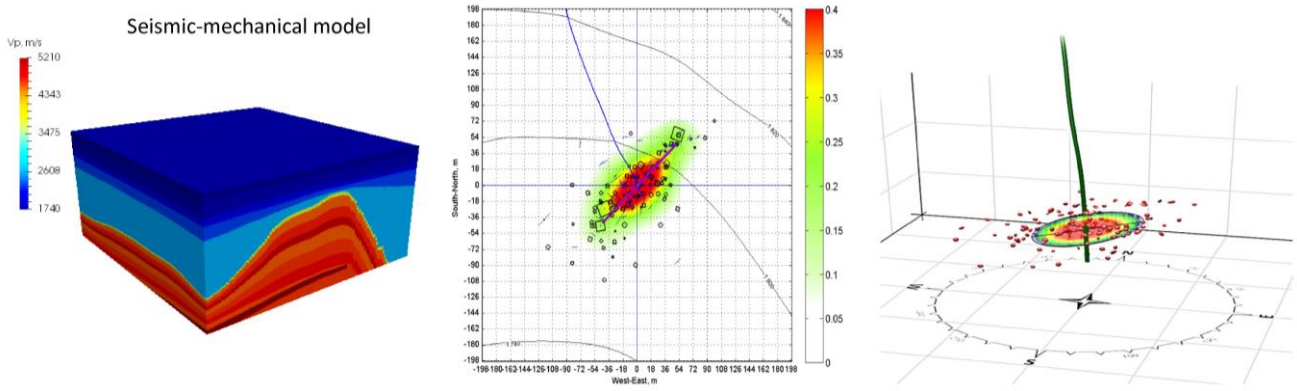
Full-Wave Location (FWL)

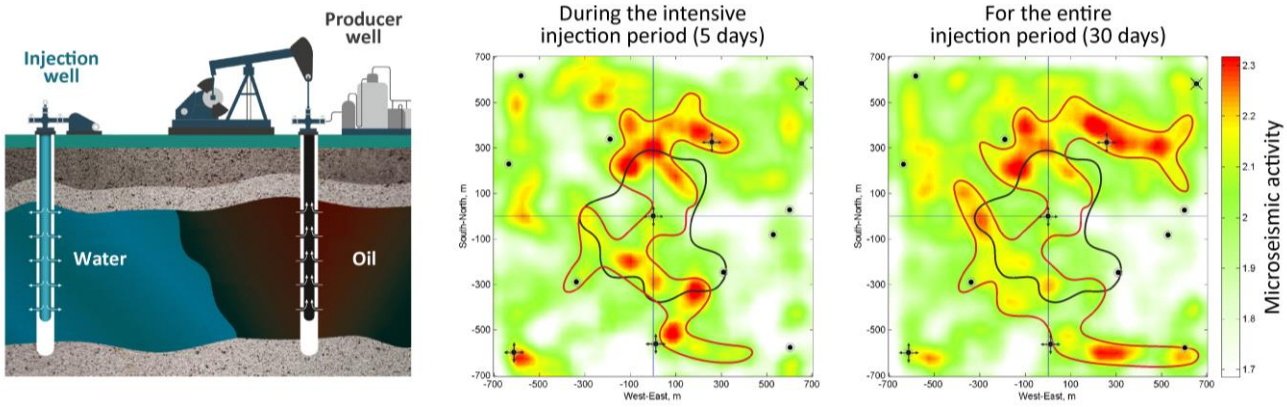
Surface microseismic monitoring

It is a passive microseismic monitoring technology that facilitates better reservoir management and improvisation of hydrocarbon recovery. The technique based on full-waveform seismic numerical simulation and uses microseismic events information that occurs throughout the production life of hydrocarbon reservoirs.

Hydraulic fracture monitoring: The microseismic events originated from hydraulic fracturing denote not only their location but also the seismic moment sensor that permits the identification of the directions of fracture propagation.



Fluid-front movement monitoring: The water injection during production induces high fluid pore pressure changes at the fluid front, triggering microseismic events. By examining the change in the location of these events in time, a picture of the fluid-front movement inside the rock mass can achieved. The microseismic data give preferred flow paths and indicate possible flow anisotropy.



Natural active network mapping: Since microseismic events occur mostly on pre-existing fractures or faults, the computation of their location provides a way of delineating active faults. It is, therefore, possible to obtain the geometry and position of these faults and to determine the active fault network in the reservoir, from a sufficient number of microseismic events recorded over a long period of time (3-4 weeks). Such preliminary knowledge about active fracturing used to predict the risks of collapses during mining operations, in designing of hydraulic fracturing, optimizing field development, selecting the optimal direction of horizontal wellbore.

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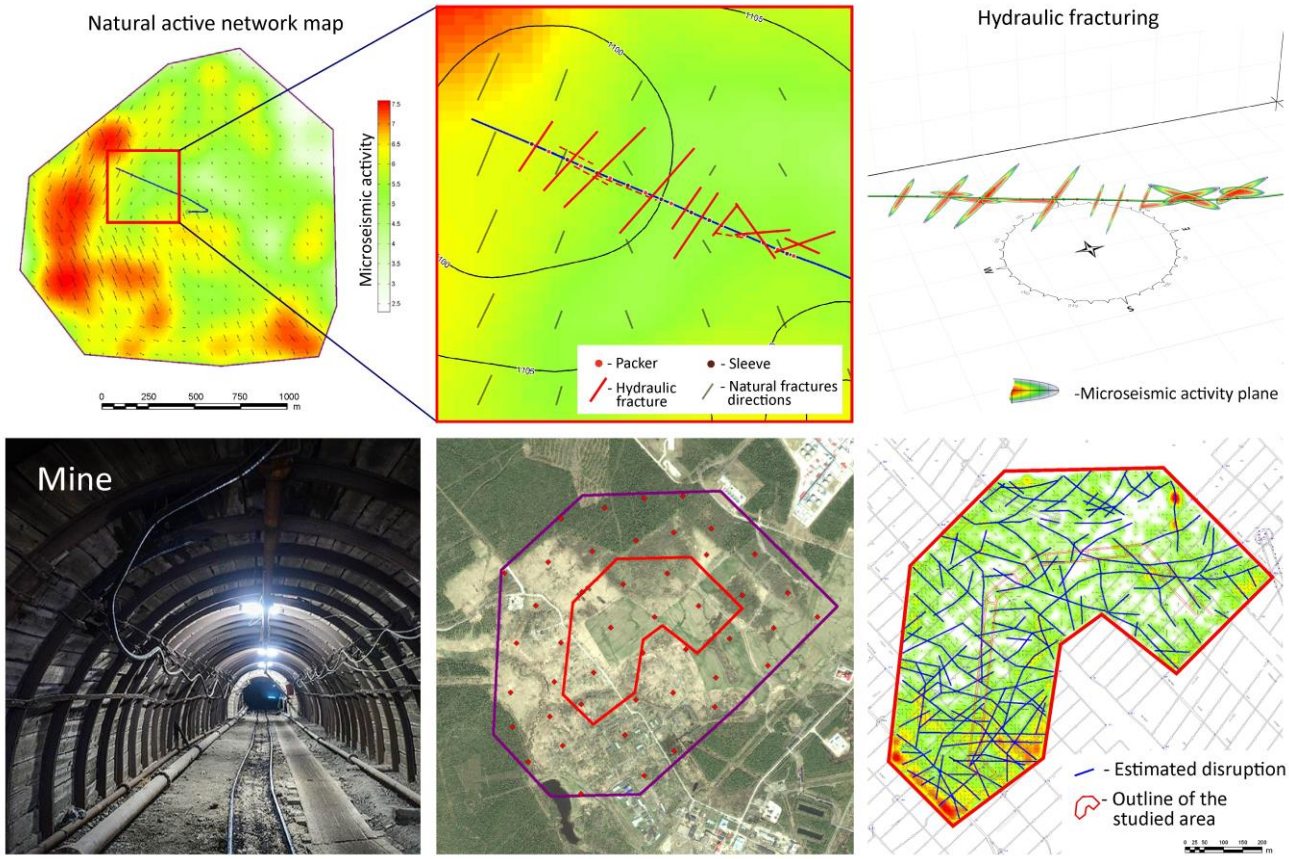
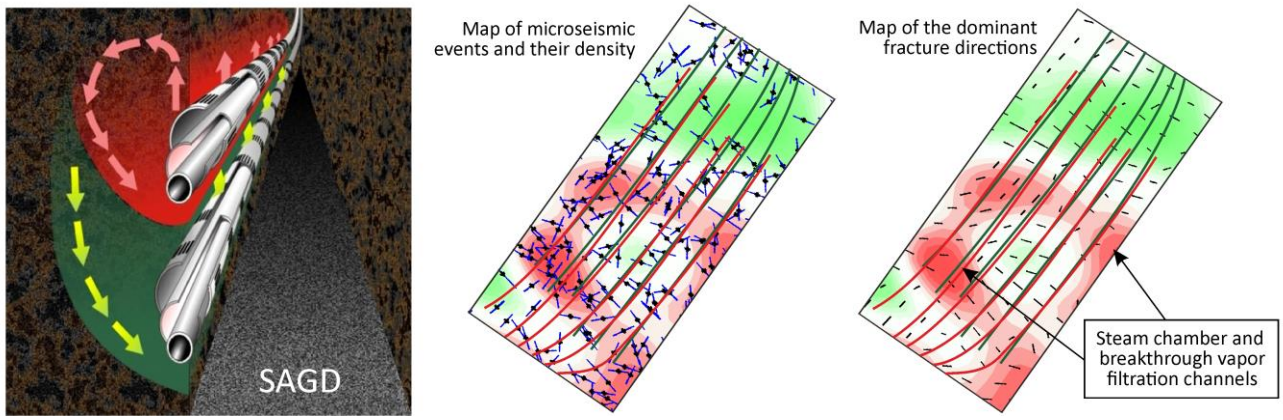


Thermal treatment monitoring: In the process of steam injection into the reservoir as a result of thermal expansion and changes in the structure of the host rocks, which increases the microseismic activity in these areas relative to the general background. According to the monitoring results, the position and size of the steaming zone evaluated; breakthrough channels for vapor filtration or the position of the combustion front, its length and direction are identified.



All this monitoring performed from the surface without any disturbance to the ongoing operations in the neighbouring wells that is why no additional costs incur to the clients (significantly cheaper in total costs). The technology of the Full-Wave Location has high noise immunity and sensitivity, which allows it to be used in the developed fields in conditions of high man-made noise.

Since 2011, "Gradient" CJSC has performed more than 65 different monitoring. Among them 40 hydraulic fracturing monitoring in vertical or inclined wells, 12 monitoring of multi stage fracturing in horizontal wells, 5 monitoring of water flooding and 9 monitoring of active fracturing network mapping.

Our clients are Russia's largest oil and gas companies - ROSNEFT, TATNEFT, GAZPROM, LUKOIL and small private companies of various levels. The Indian company ONGC is our partner abroad.

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