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Holocene morphologic changes offshore the Quarteira region, Algarve, south Portugal

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A 160 km long SPARKER single channel seismic reflection survey was acquired in November 2008 on the shallow continental shelf of south Portugal to investigate the recent tectonics of the S.Marcos – Quarteira Fault (SMQF) and of the Carcavai Fault.

The NW-SE trending S.Marcos – Quarteira Fault (SMQF) can be traced on the onshore-offshore region of south Portugal for an extension of 160 km. It is a Variscan (Hercynian) orogenic thrust that was inverted as an extensional fault during the Mesozoic rifting in south Portugal, during which it played a major role in the segmentation of the Algarve Basin. The SMQF was re-inverted as a transpressive fault during the Paleogene-Miocene compression and folding and thrusting of Pleistocene terrigenous strata attest for its present day tectonic activity. The Carcavai fault trends NE-SW, intersects the SMQF. The Carcavai fault also played the role of rift fault during the Mesozoic and was inverted as a thrust during the Cenozoic compression. The mapping of both SMQ and Carcavai Faults offshore south Portugal attests for a complex interaction between the two in what concerns the Holocene and tectonics and paleogeography. The Carcavai Fault accommodates most of the Pliocene-Quaternary compression on its hanging-wall, whilst the SMQF takes up the deformation on the foot-wall of the Carcavai Fault.

In what refers the early Holocene paleogeography, the interpretation of the seismic profiles shows the existence of two sedimentary bodies of possible Holocene age separated by a peninsula that consists of Pliocene-Pleistocene prograding clastics that make up the present day coastal cliff. This peninsula is parallel to the present day coastline, which is also parallel to the SMQF. The two bodies have different seismic facies. The offshore Holocene displays fairly continuous reflections, whilst the internal Holocene is made up of more discontinuous reflections. The isobaths map of the base of the external Holocene unit shows a smooth gently dipping surface towards the open sea, while the internal Holocene unit displays a complex basal surface with linear troughs lying on the prolongation of present day fluvial incisions. A channel connecting the marine and fluvial (lagoon?) domains is also recognized and lies on top of the offshore prolongation of the Carcavai Fault. The mapping of the base of the Plio-Pleistocene unit shows that this unit is affected by the tectonic deformation and that a syncline fold underlies the channel that connects the two marine and fluvial Holocene sequences.

The edge of the marine Holocene does not exceed 35 msec TWT, i.e. approximately 23m below sea level. Correlation with a local eustatic sea level curve indicates an age of 8000-10000 years for the inception of these marine and fluvial systems.