



## **Enhancement of seismic monitoring in hydrocarbon reservoirs**

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Hydraulic Fracturing (HF) is widely considered as one of the most significant enablers of the successful exploitation of hydrocarbons in North America. Massive usage of HF is currently adopted to increase the permeability in shale and tight-sand deep reservoirs, despite the economical downturn.

The exploitation success is less due to the subsurface geology, but in technology that improves exploration, production, and decision-making. This includes monitoring of the reservoir, which is vital. Indeed, the general mindset in the industry is to keep enhancing seismic monitoring. It allows understanding and tracking processes in hydrocarbon reservoirs, which serves two purposes, a) to optimize recovery, and b) to help minimize environmental impact.

This raises the question of how monitoring, and especially seismic techniques could be more efficient. There is a pressing demand from seismic service industry to evolve quickly and to meet the oil-gas industry's changing needs. Nonetheless, the innovative monitoring techniques, to achieve the purpose, must enhance the characterization or the visualization of a superior-quality images of the reservoir.

We discuss recent applications of seismic monitoring in hydrocarbon reservoirs, detailing potential enhancement and eventual limitations. The aim is to test the validity of these seismic monitoring techniques, qualitatively discuss their potential application to energy fields that are not only limited to HF. Outcomes from our investigation may benefit operators and regulators in case of future massive HF applications in Europe, as well.

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Selected Programme Groups ERE2

Impact of energy and resource exploitation on the environment

ERE2.1 Environmental impacts of hydraulic fracturing: Measurements, monitoring, mitigation and management

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