

Supplementary material for:

Salt tectonics in the Eastern Mediterranean: Where a giant delta meets a salt giant

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DATA AND METHODS

Previous regional compilations of the Pliocene-Quaternary section in the Mediterranean presented sediment thickness data (Morelli, 1988; Morelli and Val'chuk, 1988; Genesseeux et al., 1998; Nashaat, 1998; Hall et al., 2005; Segev et al., 2006; Macgregor, 2012). For the purpose of this study we compiled a base Pliocene (~top salt) structural map. Our compilation (Figure DR1) is based on published and unpublished seismic and well data. The "International Bathymetric Chart of the Mediterranean" (Genesseeux et al., 1998) is a compilation of the Pliocene-Quaternary sediment "thickness" in two way time (TWT) for the entire Mediterranean Sea, produced by the Intergovernmental Oceanographic Commission. We used this compilation wherever newer data is unavailable. For the Nile deep sea fan (NDSF), the Eratosthenes Seamount, and the Herodotus basin we use various sources that are detailed in table DR1. For Israel's exclusive economic zone we used Steinberg et al. (2011) and Sagy et al. (2015). In

addition, we used local structural and thickness maps and many cross sections, some in TWT and some in length units. All sources used for our compilation are listed in table DR1.

The top salt pressure map is calculated by the equation: $p = \rho gh$, where p is pressure at top salt surface, g – gravity constant, ρ - density, h - layer thickness. Using a density of 2200 kg/m³ for Pliocene-Quaternary layer and 1030 kg/m³ for seawater layer, we added the effect of the two layers. The result expresses the vertical present-day pressure (MPa) applied on the top of the salt layer highlighting areas with pressure gradients.

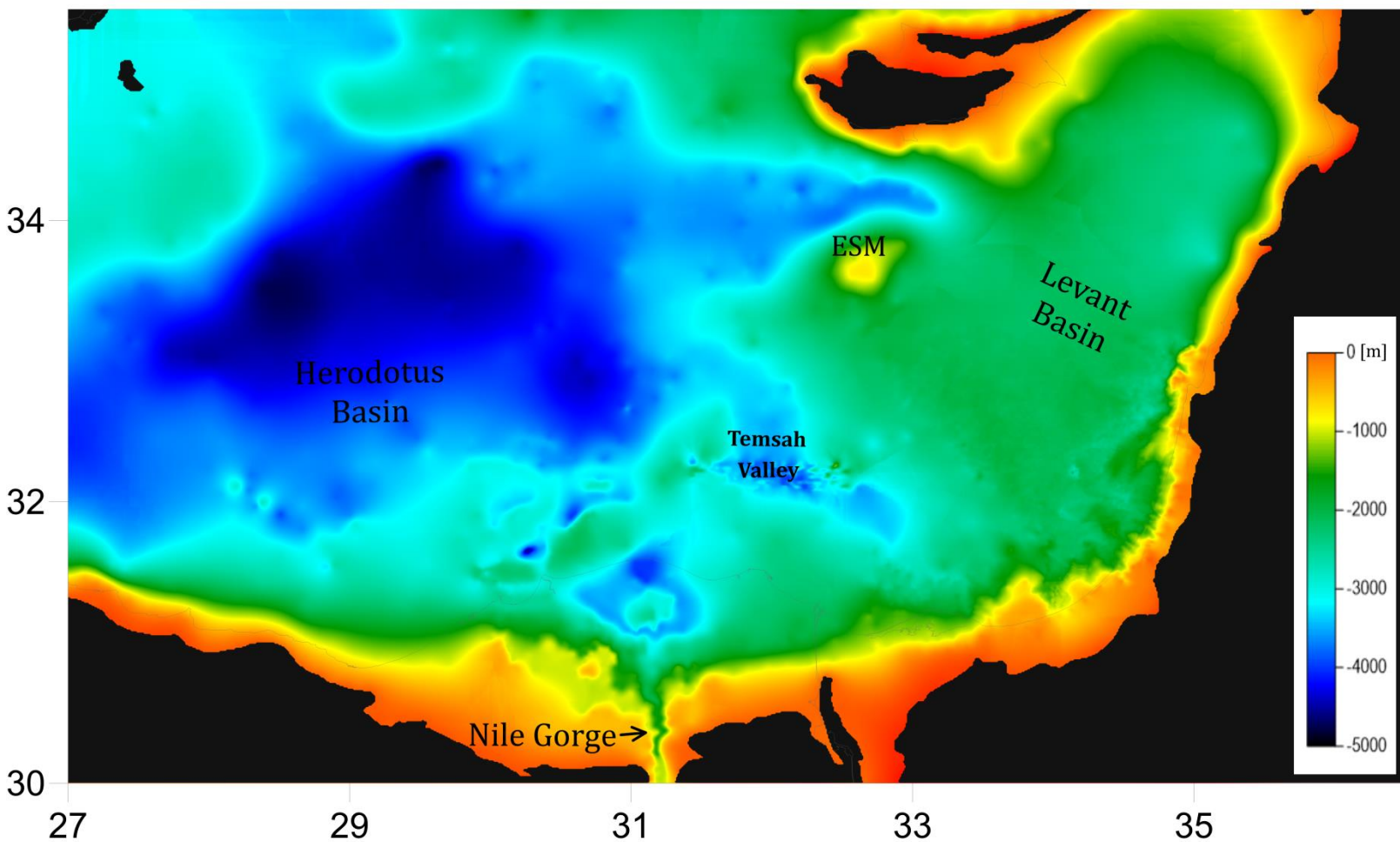


Figure DR1: Base Pliocene (~top Messinian Evaporites) structural map. Black area denotes no Pliocene-Quaternary section. Present-day coastline (gray) is shown for reference.

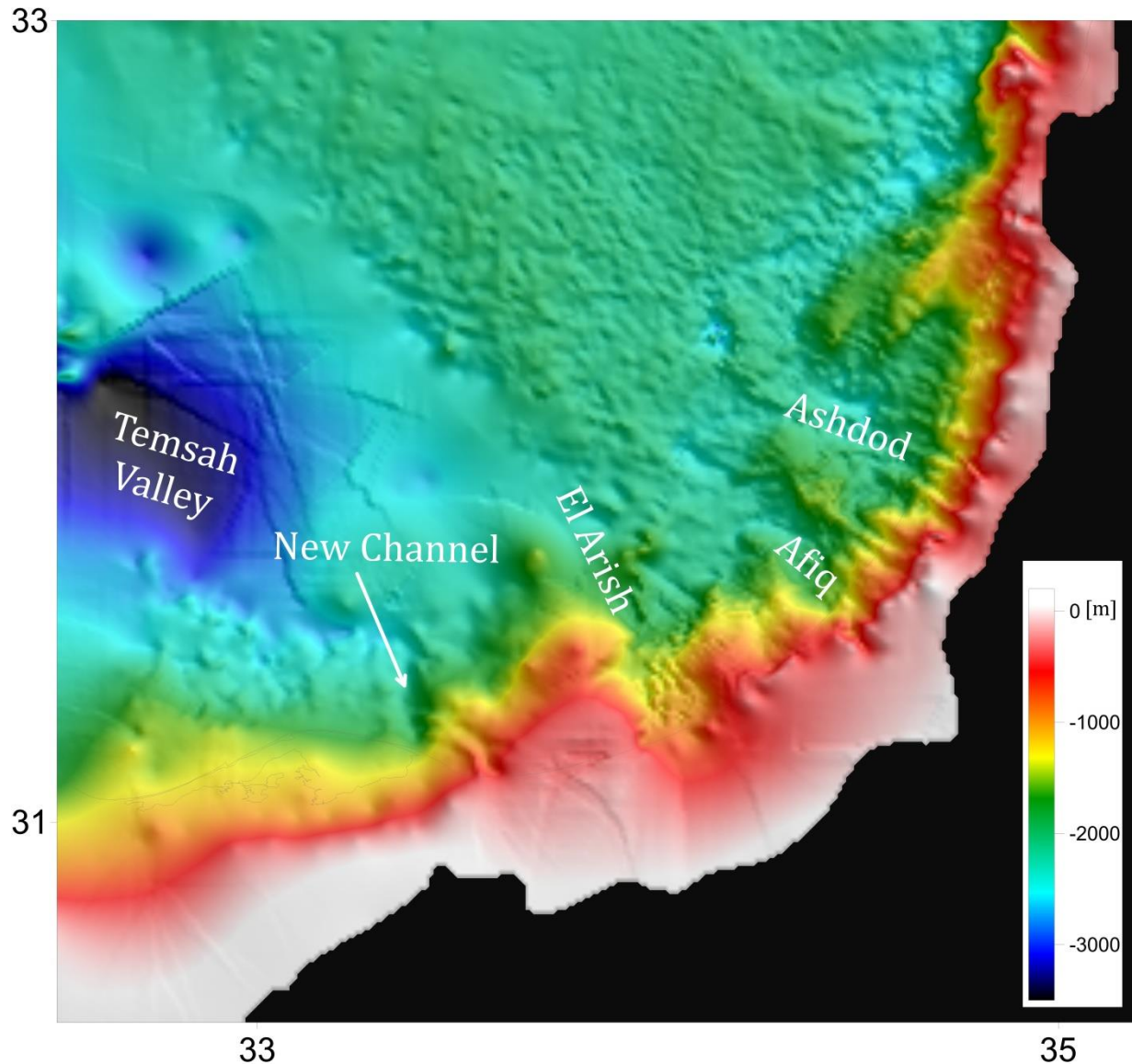


Figure DR2: Base Pliocene structural map showing in detail the steep incised relief left after the Messinian Salinity Crisis offshore Israel and Sinai. Most canyons incised across the continental margin were previously described in the literature (e.g., Druckman et al., 1995; Bar et al., 2013, 2016). However the canyon west of the El Arish Canyon (white arrow) is presented here for the first time (New Channel). This canyon indicates that the Tamsah Valley already existed by the end of salt deposition.

TABLE DR1. DATA SOURCES FOR BASE PLIOCENE MAP				
#	Source	Depth or Thickness	Sysmic data map / Cross section / Drill hole data	Units
1	Abd-Allah et al., 2012	Depth to Top Salt	Seismic cross section + map	TWT [sec]
2	Barber, 1981	Depth to Top Salt	Seismic map	meters
3	Base Pliocene of the Israeli Exclusive Economic Zone (Sources from steinberg et al., 2011 and Sagy et al., 2015)	Depth to Top Salt & PQ Thickness	Seismic cross section + map	TWT [sec] & meters
4	Came'ra et al., 2010	Depth to Top Salt	Seismic cross section	meters
5	Carton et al., 2009	Depth to Top Salt & PQ Thickness	Seismic cross section + map	TWT [sec] & [msec]
6	Ducassou et al., 2007	Depth to Top Salt	Drill hole data	meters
7	Ducassou et al., 2009	Depth to Top Salt	Drill hole data	meters
8	Garziglia et al., 2008	Depth to Top Salt	Seismic cross section	TWT [sec]
9	Gaullier et al., 2000	Depth to Top Salt	Seismic cross section	TWT [sec]
10	Gennesseaux et al., 1998	PQ Thickness	Seismic map	TWT [msec]
11	Hanafy et al., 2016	PQ Thickness	Seismic map	meters
12	Kellner et al., 2009	Depth to Top Salt	Seismic map	TWT [sec]
13	Loncke et al., 2002; 2006	Depth to Top Salt & PQ Thickness	Seismic cross section + map	TWT [sec] & meters
14	MIDBAR	Depth to Top Salt	Seismic map	TWT [msec]
15	Sarhan et al., 2014	Depth to Top Salt	Seismic cross section	TWT [sec]
16	Shaaban et al., 2006	Depth to Top Salt	Seismic map & Drill hole data	meters

Table DR1: Data sources for the compiled base Pliocene structural map (Figure DR1). Location of each source number can be found in the source location map (Figure DR3).

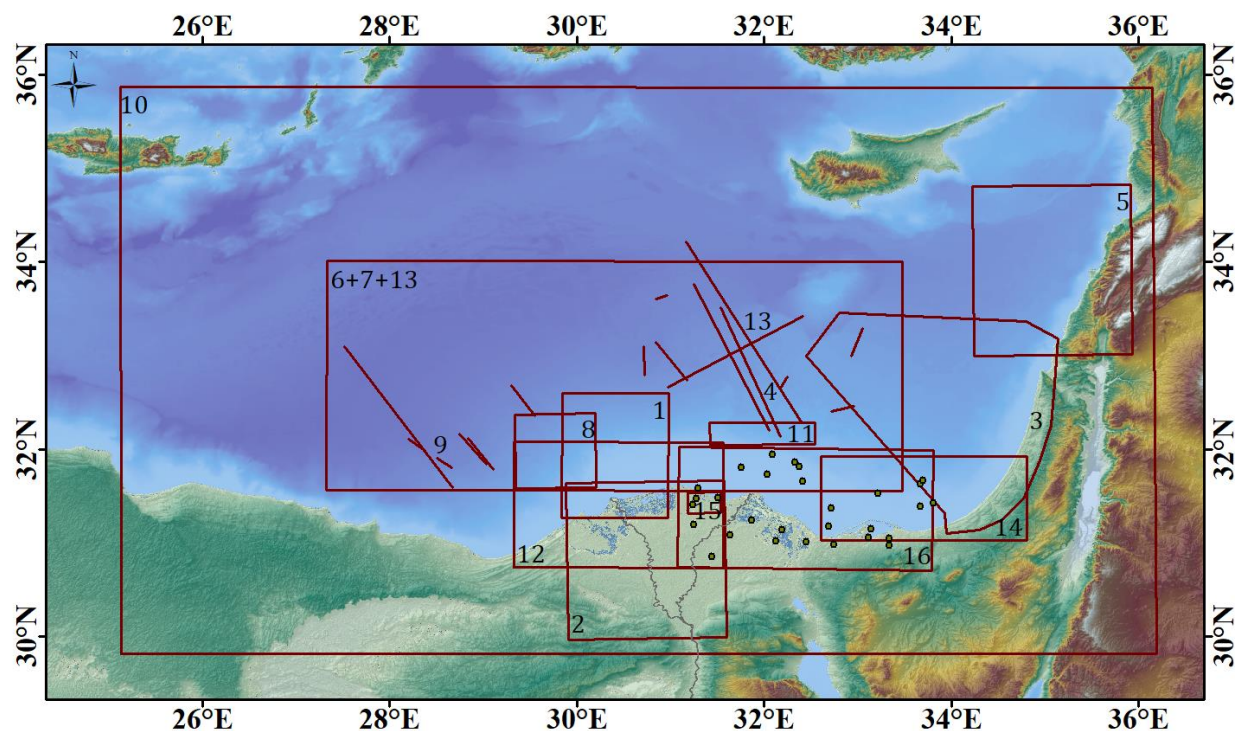


Figure DR3: Location of studies used for compilation. Numbers correspond to Table DR1.

Salt migration

To reconstruct the original boundary of the salt basin prior to its basinward flow, we examine salt rollers, welds, and normal faults. These structures are formed as response to salt withdrawal (Rowan et al., 1999; Wagner and Jackson, 2011; Allen et al., 2016) and thus mark the salt evacuation zone (SEZ, Fig. 1c). Figure DR4 (modified after Allen et al., 2016) demonstrates that the width of the SEZ is <30 km. We, therefore, conclude that the difference between the present-day salt pinch-out line and the original boundary of the salt wedge is quite narrow in terms of the PQ depocenter, which was originally deposited landward of the thick (>150 m) salt layer.

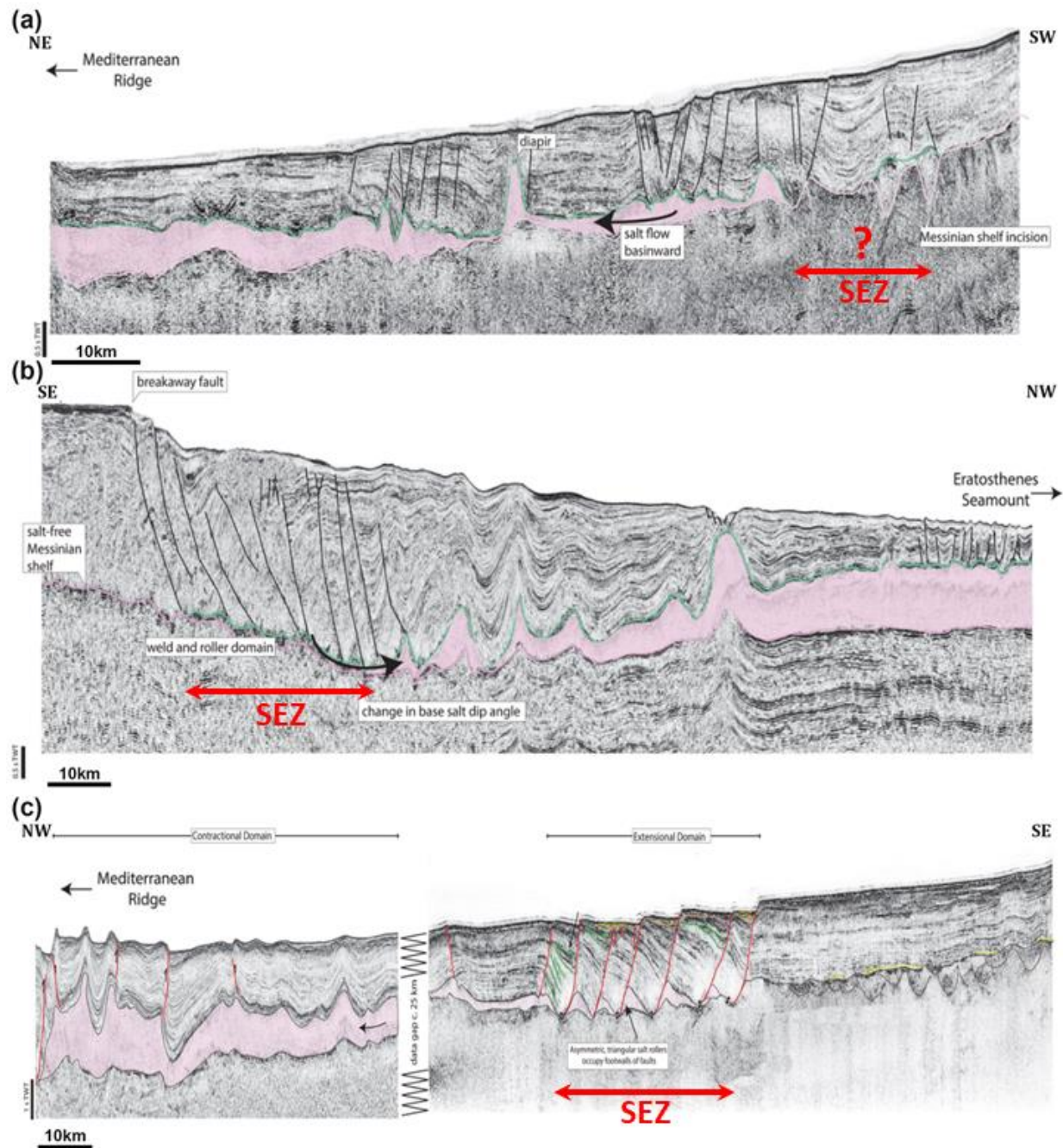


Figure DR4: Seismic cross sections (modified after Allen et al., 2016) showing the distribution of salt rollers, welds, and normal faults. The area marked by a red arrow indicates the salt evacuation zone (SEZ), which is narrower than 30 km. Section's location in Fig. 1c.

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