Fluid seepage evidence in the Adventure Plateau (NW Sicily Channel)

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The northwestern region of the Sicilian Channel hosts a great number of morphological highs, the widest of which is the Adventure Plateau which is part of the Sicilian-Maghrebian Fold and Thrust Belt system, formed mainly during the Neogene. The complex morphology of the Adventure Plateau was shaped in the Lower Pliocene also by an extensional phase that produced high-angle normal faults mostly NW-SE to N-S oriented. Through these preferential pathways, magmatic fluids ascended and produced widespread volcanic manifestations. The interpretation of MBES (Multibeam Echosounder), seismic (sparker, airgun), well logs, and ROV (Remote Operative Vehicle) data identified several features related to the presence of fluids in the study area. The morpho-structural analysis showed an NW-SE-oriented fault system and a string of depressions that follows the same trend. The seismic-stratigraphic analysis highlighted various seismic signals located below the depressions, such as bright spots, enhanced reflection zones, and chimneys, which also suggest the presence of fluids that would rise to a few meters' depth. Since all these fluids' seepage evidence occur along the fault system, we consider this as the main pathway for vertical fluids migration. Further, to understand the fluid's origin, a detailed well-log analysis has been performed; this showed the presence of oil traces, at a depth of 250 m, and gas (CO_2) at a depth of 500 m. So, also considering the magmatic fluids evidence found by literature data, a possible mixed origin of the fluids, both biogenic and magmatic, should be assumed. Therefore, this work allowed us not only to identify new fluid seepage evidence in the Adventure Plateau but also to provide new insights into the identification of fluid leakage pathways.