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Fluids emission and gas chimneys imaged in high-resolution 3D seismic: Investigating the role of sedimentary structures in controlling vertical fluid migration (offshore of Ceará-Potiguar sub-basin, Brazil).

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Fluid emissions at seabed have been widely investigated during last years due to their potential in detecting new petroleum provinces and to their role in monitoring the environmental risk associated to CO_2 storage and hydrocarbon leakage from the overburden. Fluid emission appears to be characterized by a variety of different processes and genetic mechanisms, and has been reported in different geological settings. We investigated a 45 by 25 km 3D seismic dataset located in the offshore Ceará state (Brazil), imaging the submarine slope system of the Potiguar sub-basin, part of the Ceará basin. The Paleogene sequence is characterized by a series of steep canyons acting as slope-bypass systems that force the transport of sediment basinward and promote the deposition in deepwater settings. The whole area seems to be affected by gravity driven processes in the form of turbidites and hyperpycnal flows that probably are responsible of the main submarine landslides observed and of the evolution of the canyons themselves. Bottom currents seem to play a key role in shaping the margin as well, by promoting the formation of sediment ridges and fields of sediment waves. In this setting, a series of widely distributed active pockmarks are observed both at the seabed and as paleo-pockmarks in the seismic subsurface, testifying the upward fluid migration and emission along gas chimneys and conduits. Active or recent pockmark varies from tens of meters up to about 2 km in diameters and are mainly circular to elliptical. A preliminary systematic mapping of those fluid escape features shows the strong control of the chutes and pools generated by fast turbidity currents on the chimney geometry pattern and fluid conduit. This evidence may suggest that the erosional\depositional features associated to turbidite sedimentation strongly control lateral permeability variations and, consequently, the vertical fluid migration.