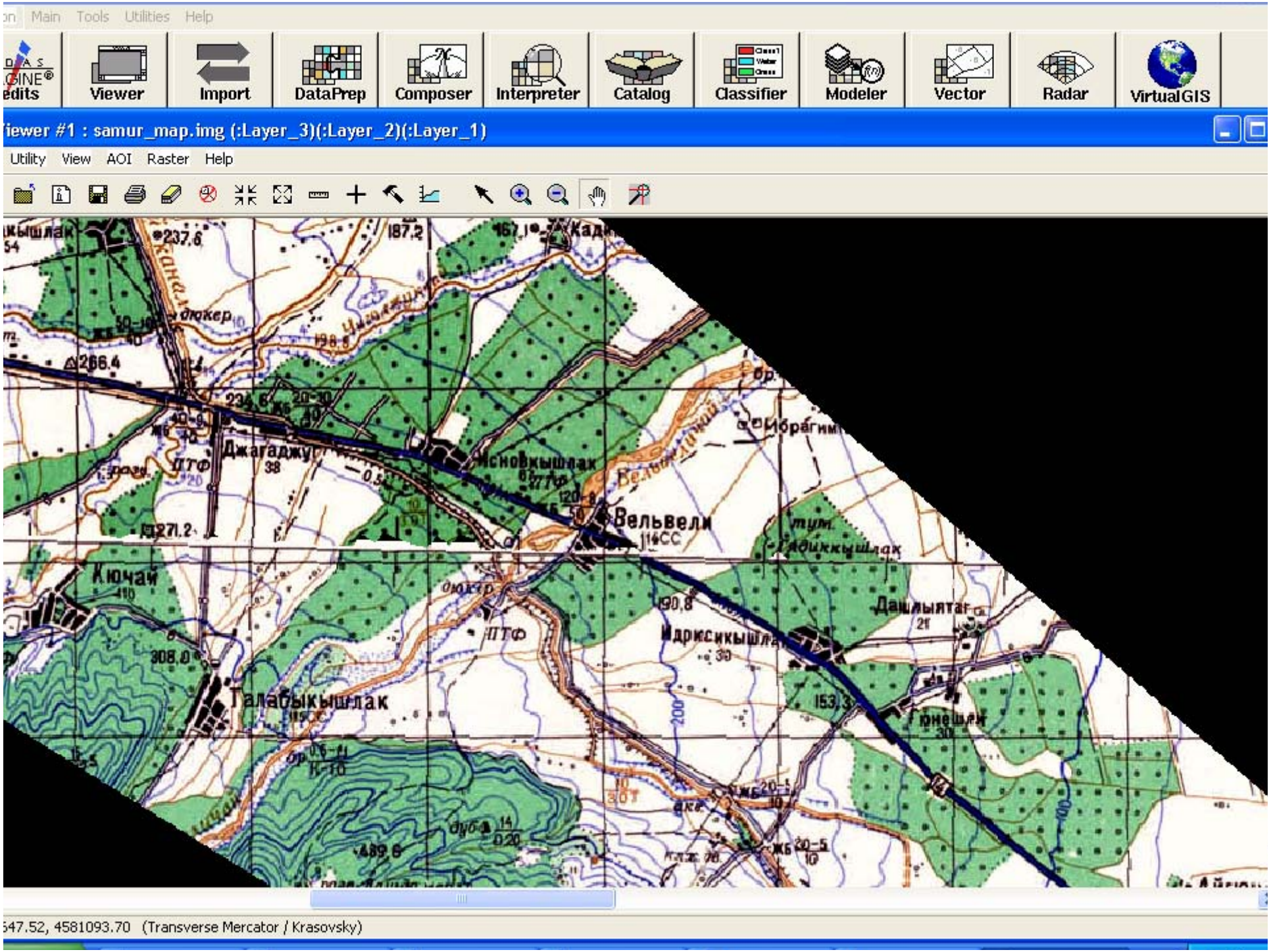
513.02, 4570131.53 (Transverse Mercator / Krasovsky)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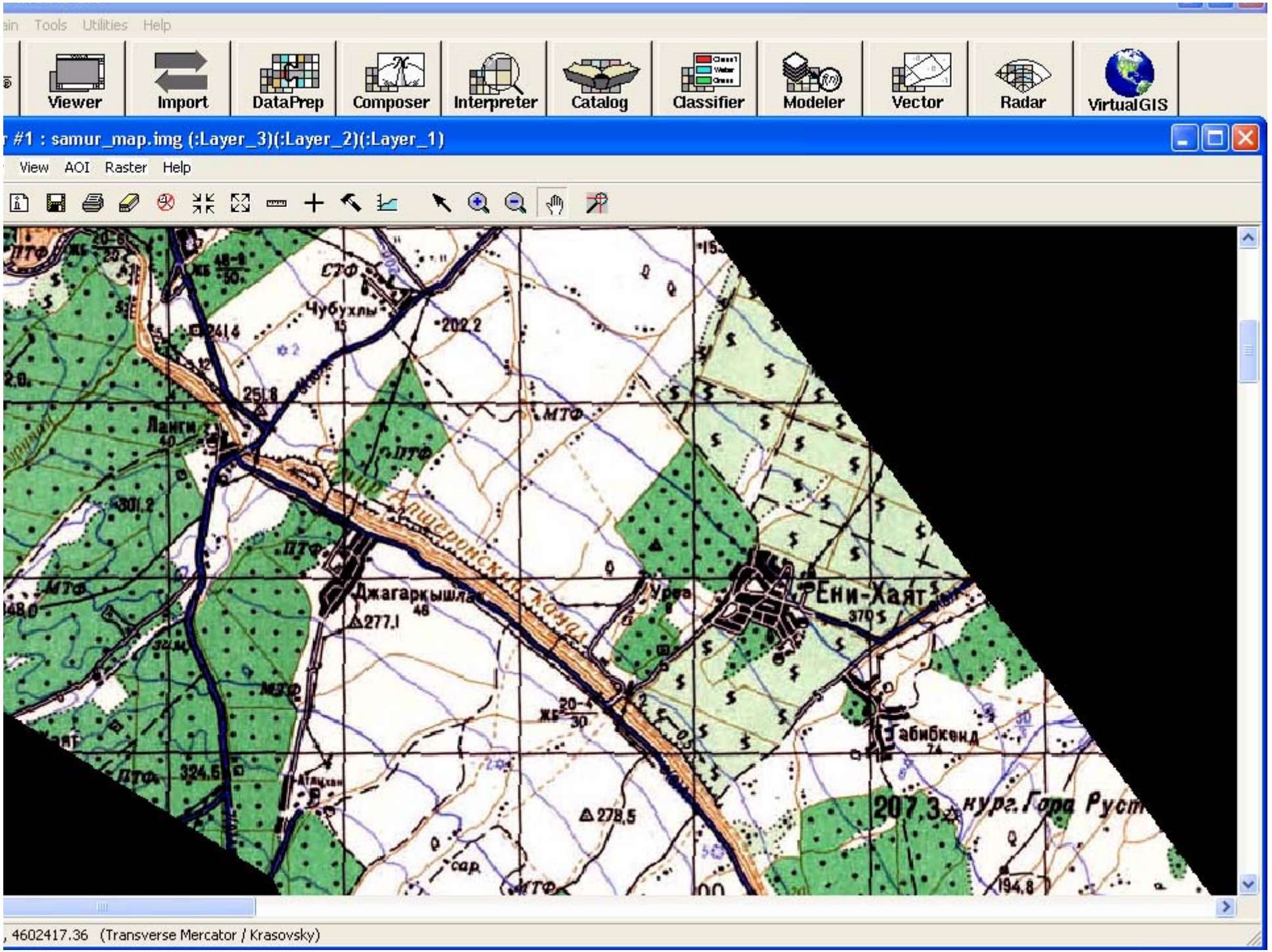

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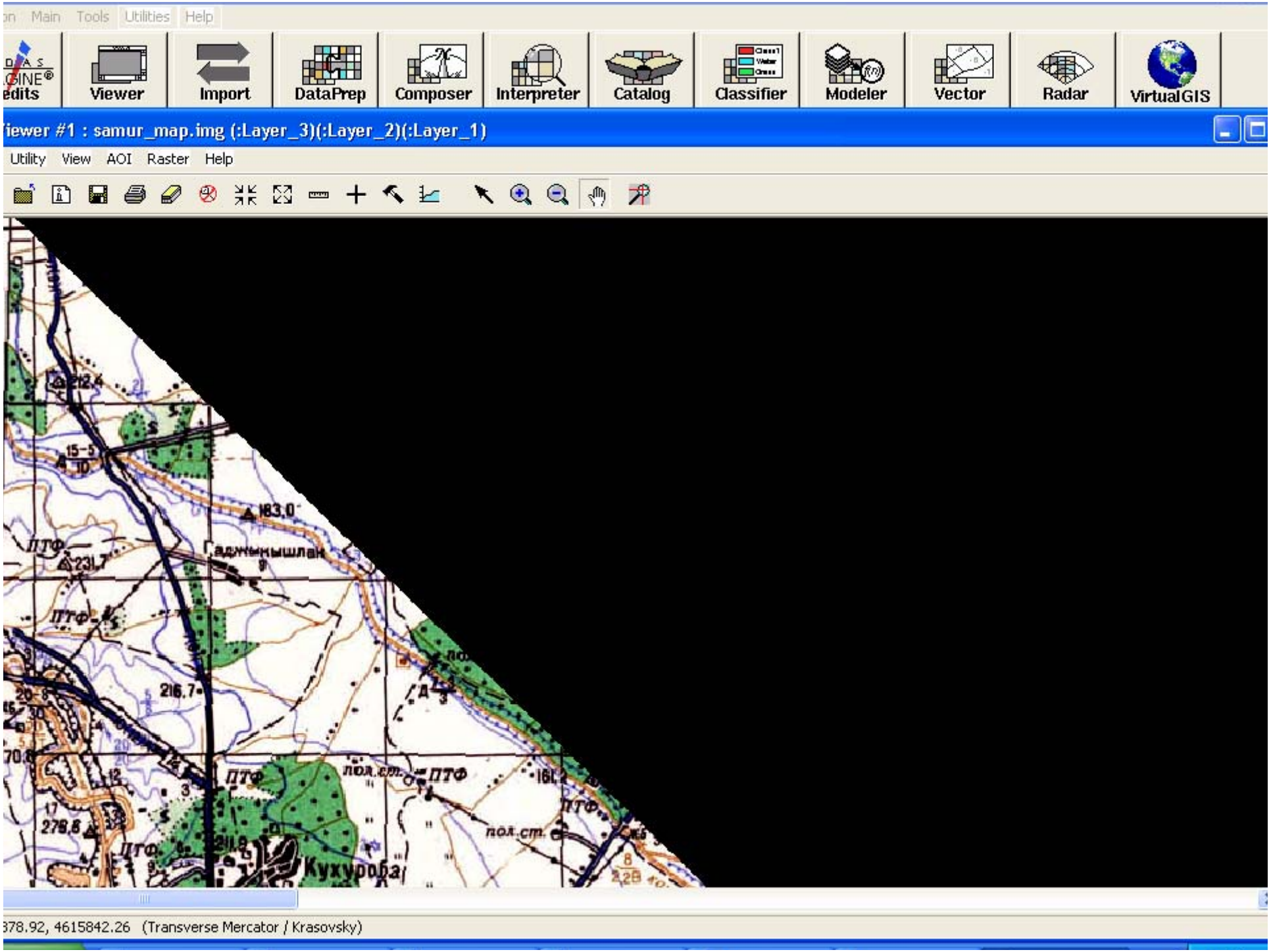
СТФ
МТФ
ПТФ
4602417.36 (Transverse Mercator / Krasovsky)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212.4
183.0
231.7
216.7
ПТФ
пол.ст.
Кухуроба
378.92, 4615842.26 (Transverse Mercator / Krasovsky)

Fragment shown hard crossing oilpipeline with other transport communications

Sevda Ibrahimova, Azerbaijan National Aerospace Agency

METHODOLOGY

Using GIS and remote sensing data, also characteristics of relief's of the specified sites of a line numerical experiments according to influence on risk of character of a relief, types of a ground, viscosity of oil, and also technical decisions on sectioning an oil pipeline have been lead.
The primary purpose for developing the model was to use it to prioritize sections of the pipeline for maintenance. All pipeline way divided into predefined areas for conducting risk assessment. Each area is defined as a portion of the pipeline system that can be treated as a single unit because all of the pipeline attributes are the same throughout its length.
Further development of methods to search on images of areas with crossing gas lines and channel, informative for the decision of tasks in view of the analysis of images is investigated. Studying of methods is directed on the decision of problems of dissertational research and provides consideration of such questions connected with methods of search, as:
1) Development of the mechanism of interaction of methods at the combined processing images IKONOS and SPOT of a terrestrial surface;
2) Research of influence of conditions of shooting on results of work of methods. The chosen methods of search of topological changes on images, their theoretical bases and specificity of realization are considered.
As there was, a big number of natural formations along the pipeline – a terrestrial relief, channels of the rivers, a vegetative cover – are fractal objects and for exact recognition this objects from high resolution images IKONOS, we calculate the fractal dimensions $q(i, j)$ and defined abnormally segments.

IKONOS data and GIS application for oil-pipeline monitoring of Baku-Novorossiysk

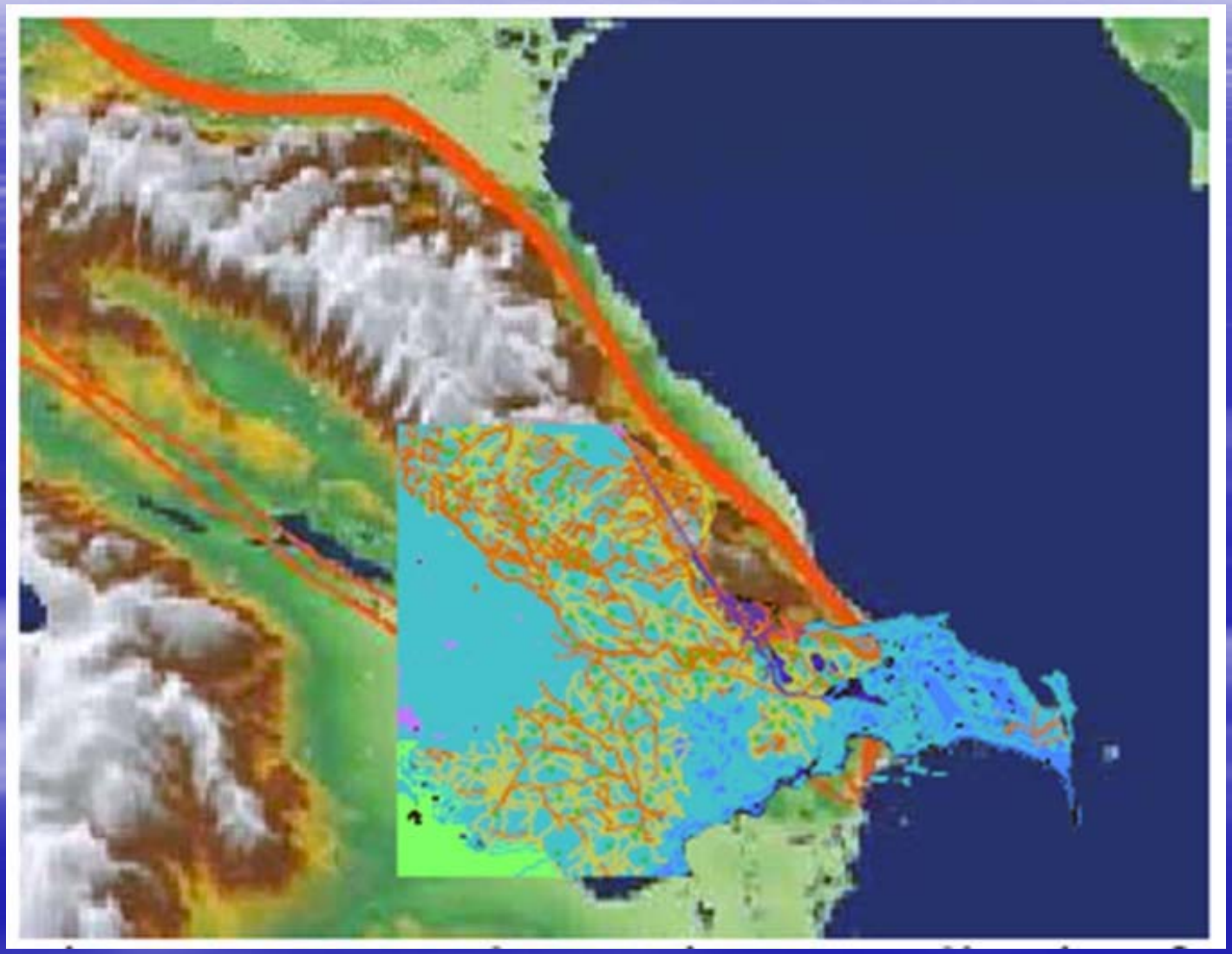

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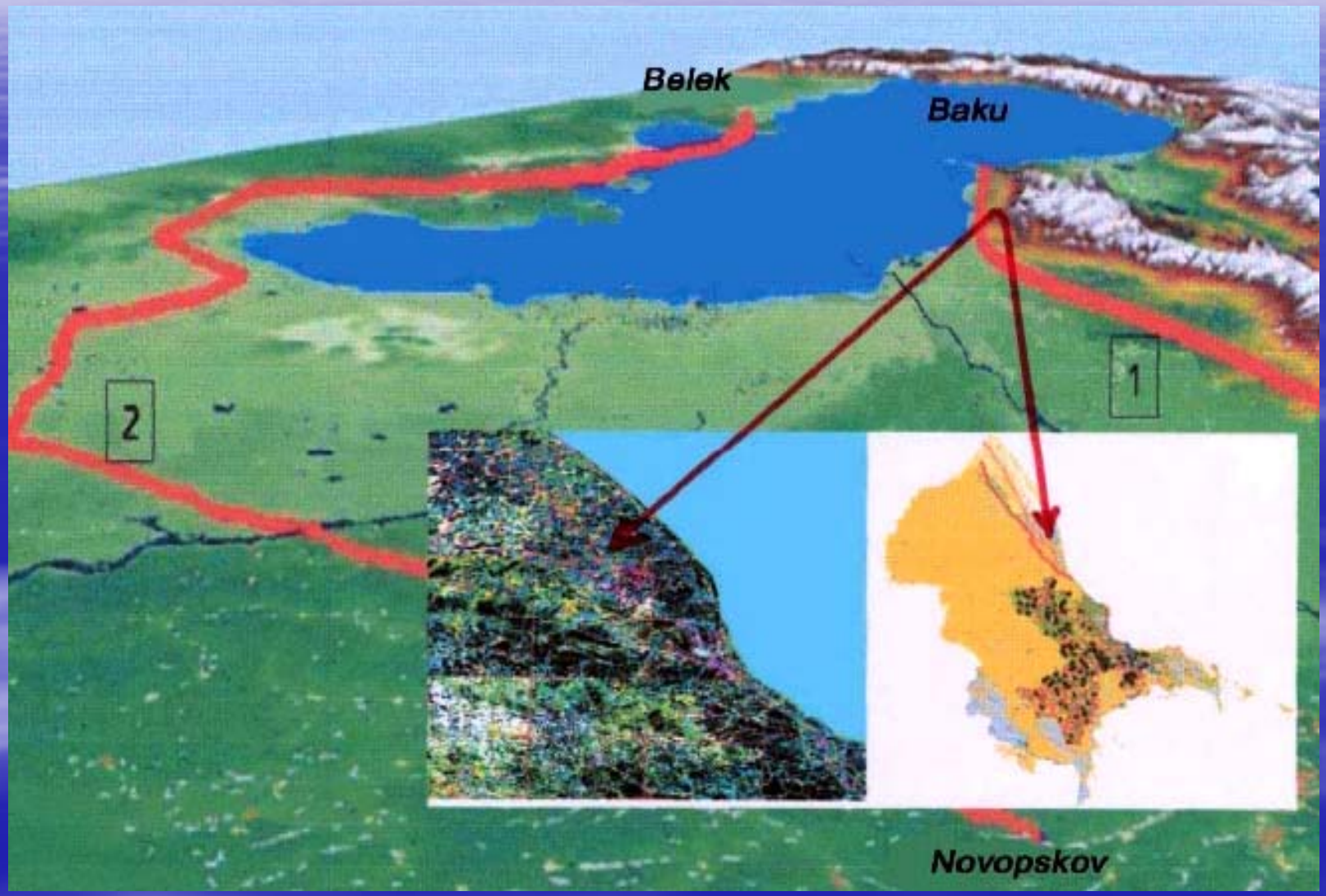
Image of study area (IKONOS- 2008). Data analyzed by ERDAS IMAGINE



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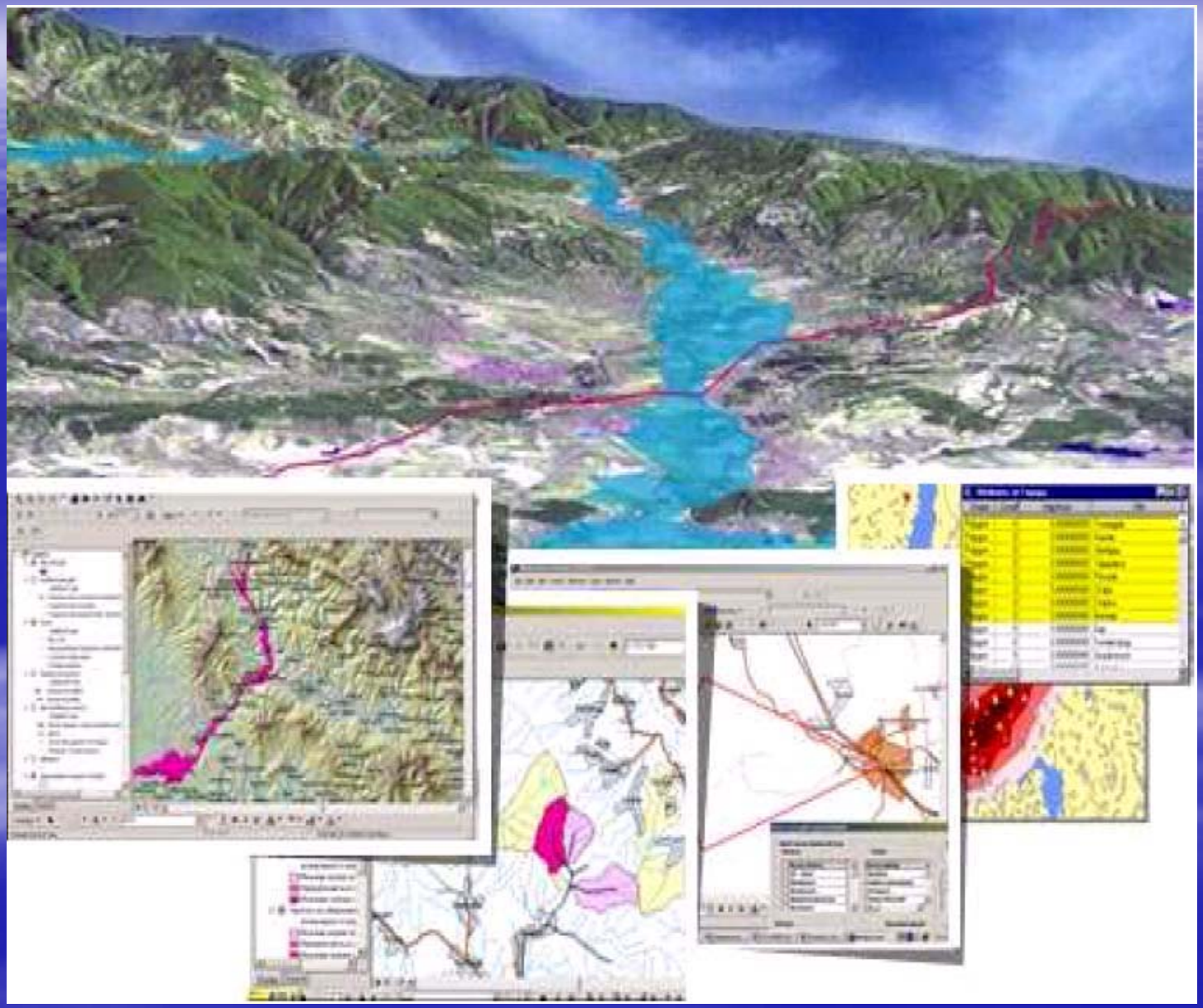
Satellite Imagery based decision support system for oil-pipeline monitoring

Sevda Ibrahimova, Azerbaijan National Aerospace Agency

3D-digital model for pipeline monitoring and GIS application



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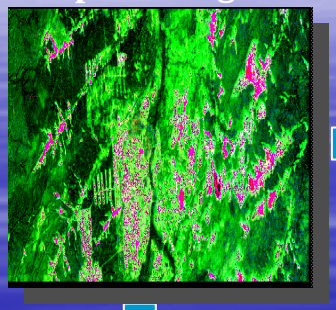
Processing

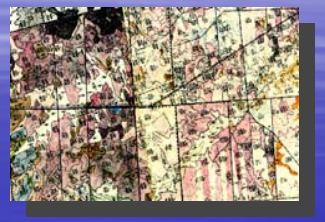
Space images



classification

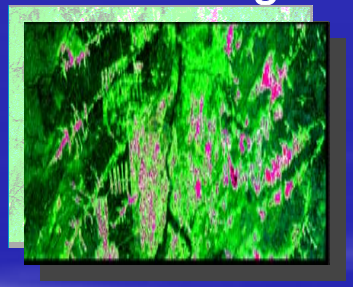
database

maps



Analysis texture

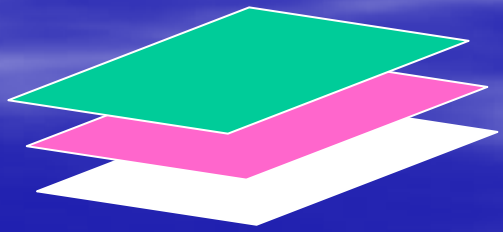
Processing



Recognizing process

Vectorisation

Thematic layers



Spectral analysis

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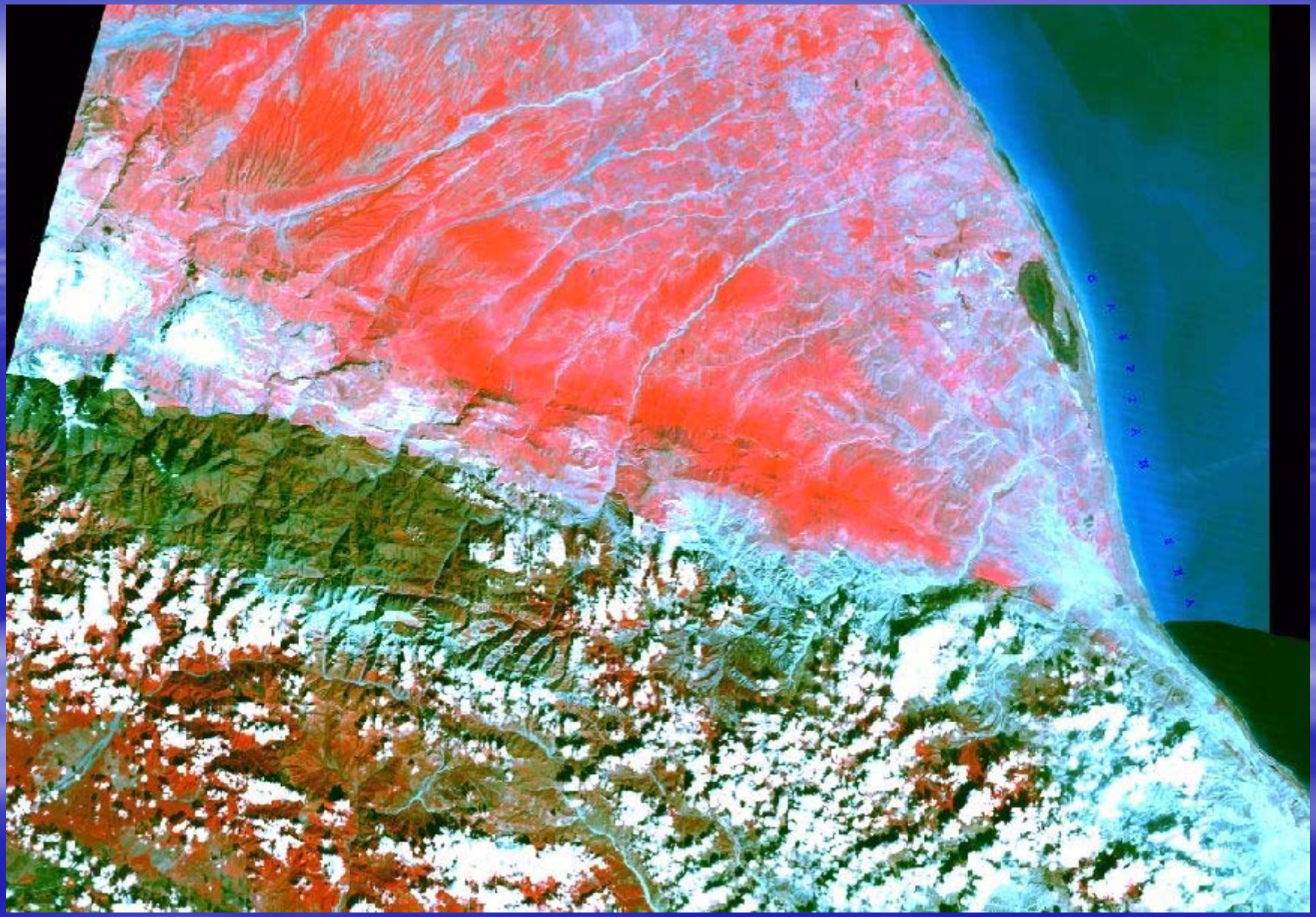

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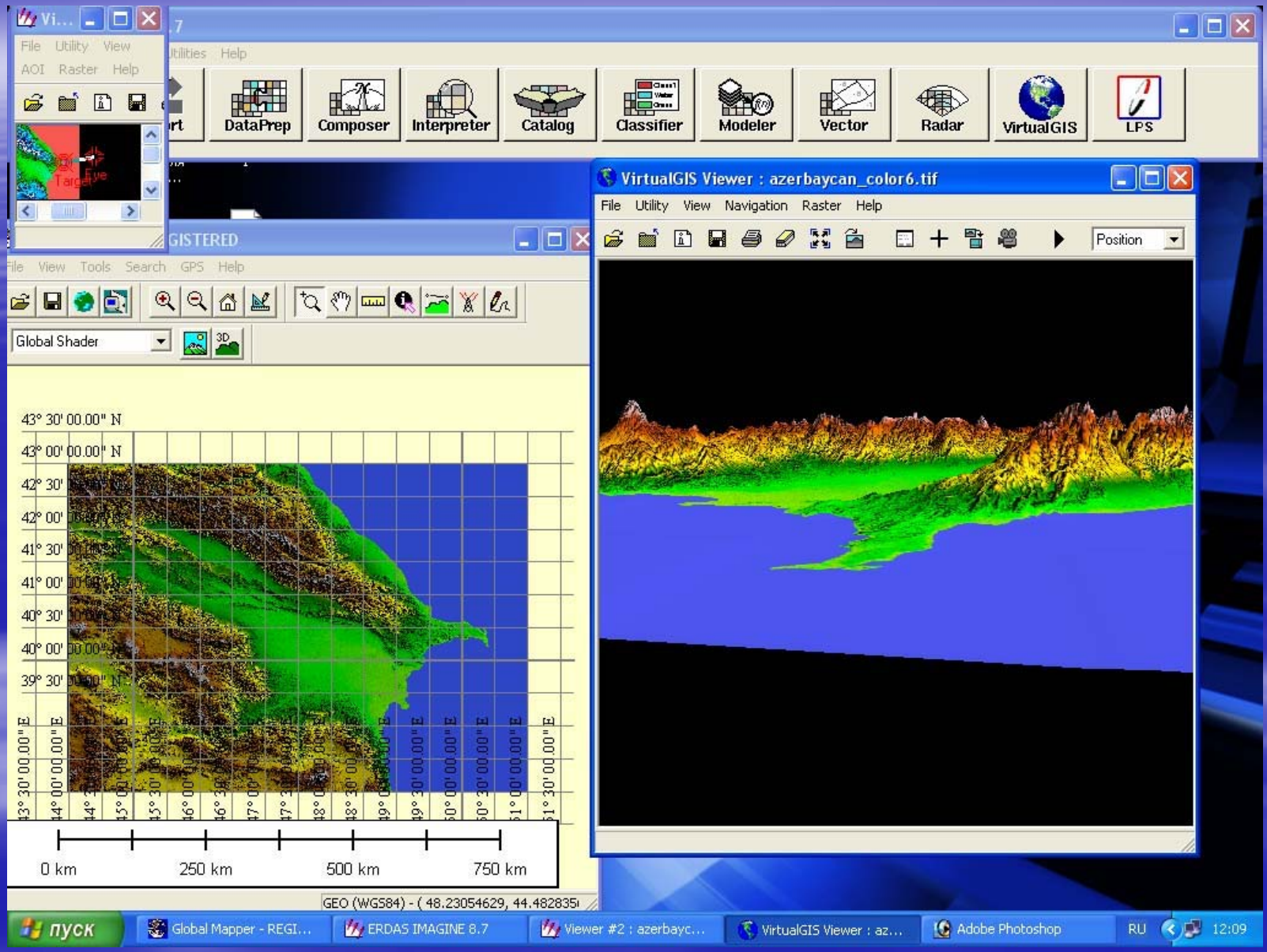

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CONCLUSION

Using remote sensing technologies combined with geoinformation systems provide users with high accuracy database comprising hazards, and disaster issues along oil-pipeline and others crossing infrastructure communications, as well as warning of aggression and risk.

Despite the fact that technological advance and using high resolution images for exact identification needed information, using the different software, disaster risk continues to grow.

In order to make optimal decisions to reduce the risk must be able to obtain the needed operative information from space images.

Also combined high modern information technology with mathematical models needs to be interactive with local ground data allowing it to be used in creating new integrated models for warning vulnerability risk.

THANK'S FOR YOUR ATTENTION!

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