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Testing the physical oceanographic implications of the suggested sudden Black Sea infill 8400 years ago

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Abstract

We apply a shock-capturing numerical model based on the single-layer shallow water equations to an idealized geometry of the Black Sea and the Sea of Marmara in order to test the implications of a suggested sudden Black Sea infill 8400 years ago. The model resolves the two-dimensional flow upstream and downstream of the hydraulic jump provoked by the cascade of water from the Sea of Marmara into the Black Sea, which would occur during a sudden Black Sea infill. The modeled flow downstream of the hydraulic jump in the Black Sea would consist of a jet that is in part constrained by bathymetric contours. Guided by the Bosphorus Canyon, the modeled jet reaches depths of up to 2000 m and could explain the origin of the sediment waves observed at this depth. At a late stage of the infill the modeled jet is attached to the coast and might account for the course of a submerged channel at the mouth of the Bosphorus. The preservation of continuous barrier-washover-lagoonal fill systems occurring on the

Black Sea shelf is, however, not easily reconcilable with the large flows over the southwest Black Sea shelf predicted by the model. Intensified flow in the upstream basin (Sea of Marmara) is restricted to the immediate vicinity of the Bosphorus, suggesting that a sudden reconnection need not have disturbed sediments in the wider Sea of Marmara.

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