Seismic characterization of fluid migration and Pockmarks in the Estremadura Spur, West Iberian Margin, Portugal

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Recently a field with more than 70 pockmarks was discovered in the NW region of the Estremadura Spur outer shelf (West Iberian margin), a trapezoidal promontory elongated in an east-west direction, between Cabo Carvoeiro and Cabo da Roca, extending until the Tore seamount.

Pockmarks are the seabed culminations of fluid migration through the sedimentary column and their characteristic seabed morphologies correspond to cone-shaped circular or elliptical depressions. These features and the associated fluid escape process are the main objectives of this work. Here we characterize these structures to understand their structural and stratigraphic control based on: 1) Seismic processing and interpretation of the high resolution 2D single-channel sparker seismic dataset, 2) Bathymetric and Backscatter interpretation and 3) ROV direct observation of the seafloor.

The analysis of the seismic profiles allowed the identification of six seismic units, disturbed by the migration and accumulation of fluids. The Estremadura Spur outer shelf has been affected by several episodes of fluid migration and fluid escape during the Pliocene-Quaternary that are expressed by a vast number of seabed and buried pockmarks. At present, the pockmarks are mainly inactive, as the seabed pockmarks are covered by recent sediments. The stacking of various pockmarks suggests a cyclical fluid flow activity that can possibly be the result of the eustatic sea level variations and the subsequent changes of the hydrostatic pressure. The origin of the seep fluids is still under debate but considering the low-sedimentation rate of the area and the low productivity a deep source for the fluids is most probable, possibly related with the Jurassic hydrocarbon system. It was concluded that the migration of fluids to the seabed occurred over the Pliocene-Quaternary in several episodes, as indicated by the buried pockmarks at different depths.