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Talking and Listening to Reservoirs: Production Monitoring by Active and Passive Seismic

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➤ ABSTRACT

Time-lapse seismic technology matured in the current decade, achieving major successes in offshore fields. On land, repeatability and noise remain hard issues, when production changes only marginally the seismic response of the reservoir. This is the challenge of onshore carbonate fields, for example, which are a large share of hydrocarbon reserves worldwide.

Microseismicity is a viable tool that works best in hard rocks as carbonates, so it is an ideal complement to 3D seismic surveys. Active seismic data provides a 3D macromodel for the earth by reflection tomography and migration velocity analysis. A good 3D model for P and S velocities in depth is critical for locating the hypocenters of microearthquakes. The latter ones become new illumination sources of the reservoir, so improving further its tomographic imaging. The hypocenter pattern in space and time gives us clues about local permeability and detects fluid pathways not resolvable by active seismic but very relevant for reservoir simulation and production.

The integration of active and passive seismic data, acquired both at surface and in boreholes, provides us information about local stress changes due to injection– not only for hydrocarbon production, but also for gas storage and CO₂ sequestration. In conjunction with well core analysis, this information paves the way for a further level of integration in reservoir simulation, i.e., including geomechanics, whose relevance is proven by subsidence and uplift effects at several producing fields.

➤ BIOGRAPHY

Aldo Vesnaver received an MS in physics and a PhD in geophysics from the University of Trieste (Italy). From 1983 to 2001, and from 2006 to present, he has been working at OGS (Italian National Institute of Oceanography and Experimental Geophysics) with various assignments, as seismic analyst, R&D team leader and vice director of department. He was a cofounder of the Italian EAGE-SEG Section in 2001, and is its current vice president.

From 1999 to 2001, he served SEG as regional coordinator for Europe in the Global Affairs Committee, serving from 2004 to 2005 as the committee chairman. He is the current chairman of the SEG Membership Committee. He is also an organizer of the Italian and the Balkan Challenge Bowl.

From 2001 to 2006, he worked at Saudi Aramco in seismic R&D. From 2002 to 2005, he was part of the Executive Committee of the Dhahran Geoscience Society, also as vice president.

From 2003 to 2006 he served as associate editor of Geophysics. From 2003 he has been associate and deputy editor of Geophysical Prospecting, and from 2006 to 2008 its editor-in-chief.

He published more than 100 papers in international refereed journals or conference proceedings. The main research topics pursued include time-lapse seismic, tomography, passive seismic, and near surface.