



Constraining sediment transport to deep marine basins through submarine channels: the Levant margin in the Late Cenozoic

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The recent world-class gas discoveries in Early Miocene sand units offshore Israel raises the question of their origin. Apparently, the simplest explanation is to relate them to a fluvial system that arrived from Arabia at that time. This system predated the modern (Pliocene) Nile River supply and existed until captured by the Dead Sea valley. Interestingly, however, very little sedimentation occurred along the Levant continental margin before the Pliocene in spite of its stepped structure that provided much space for accommodation. The only way that sediments could have bypassed the continental margin and arrive at the deep basin without being trapped in the middle is through submarine channels that crossed the continental margin. Here we explore this possibility using 3-D stratigraphic modeling techniques that quantify the sediment load and the water discharge required to fill the basin by pushing enough sediment through submarine channels. We show that such a scenario requires a fluvial system on the order of the largest rivers that exist today on earth in terms of drainage area and water discharge. Alternatively, it requires extreme hydraulic conditions in terms of diffusion coefficients and an elevated drainage basin that could not have existed in the study area. We therefore challenge the traditional view of Arabia as the main source for Oligo-Miocene deposits in the Levant Basin and suggest that the basin was mainly fed by a proto-Nile system that transported clastic material to the North African margin and then farther east by ocean currents. In a wider view we demonstrate how numerical modeling can constrain sediment transport through submarine channels as a function of basin geometry and hydraulic conditions, and how paleogeographic knowledge can be combined with current data on World Rivers to evaluate if modeling results are plausible.