

ARGUMENTS IN FAVOUR OF A HOLOCENE RAPID TRANSGRESSION IN THE BLACK SEA

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Abstract

Since Ryan et al.¹ theory about a rapid reconnection between the Black Sea and the Marmara Sea in the Holocene, an important international work have been undertaken to study the Quaternary water level fluctuations of these two bodies. It is now well established that the Black Sea has encountered complex water level fluctuations with high lake levels occurring during wet and melting period after the LGM and low lake levels occurring during drier conditions as the Younger Dryas was for this region. This presentation will summarise results obtained in the Black Sea from different research cruises and compare them with other semi-enclosed basins. These permit a rise in the understanding of the mechanisms linked to high resolution sequence stratigraphy preservation and how they have recorded the abrupt climate changes of the last deglaciation

Keywords: Black Sea, Bosphorus, Seismics

The location of the Black Sea, between Europe and Asia, makes its water level dependent on Eurasian climatic fluctuations. This inland sea is a perfect present-day example of what is a marginal basin where connection changes dramatically with sea level. The Black Sea is at present the world's largest anoxic basin, making it an important modern analogue for past anoxic conditions, while during the last glacial period, it was a low salinity oxygenated lake, isolated from the Mediterranean. The Black Sea and the low sea level periods when were deposited lake sediments represents valuable archives for the study of past climate changes. Actually, the glacial period northern ice cap prevented major East European rivers to flow north as they do today. During ensuing interglacial periods, these rivers were diverted to the south in the direction of the Black Sea and Caspian Sea receiving basins and consequently have increased the size of these Drainage Basins Therefore, unique conditions specific to the Black Sea were established while this water body became isolated from the Global Ocean. This results in avoiding the hysteresis effect which is the latent period needed by the Global Ocean to respond to the consequences of ice melting. This presentation is part of one of the objectives of the INQUA/IGCP 521 project (Black Sea-Mediterranean Corridor during the last 30 ky: sea level change and human adaptation) which is to obtain a good as possible reconstruction of climate dynamics and the changes from wet to arid periods together with the determination of palaeodepths. Such results are of interests for the CIESM as they will lead to a cooperation in the construction of a sea-level curve for the Black Sea. Presently, it is well established that the Black Sea has encountered complex water level fluctuations with high lake levels occurring during wet and melting period after the LGM and low lake levels occurring during drier conditions as the Younger Dryas was for this region. As the Black Sea, abrupt Sea-level rises have been recorded in many different semi-enclosed basins around the world. The link to rapid transgressions is easy to do, even if the mechanisms are completely different. Large and rapid releases of freshwater from ice sheets since the LGM to sensitive areas may also arise from several mechanisms. The last deglaciation provides the level of preservation necessary to identify specific mechanisms of ice-sheet forcing and attendant climatic responses. The presentation will summarise results obtained in the Black Sea from different research cruises and compare them with other semi-enclosed basins. These permit a rise in the understanding of the mechanisms linked to high resolution sequence stratigraphy preservation and how they have recorded the abrupt climate changes of the last deglaciation. When the Black Sea was isolated, both the lack of saltwater input and the increase of fresh water run-off from the rivers, led to reduced salinity levels in the Black Sea. This process happening during the glacial periods, linked to water level fluctuation, is measured in the fauna succession showing an abrupt change from salt-water to fresh/brackish-water species. The initial hypothesis of a rapid saltwater flooding of the freshwater lake that was the Black Sea in the Late Glacial Maximum (LGM) was proposed since 1996 by Ryan et al. The flood hypothesis raised controversy and initiated refutation, but recently also received supports The European Project ASSEMBLAGE (EVK3-CT-2002-00090) provided geophysical and sedimentary data collected in the north-western part of the Black Sea from the continental shelf and slope down to the deep-sea zone. This project focused on applying sequence stratigraphic models to seismic data recorded on the north-western Black Sea shelf, in order to correlate the sequences interpreted using seismic stratigraphy methods to sea-level fluctuations. To achieve the project's objectives, very high resolution seismic data were acquired during the BlaSON cruises (1998 and 2002) on board the research vessel LE SURO; and during the ASSEMBLAGE 1 (2004) cruise on board the research vessel LE MARION DUFRESNE. During the first two cruises paleo-shorelines and sand ridges were identified and a set of seismic

data was acquired on these targets to support pseudo 3D analyses. This coupled with a multiproxy approach emphasizes that the Black Sea water level is dependent on Eurasian climatic fluctuations. This sequence stratigraphy study is validated by dated samples obtained from long cores (up to 50 m long) providing a firm calibration of Black Sea water level fluctuation since the LGM. It especially shows that the Black Sea experienced a contemporary rise in water level with the melting of the Fennoscandian Ice sheet followed by a drop of the water level from the Younger Dryas to the Pre-Boreal. This recent lowstand is confirmed by the presence of the forced regression sequences, the wave cut terrace and the coastal dunes still preserved on the shelf, even after the Black Sea was rapidly invaded by Mediterranean/Marmara marine waters.

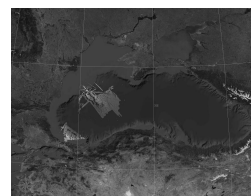


Fig. 1. BlaSON and ASSEMBLAGE survey multibeam results for the Black Sea

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