**Technology of Thermal Geo-tomography is based on following Mathematical correlation:**

1. **$\delta\ell \cdot \Delta T$= constant**

**Where $\delta\ell$ – is an element of spatial resolution; ΔT– equivalent of noise radiation temperature that characterizes basic fundamental parameters of aerospace equipment for thermal imaging; $\ell$ = 2,5÷2,72 (constant).**

**An exchange of spatial resolution into temperature sensitivity takes place. The degree of generalization is determined by a number of integer values 1,2,3,4,5…, the first layer of a solid thermal model is initial thermal digital image, and zero layer is a panchromatic image (diapason of a visible electromagnetic spectrum - 450÷900nm).**

2. $$T_{PB} = \sqrt[4]{\varepsilon}\, T_{TB}$$

where , $T_{PB}$ is radiometric temperature ,ε – is the radiating capacity of the object of search, $T_{TB}$ – is thermodynamic temperature.

Knowing radiating capacity function for wave lengths of various geological environments out of experimental data, they can be identified on the basis of aerospace video thermal imager survey data.

Increase in the number of spectral ranges provides for a more precise object temperature measurement as well as determination of their radiating capacity in each of the sub ranges using measured temperature.

**In order to assess penetration depth hN at the level of N layer normally the following formula is used**

**3.** $$h_N = \frac{H^2}{h_T + H}\left(\frac{N\delta}{2} + \frac{N^2\delta^2}{4}\right);$$

**where N – is a number of horizontal layer; $h_T$ – is a proposed distance from the surveyed object to the Earth surface; H – is a distance from the receiver of survey equipment to the Earth surface; $\delta$ - is angular spatial resolution of survey equipment in radians.**

Taking into consideration the fact that the value of the addend in brackets is negligibly small for $N \le 100$ and in case, when $h_T \le H$, which is true for space survey performed from great heights, expression ( 3) can be simplified as follows

$$h_N = H \frac{N}{2}\delta;$$

# Completed Work in North East Part Of India
# Case Studies

ТЕПЛОВЫЕ КОСМИЧЕСКИЕ ТЕХНОЛОГИИ В ПОИСКЕ УГЛЕВОДОРОДОВ

**NORTH EAST ( INDIA)**

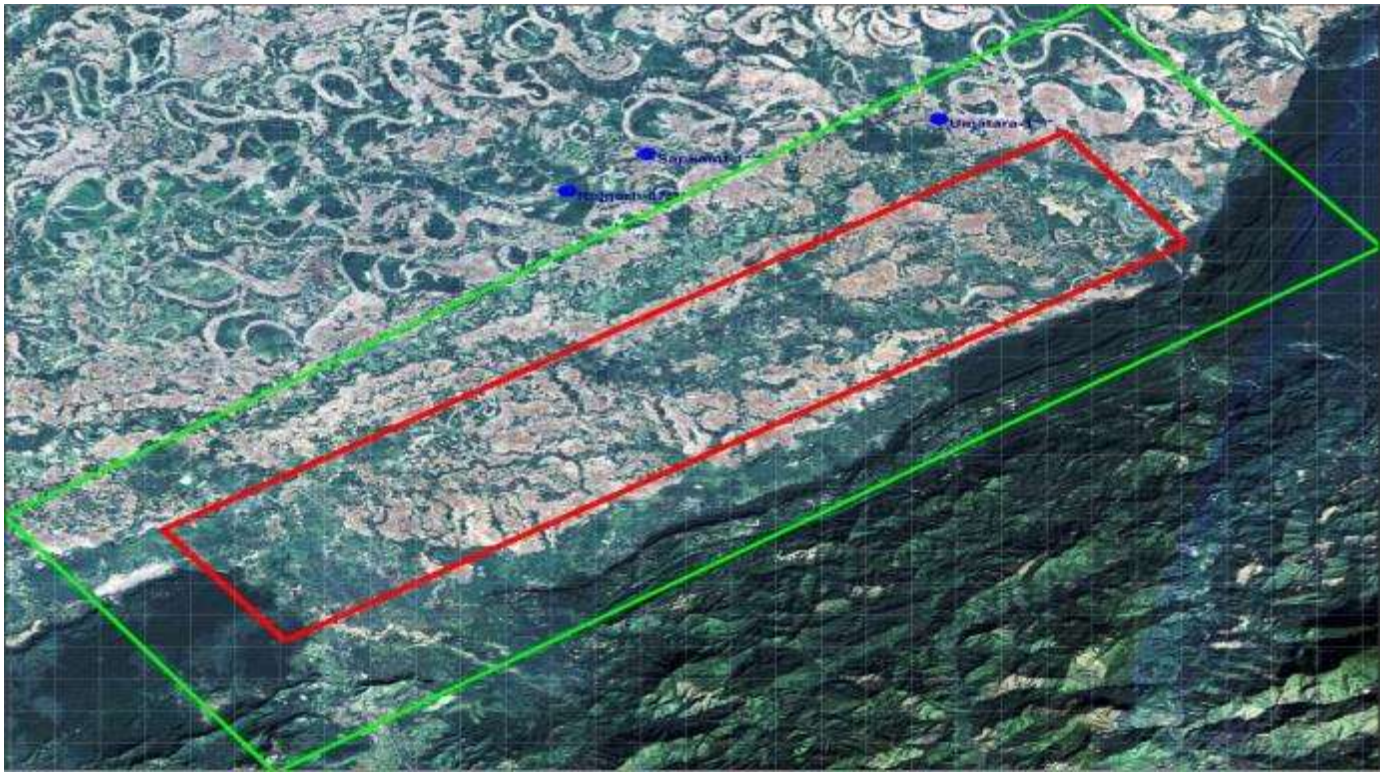
The Technology of Thermal Geo-tomography was carried out through a Contract with one of the Oil company in North east part of India in 2011-12 with the aim to estimate the facilities of Technology of Processing and Interpretation of Satellite Data for revealing hydrocarbon deposits. The study was carried out in two different areas viz. Mizoram and Sonari- Sapekhati area. In Mizoram 300 Sq Km was covered mostly covering the northern part of the block. In Sonari-Sapekhati-Borhat also 300 Sq Km area was covered under this study.

With regards to the Sonari-Sapekhati-Borhat Area, the TGA Interpretation results are almost matching with the drill result of various wells and the understanding of the prospectivity of the area from Seismic Interpretation.

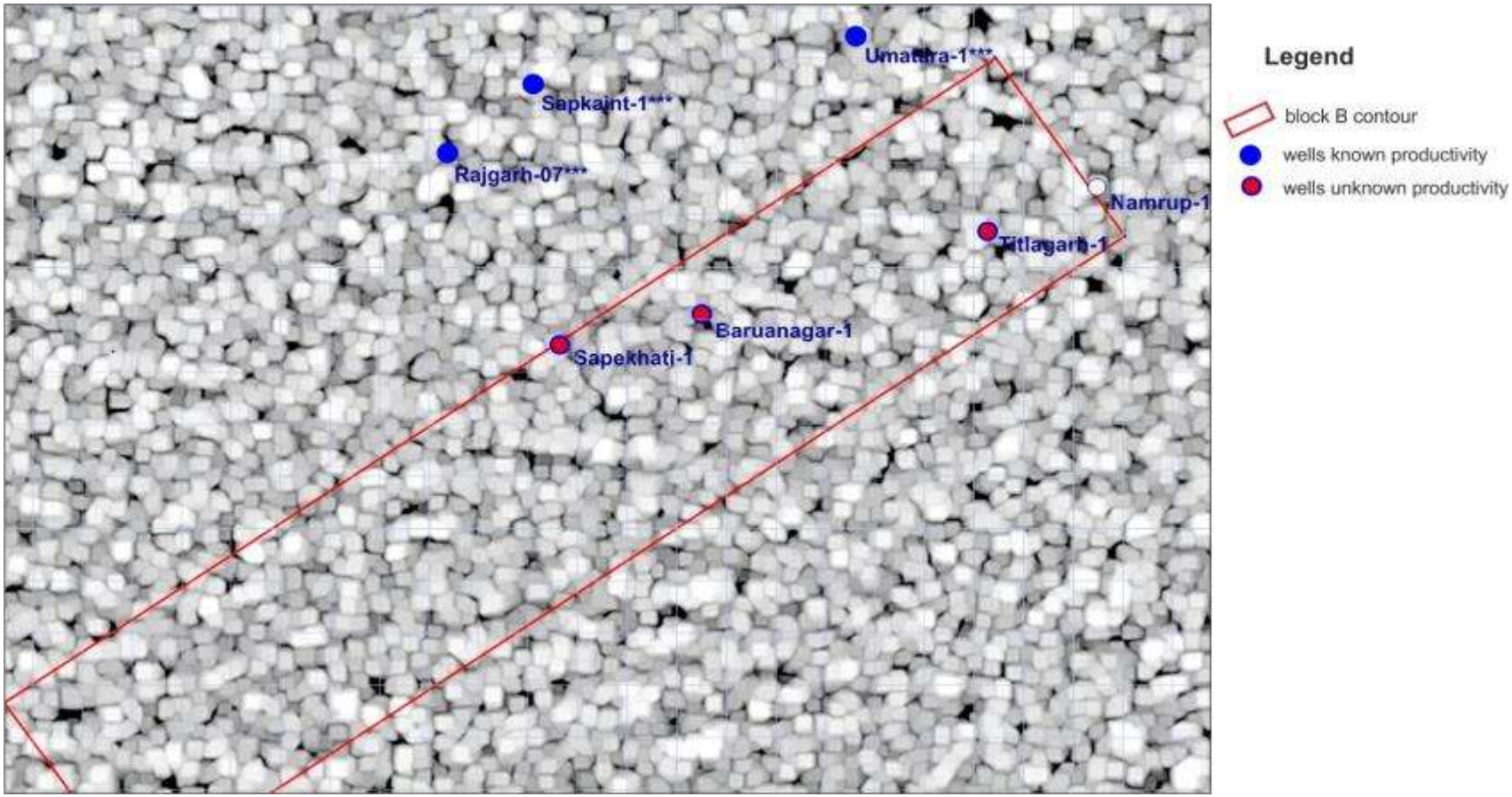
The pre-drill TGA interpretation and post drill results of Sonari-Sapekhati-Borhat areas are given below:

| Well No. | TGA interpretation | Testing Results | Figure No. |
|---|---|---|---|
| Sapkaint-1 | HC accumulation at around 3300m | Proved as Oil @ 3350-m bd Lower Tipam Sand | 1 |
| Rajgarh-7 | HC accumulation at around 3500m-4200m | Proved as Oil @ 3068-mbd Tipam Middle Sand | 2 |
| Baruanagar-1 | Reservoir is tight in nature | Proved as tight reservoir | 3 |
| Sapekhati-1 | Reservoir is tight in nature | Proved as tight reservoir | 4 |
| Umatara-1 | HC accumulation at around 3600m | Proved as Oil @ 4287-mbd Barail $4^{th}$ +$5^{th}$ Sand | 5 |

# BORHAT-SEPEKHATI BLOCK (ASSAM)



# Horizontal Layer -1



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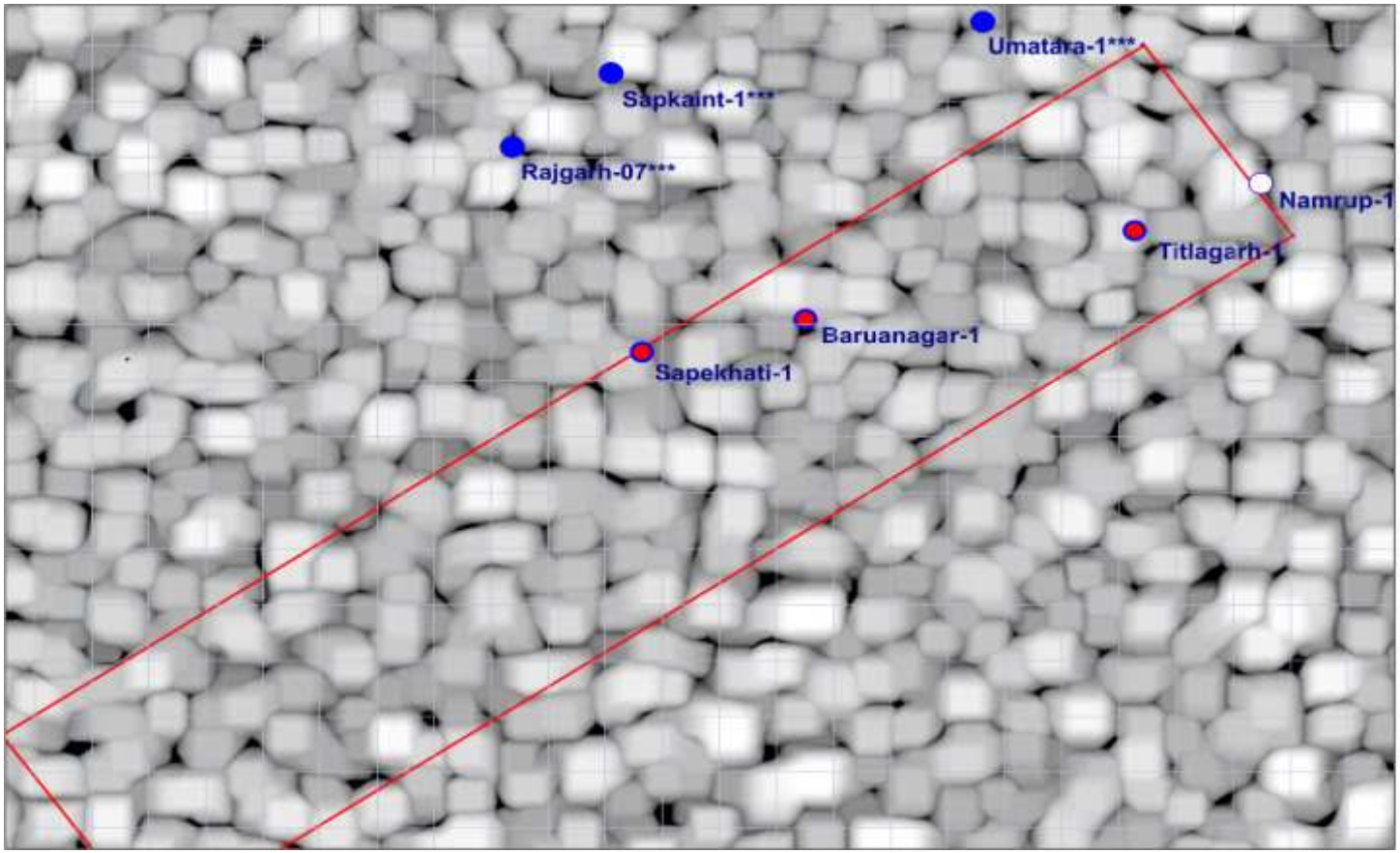
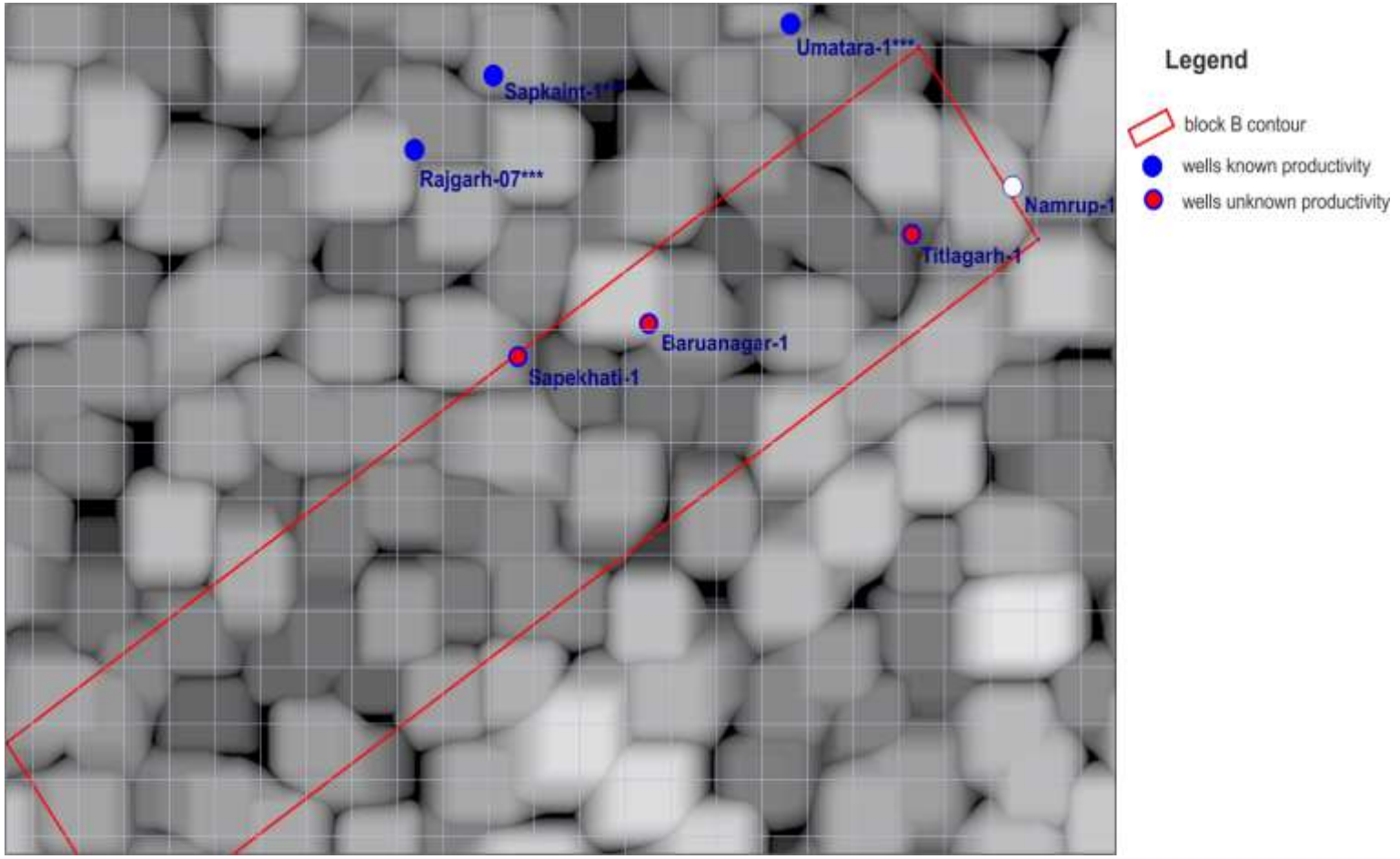
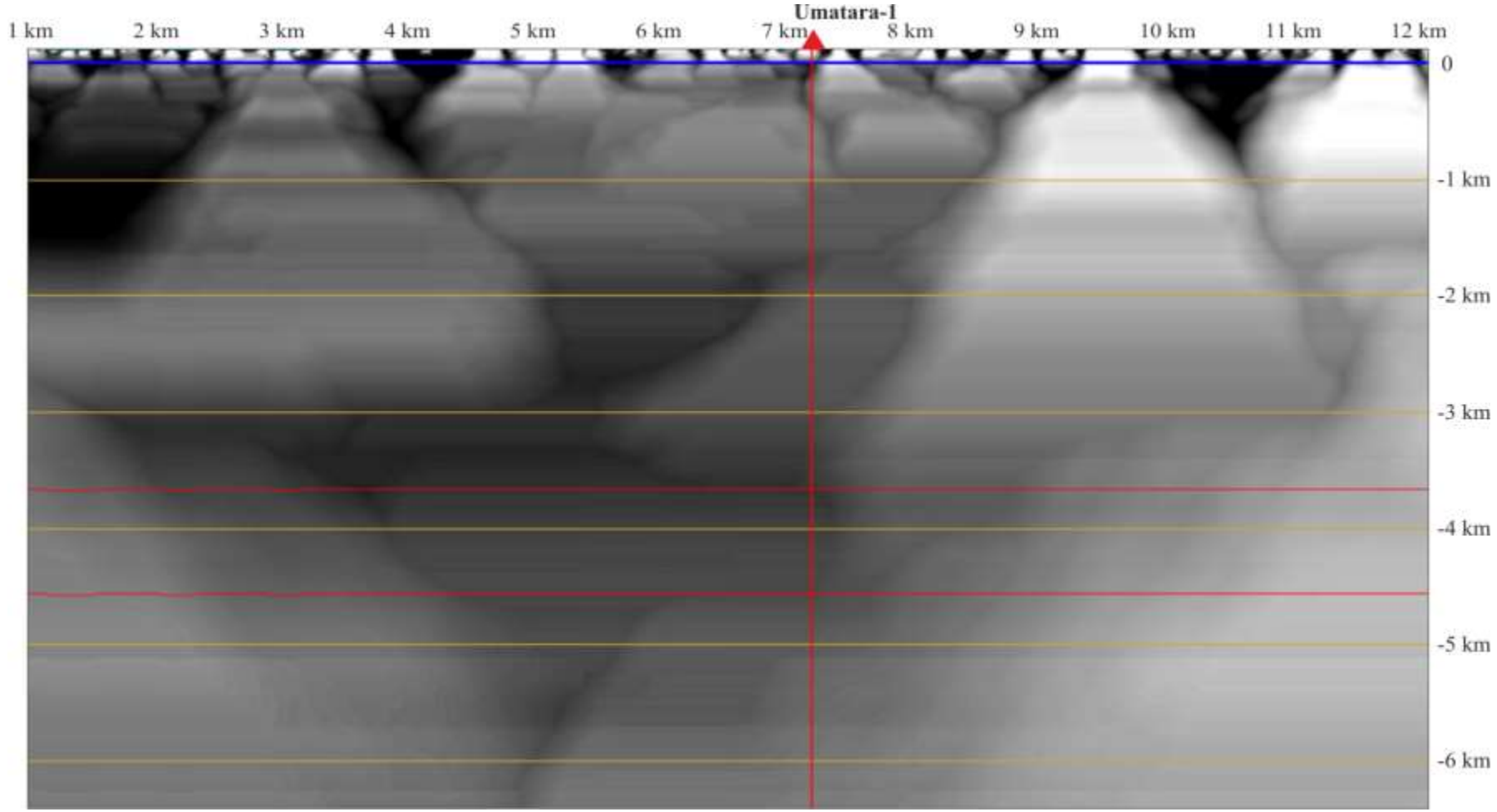


# Horizontal Layer -3



# Vertical Section



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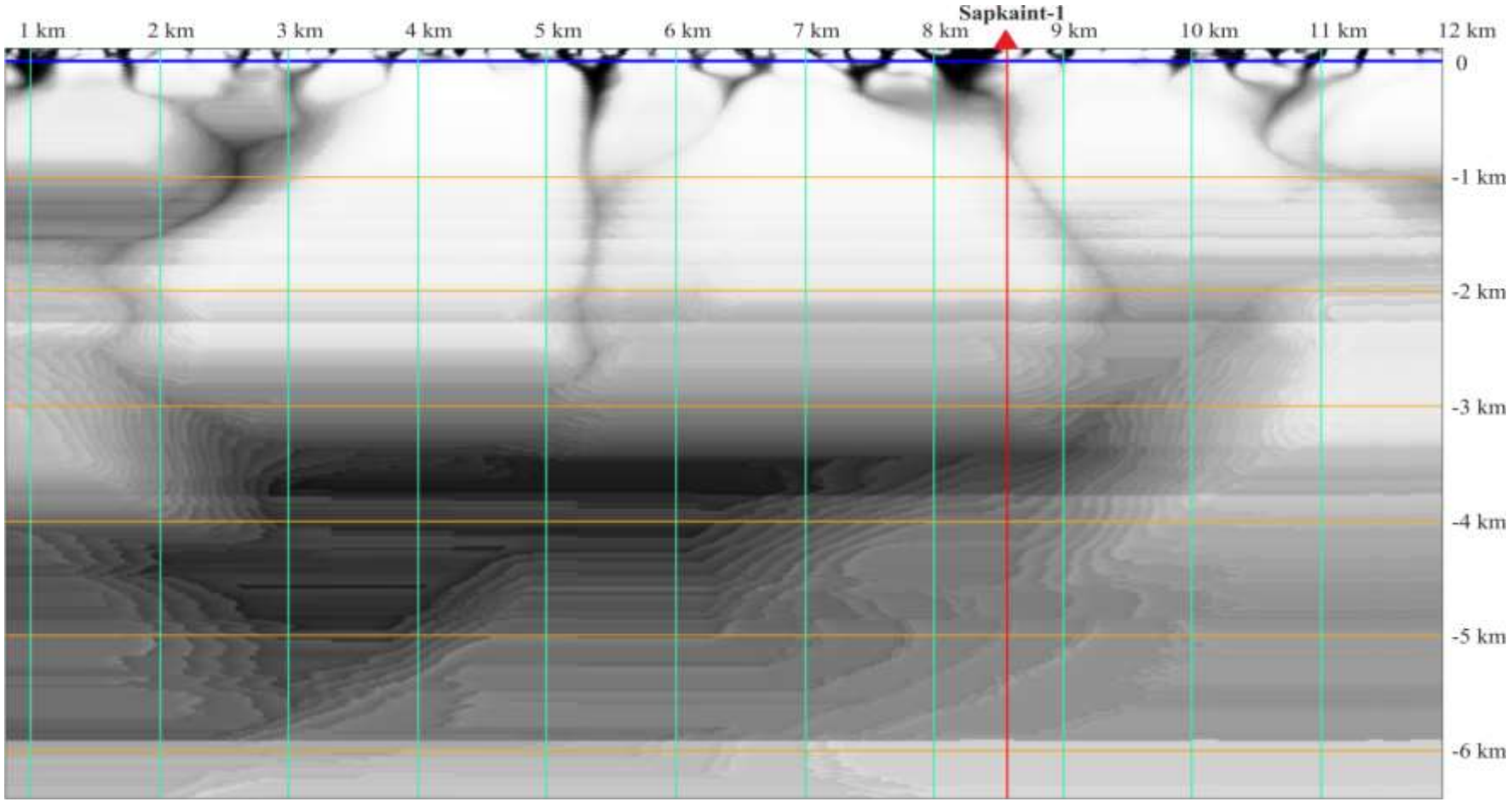

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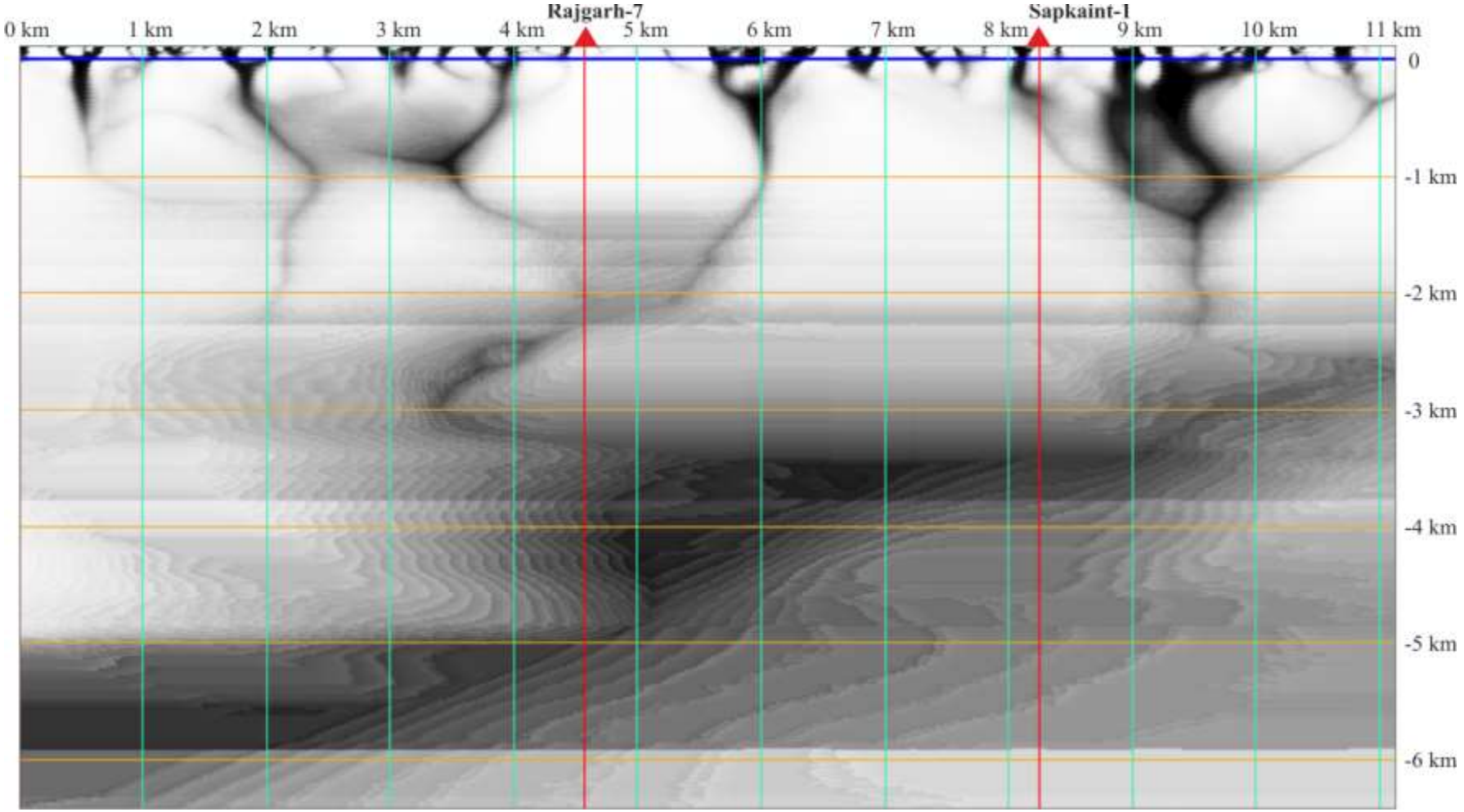

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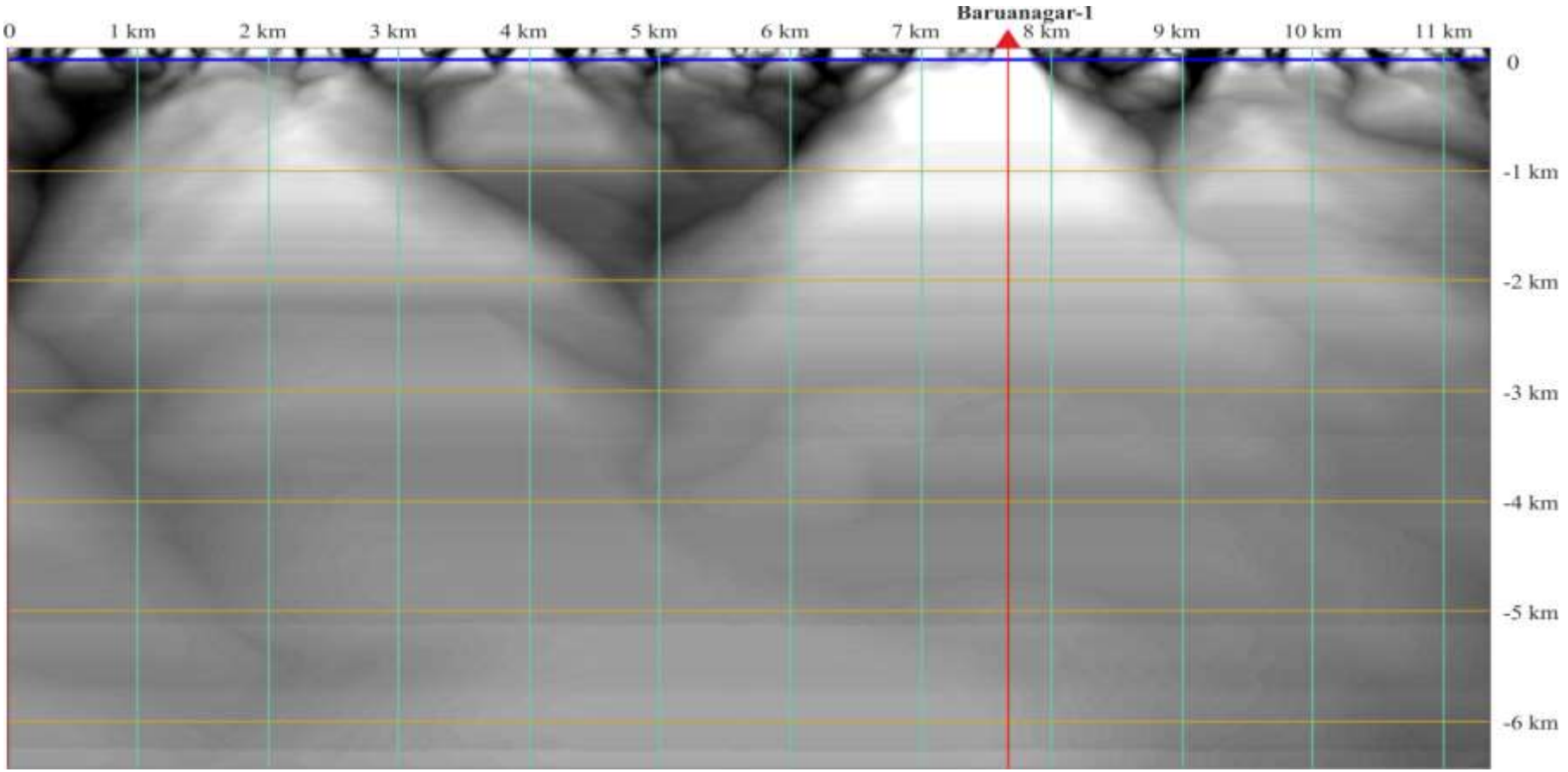
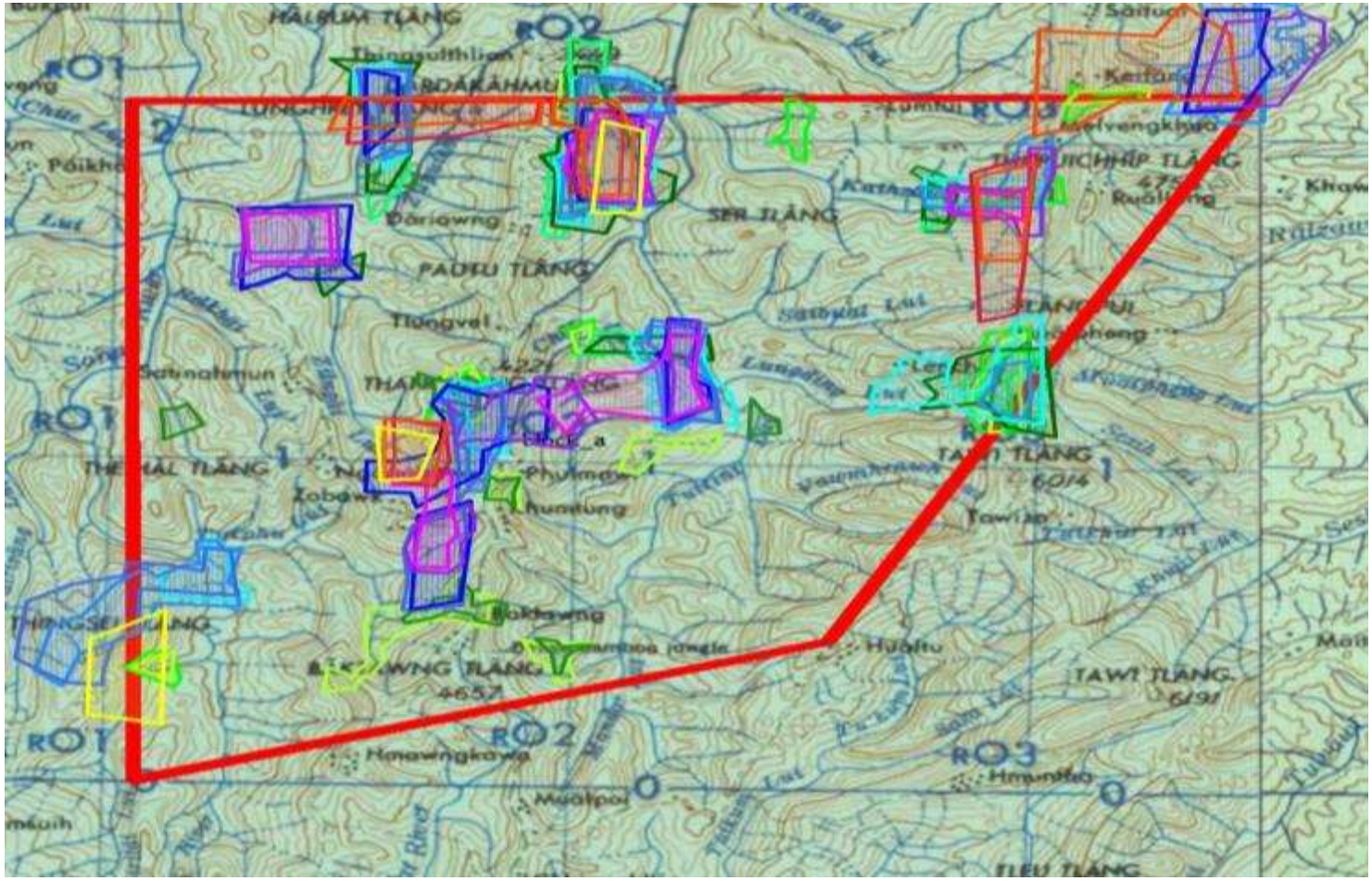


MIZORAM
ТЕПЛОВЫЕ КОСМИЧЕСКИЕ ТЕХНОЛОГИИ В ПОИСКЕ УГЛЕВОДОРОДОВ

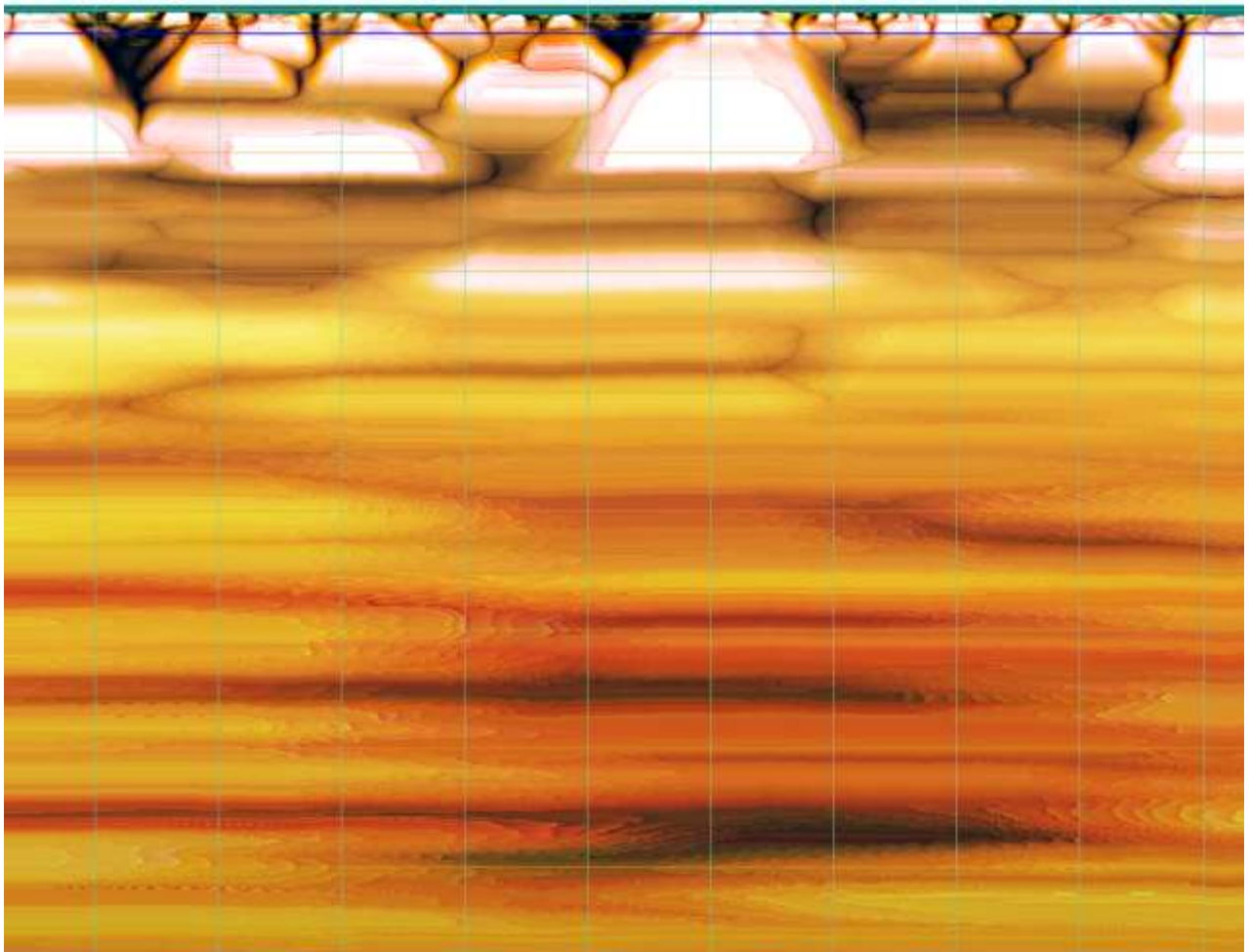

RO1
RO2
RO3
PADU TLÀNG
SER TLÀNG
TAWI TLÀNG
TAWI TLÀNG
RO1
RO2
RO3

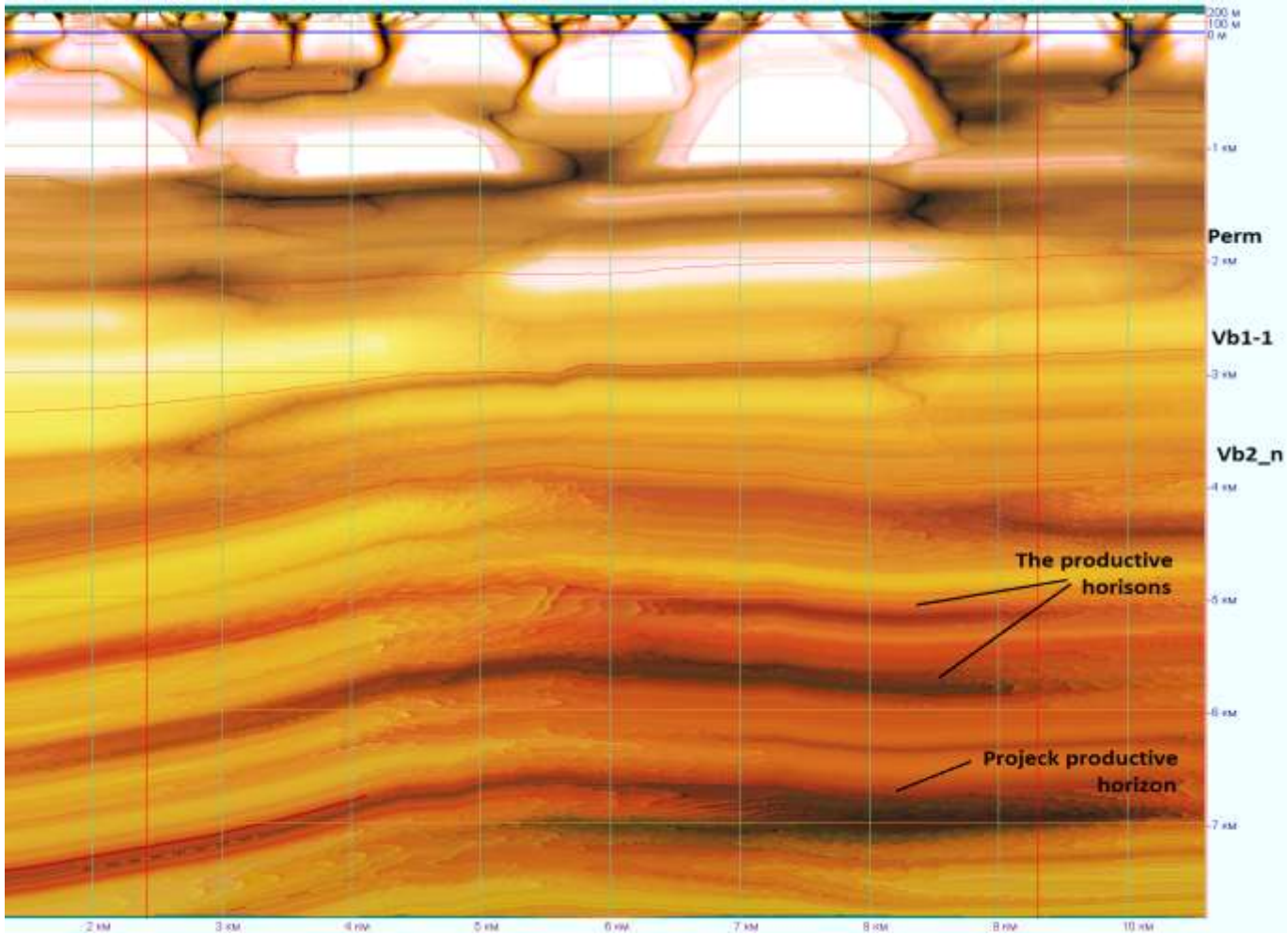
Kaifang 1
Kaifang 1 OIL
Kaifang 2
Kaifang 2_2
Muaipheng
Image © 2016 CNES / Astrium
© 2016 Google
Google earth

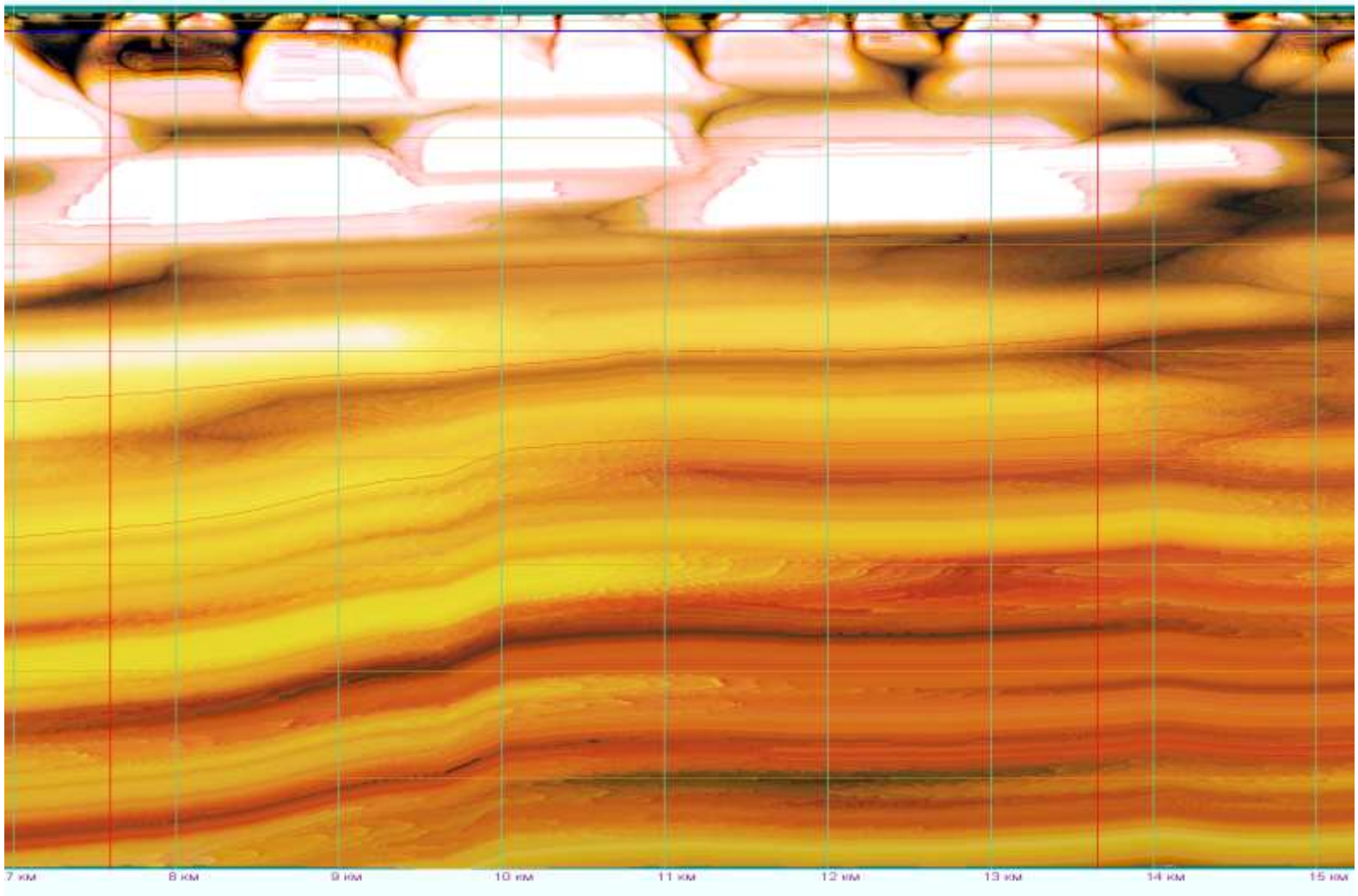
Keifang 1 OIL
Keifang 1
Keifang
Сайчуан
B
Ruichawm
D
Ruallung
Keifang 3
Google earth

# INTERPRETATION OF TTG Data ALONG WITH SEISMIC DATA ON PROGRAM “THERMOSURFER”

ТЕПЛОВЫЕ КОСМИЧЕСКИЕ ТЕХНОЛОГИИ В ПОИСКЕ УГЛЕВОДОРОДОВ




Perm
Vb1-1
Vb2_n
The productive horisons
Projeck productive horizon


7 км
8 км
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13 км
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15 км

# ТЕПЛОВЫЕ КОСМИЧЕСКИЕ ТЕХНОЛОГИИ В ПОИСКЕ УГЛЕВОДОРОДОВ