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Coastal sand dunes at -100m below sea level as proof of a post Younger-Dryas Black Sea lowstand.

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A 3D geometric interpretation of very high-resolution seismic Chirp profiles acquired on the Romanian shelf demonstrates that the last climate change known during Holocene times was well recorded in the Black Sea basin and particularly provides a good record of its water level fluctuations. The seismic interpretation shows that the lacustrine shelf deposits form an important basinward-prograding wedge system. On top of these prograding sequences is a set of sand dunes that delineates a berm-like feature around the isobath of -100 m. Landward of this dune field are small depressions containing Barkhan-like features. The upper part of the last prograding sequence is incised by anastomosing channels which ends in the Viteaz canyon. This incision phase and the dunes are built on the freshwater prograding wedge.

10 sequences were distinguished using the seismic sections acquired during the BlaSON and Assemblage cruises. Analyses of cores retrieved from this area demonstrate that the first 8 sequences represent lacustrine prograding wedges, the ninth sequence is the dune system itself and the tenth is a marine mud drape.

The lacustrine prograding wedges witness a low water level characterised by forced regression-like reflectors mapped from the pseudo-3D seismic data. Their hinge point corresponds with the wave erosion surface mapped around the -100 m isobath on the multibeam mosaic. Dated cores recovered in the area give age control on this lowstand period, which lasted from 13 kyr BP to 8 kyr BP as implied by:

(1) the continuously dry climatic conditions in the region inferred from high percentages of herbs and steppe elements determined from the ASSEMBLAGE cores (Popescu et al., submitted); and

(2) the formation of dunes between 9.7 and 8.5 kyr BP on the desiccated north-western Black Sea shelf at -100 m.

Numerous Russian authors suggested a sea level lowstand at about -90 m based on the location of offshore sand ridges at the shelf-edge south of the Crimea Peninsula (Aybulatov and Shcherbakov, 1990; Fedorov, 1963; Fedorov, 1972; Fedorov, 1988; Kuprin et al., 1974; Muratov et al., 1974; Neprochnov, 1980; Nevesskaja and Nevesskiy, 1961; Shcherbakov and Babak, 1979; Shcherbakov et al., 1980; Shimkus et al., 1987). The buried, anastomosing fluvial channels (Popescu et al., 2004) that suddenly disappear below 90 m depth, and a unique wave-cut terrace between -95 and -100 m on the outer shelf are therefore consistent with a major level lowstand at somewhere around 100 m depth. A regional erosional truncation recognised along the southern coast of the Black Sea point to a (Demirbag et al., 1999; Gorur et al., 2001). A similar depth has also been deduced from a terrace on the northern shelf-edge (Major et al., 2002).

Preservation of the sand dunes and the occurrence of small, buried incised valleys mark a rapid transgression during which ravinement processes related to the water level rise had no time to erode the seafloor significantly (Benan and Kocurek, 2000; Lericolais et al., 2004). Around 7.5 kyr BP, the present-day conditions of the surface waters of the Black Sea became abruptly established as a result of the rapid flooding of the Black Sea by Mediterranean waters, as shown by dinoflagellate cyst records (Popescu et al., 2004; Popescu et al., submitted) and other data (Ryan et al., 2003; Ryan et al., 1997). Simultaneously, widespread sapropel deposition began both on the continental slope and in the deep basin. At 7,160 yrs BP, a sudden (within <760 yrs) inflow of a very large volume of marine Mediterranean waters occurred, resulting in an abrupt increase in salinity to their present-day euxinic values (Popescu et al., 2004; Popescu et al., submitted). Evidence for this inflow can also be found in the abrupt replacement of fresh to brackish species by marine species. Furthermore, hydraulic modelling shows that about 60,000 cubic metres of water per second must have flowed into the Black Sea basin after the Bosphorus sill was breached and that it would have taken 33 years to equalize water levels in the Black Sea and the Sea of Marmara (Siddall et al., 2004). Such a sudden flood would have preserved the lowstand markers on the north-western shelf of the Black Sea.

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