ELECTRONIC SUPPLEMENTARY MATERIAL

layer	depositional age [Ma]	lithology	mean thickness [m]	petroleum system element
Ophiolite	79-79.8	mixed ophiolite	?	
Ophiolite 8	79.8-80.7	mixed ophiolite	?	
Ophiolite 7	80.7-81.6	mixed ophiolite	?	
Ophiolite 6	81.6-82.5	mixed ophiolite	?	
Ophiolite 5	82.5-83.4	mixed ophiolite	?	
Ophiolite 4	83.4-84.3	mixed ophiolite	?	
Ophiolite 3	84.3-85.2	mixed ophiolite	?	
Ophiolite 2	85.2-86.1	mixed ophiolite	?	
Ophiolite 1	86.1-87	mixed ophiolite	?	
Hawasina Nappes	87-87.5	Limestone (shaly)	1.400	
Aruma Gp	87.5-88.6	Conglomerate, Shale, Limestone	600	Seal Rock
Erosion: Wasia-Aruma break	88.6-91	Limestone (micrite)		
Wasia Gp. - Natih A	91-95	Limestone (micrite)	50	Reservoir Rock
Wasia Gp. - Natih B	95-96	Limestone (organic rich - 10% TOC)	50	Source Rock, 15% TOC
Wasia Gp. - Natih C, D	96-98	Limestone (micrite)	65	Reservoir Rock
Wasia Gp. - Natih E	98-100	Limestone (organic rich - 10% TOC)	60	Source Rock, 4% TOC
Wasia Gp. - Natih F, G	100-104	Limestone (micrite)	65	Searl Rock
Wasia Gp. - Nahr Umr	104-113	Limestone (shaly)	140	
Kahmah Gp. - Shuaiba Fm.	113-124	Limestone (organic rich - 1-2% TOC)	350	
Kahmah Gp. - Kharaib, Lekhair Fm	124-130	Limestone (shaly)	150	
Kahmah Gp. - Habshan Fm-	130-136	Limestone (micrite)	75	
Kahmah Gp. - Salil Fm.	136-139	Limestone (micrite)	75	
Kahmah Gp. - Rayda Fm.	139-147	Limestone (micrite)	75	
Sahtan Gp.	147-187	Sandstone (arkose, quartz poor)	370	
Hiatus Sahtan - Akhdar	187-200	Dolomite (typical)		
Akhdar Gp. - Mahil Fm.	200-267	Dolomite (typical)	600	

Figure S1: Stratigraphic age assignment used for the numerical basin modeling
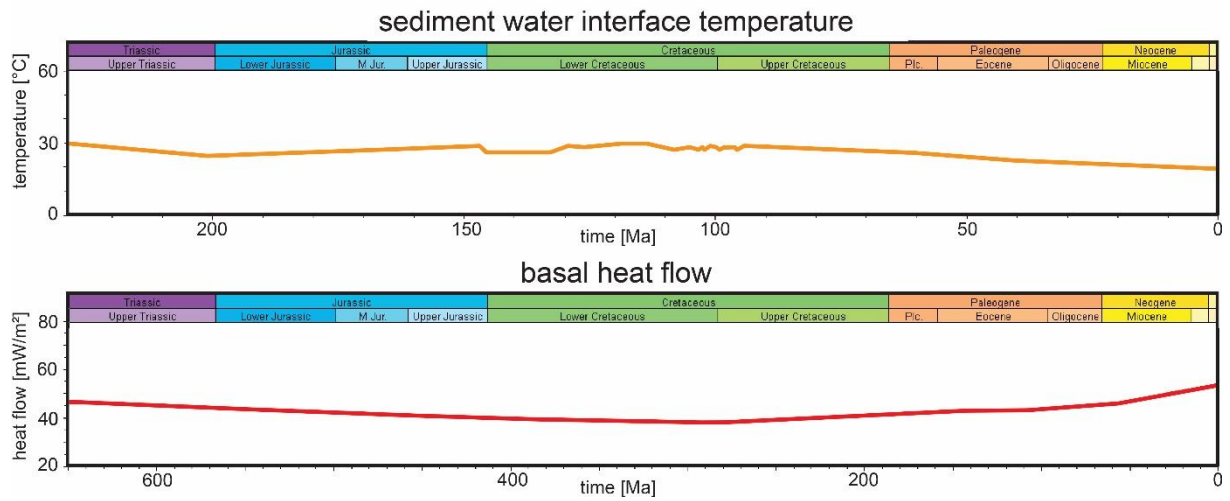
Figure S2: Thermal boundary conditions used for numerical basin modeling. Mean surface temperatures are reconstructed based on plate motion and the changing paleo-latitude (Wygrala, 1989). Basal heat flow was constrained by sensitivity analysis.
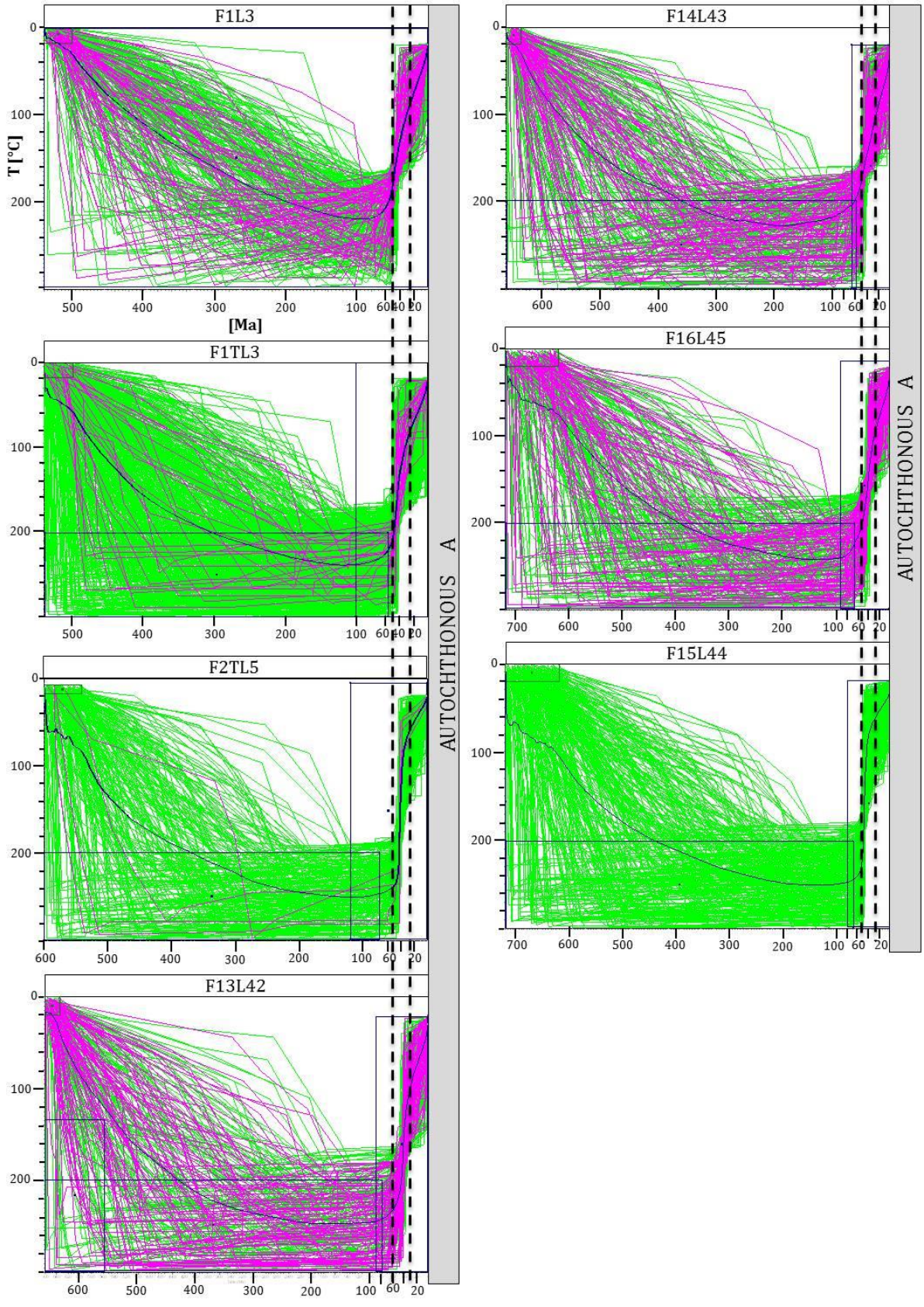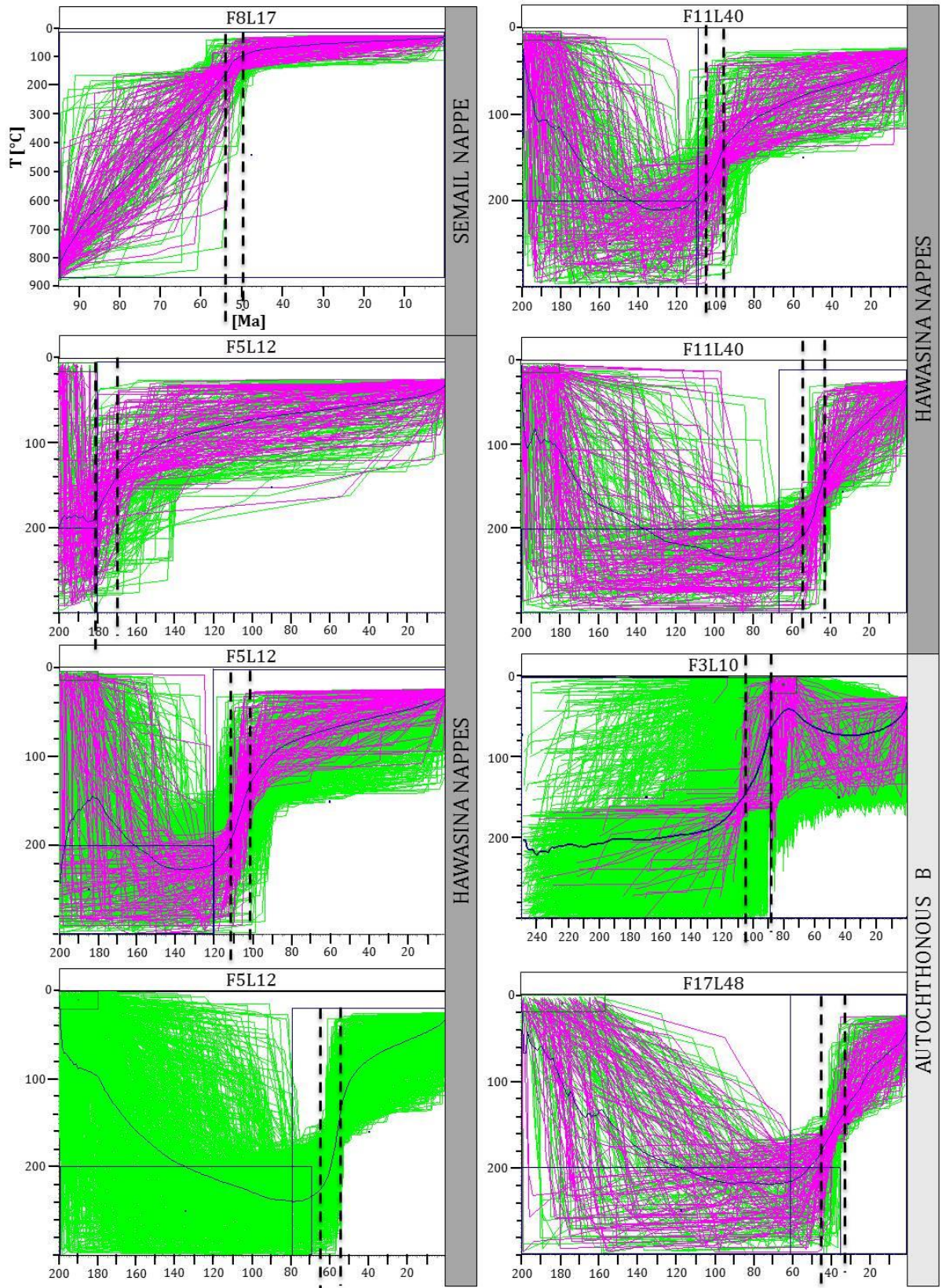
Figure S3 (previous page) and S4: Modeled time-temperature paths of samples of Semail Ophiolite, Hawasina Nappes, Autochthonous A and B. The black line represents the weighted mean values of good fits between model and data (purple paths) and acceptable fits (green paths). Models outline rapid cooling until c. 50 Ma in the Ophiolite (A), and main cooling in Hawasina Nappes (C), and Autochthonous A and B (D, E) at c. 50-30 Ma. Modeled paths of the not reset zircons of the Hawasina Nappes are shown in comparison (B).
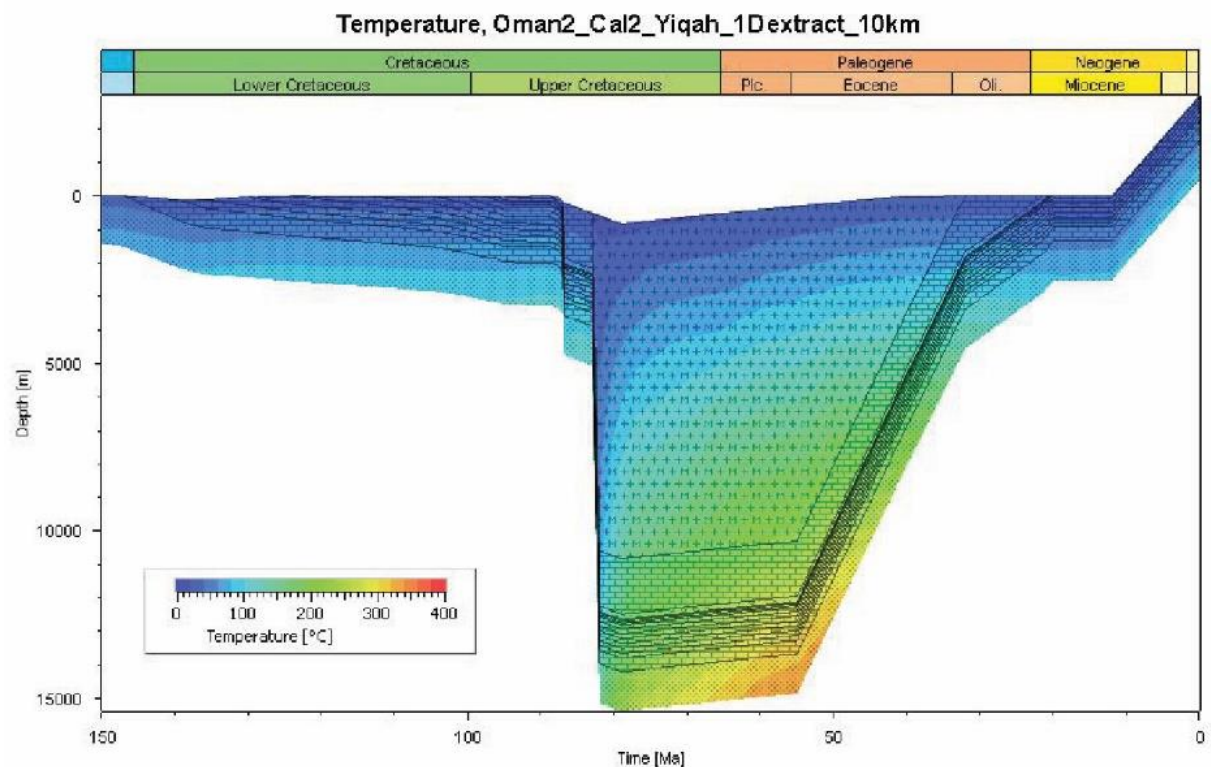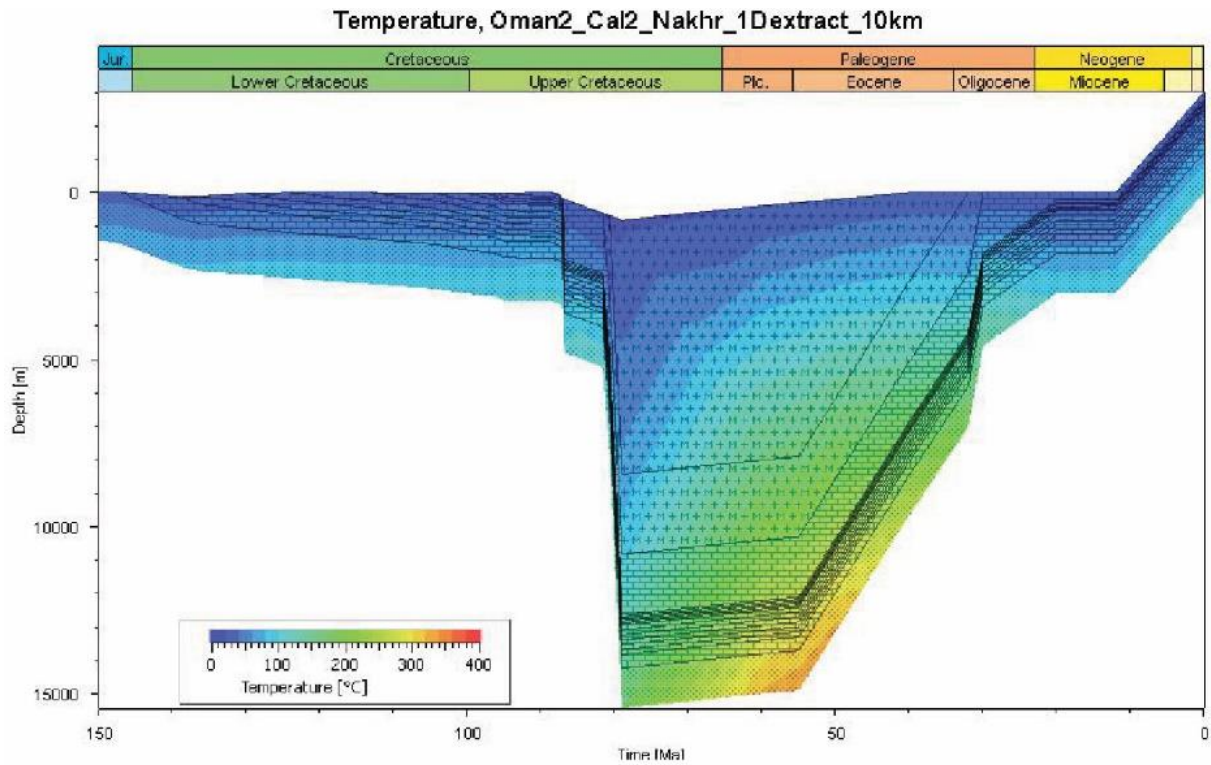
Figure S5: Modeling results: Two representative burial plots for two pseudo-wells created near the entrances of Wadi Nakhr and Yiqah (Figure 1) show two phases of rapid burial related to Hawasina Nappe and ophiolite emplacement at 88 and 78 Ma. Burial in the North (Wadi Yiqah) starts c. 2 Ma earlier due to ophiolite obduction taking place from N to S.
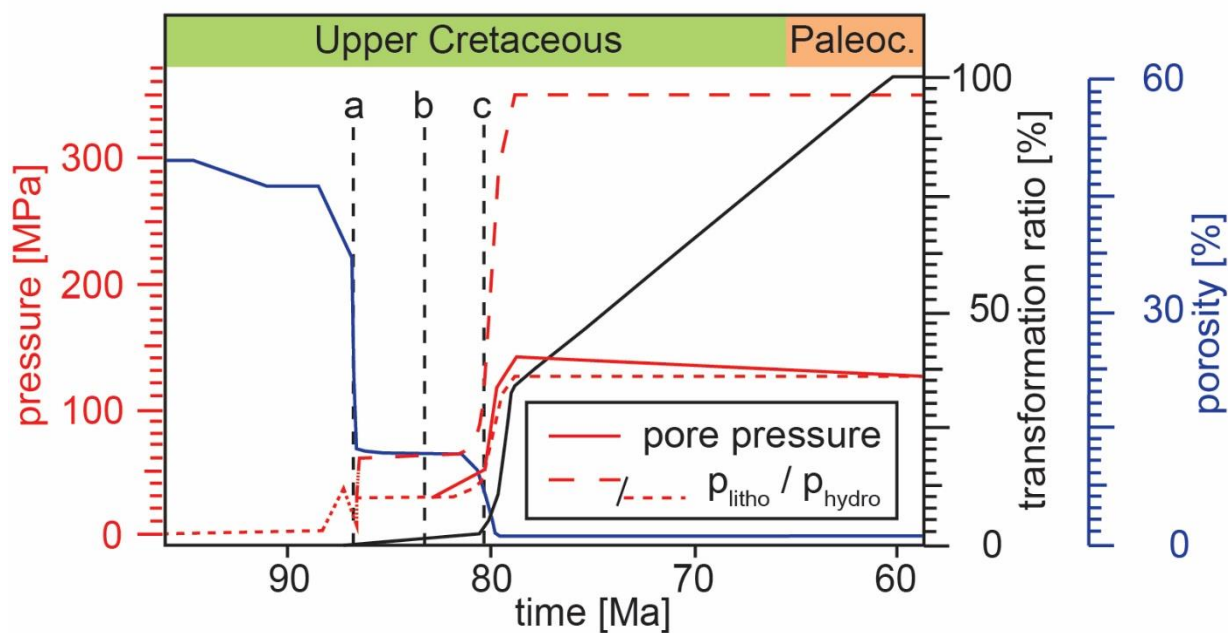
Figure S6: Pressure and porosity model results for the Natih B source rock at Wadi Nakhr with perfect seal conditions (kv, h = 10-23 m²) assigned to the Muti Fm. (top seal): Porosity loss (blue) over time in response to the moving forebulge (a), the emplacement of sedimentary (b) and ophiolitic nappes (c). Comparison to the transformation ratio (black) outlines overpressure associated with hydrocarbon generation.
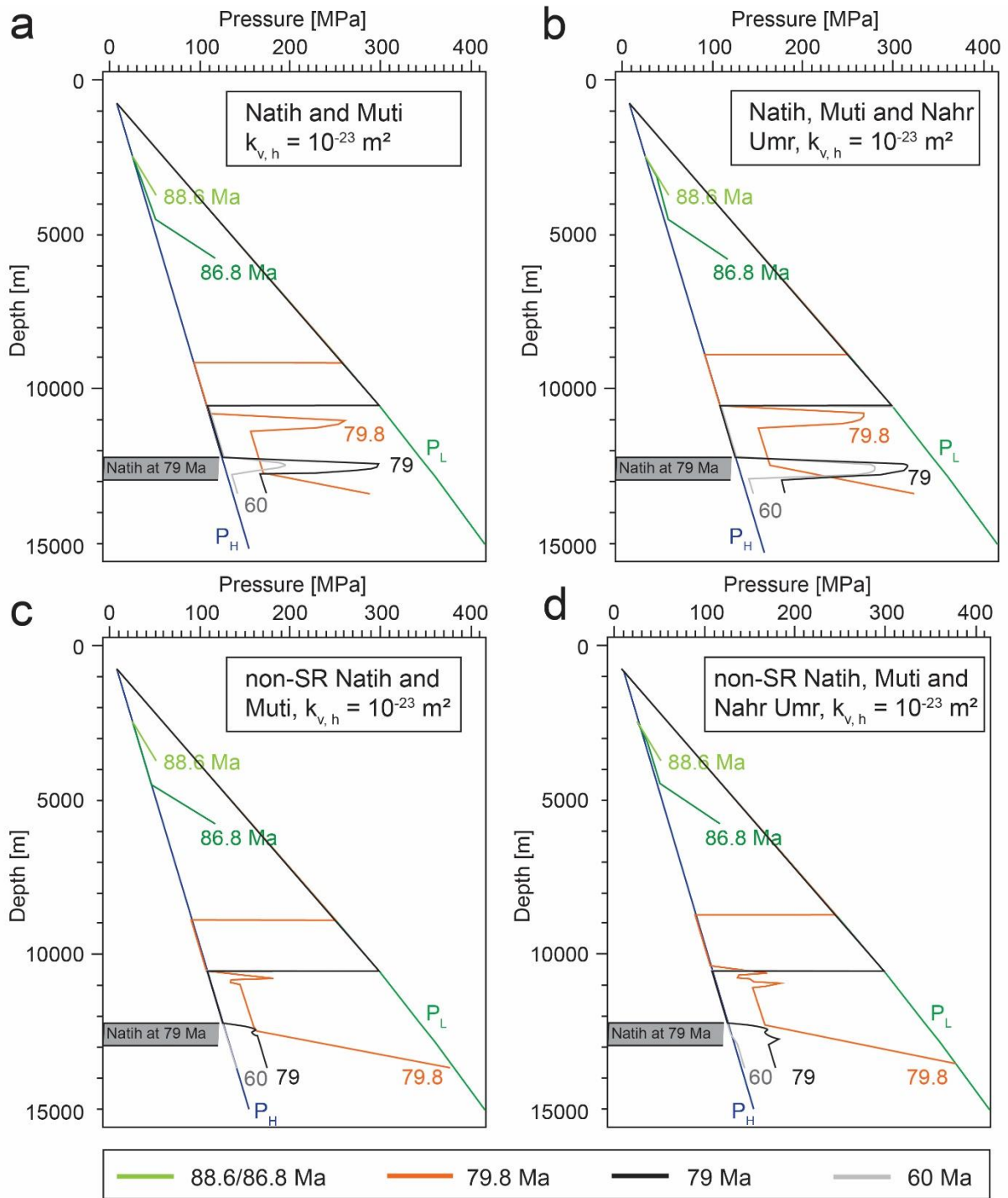
Figure S7: Pressure depth evolution for selected time steps (numbers in Ma) and reduced permeabilities of Muti, Natih and/or Nahr Umr Fm. Lithostatic and hydrostatic pressure lines and the position of the Natih Fm. are shown for peak pressures when deepest burial was reached at 79 Ma. Normal permeabilities of a shaly limestone with a porosity of 1 % reached by burial under the ophiolite are in the order of 10-15 m².
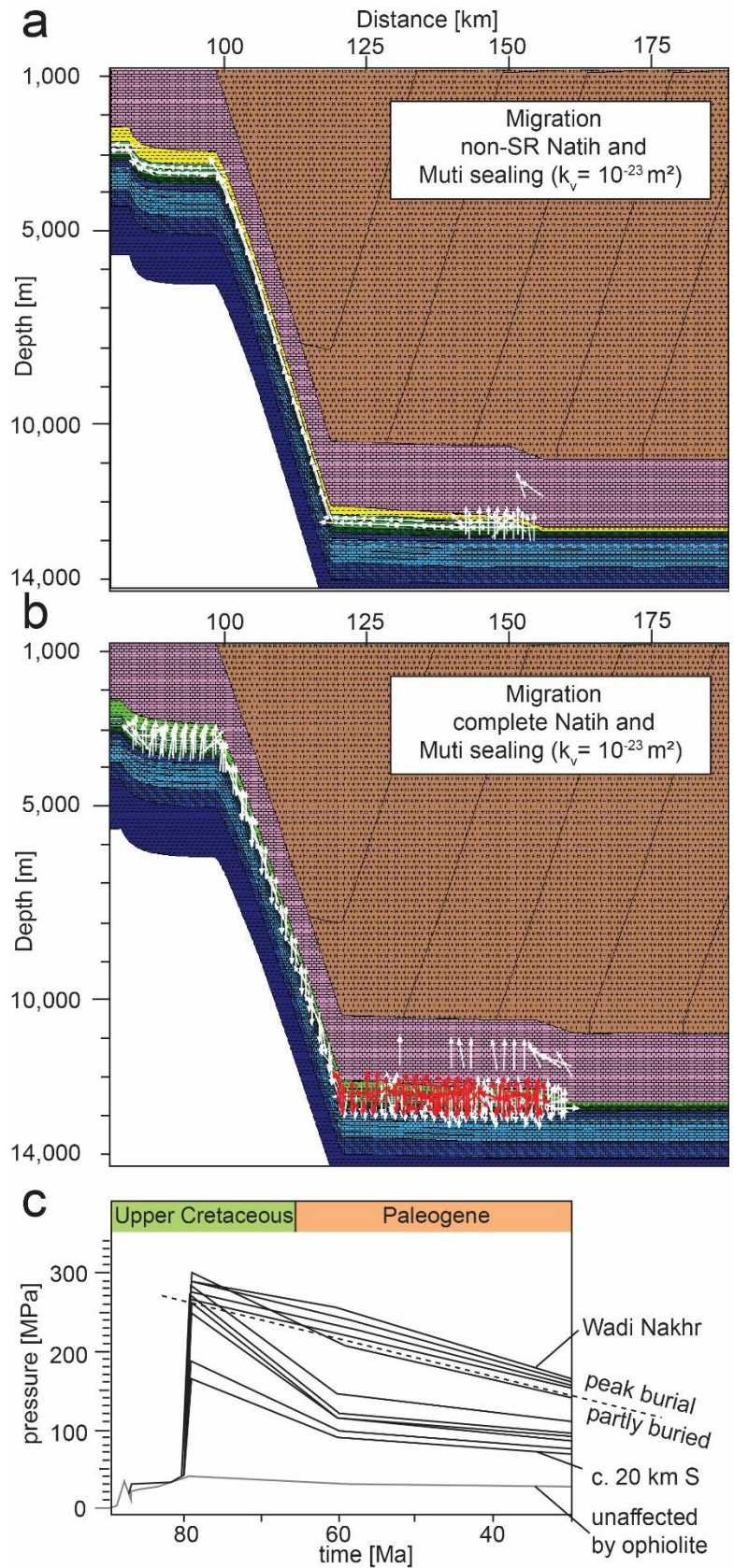
Figure S8: Model results of fluid migration in front of the obducting ophiolite. Migration localizes in the source rock layers of the Natih Fm. if they remain permeable (a) or at layer boundaries if the complete Natih has reduced permeabilites (b). Pressure evolution of the Natih Fm. over time for selected locations underneath the ophiolite (c) show how a pressure gradient established during obduction. The topmost black line represents the location of the Wadi Nakhr, each line below a position 2 km further south. The gray baseline represents the obduction-uneffected pressure evolution for comparison.
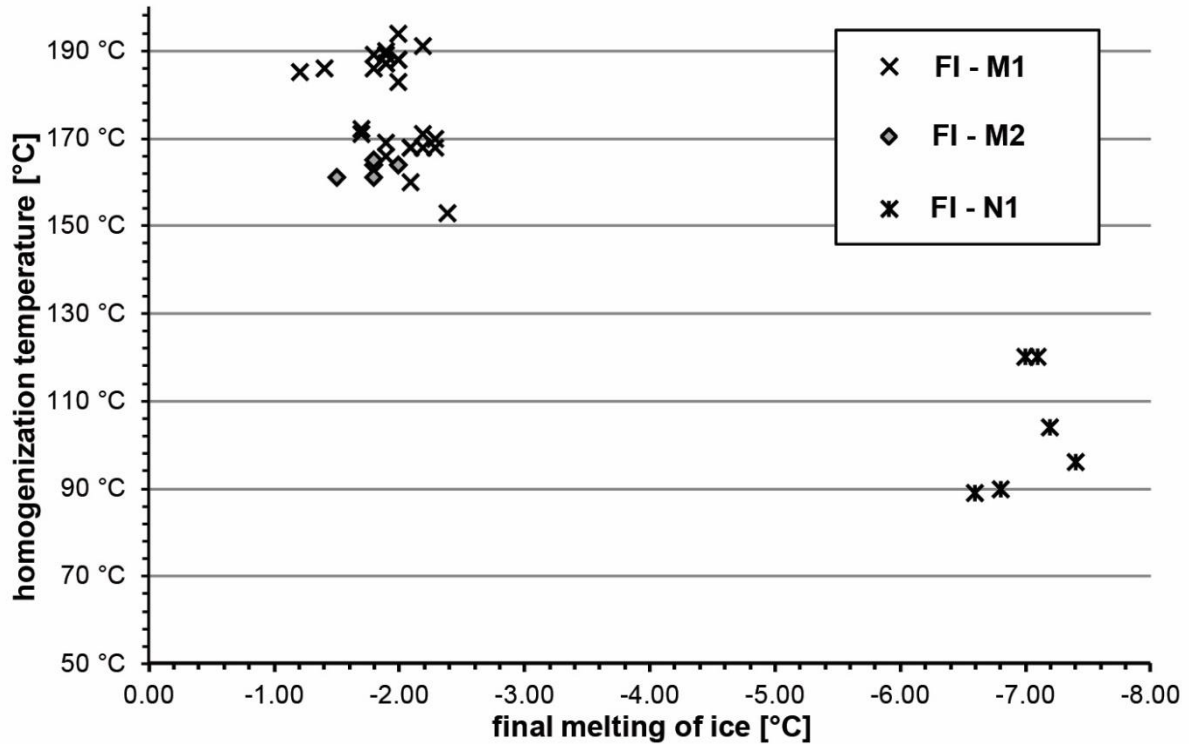
Figure S9: Additional fluid inclusion data plots: homogenization temperatures plotted against the salinities in wt.-% NaCl equivalent which are calculated out of the final melting temperature after Bodnar (1993).

lithology	density	max. compressibility	thermal conductivity		heat capacity	
	[kg/m³]	[Gpa⁻¹]	at 20 °C [W/m/K]	at 100 °C [W/m/K]	at 20 °C [kcal/kg/K]	at 100 °C [kcal/kg/K]
ophiolite mixed after Rioux et al. 2013*	3076	-	3,36	2,96	0,18	0,21
serpentinized ophiolite mixed after Rioux et al. 2013	3012	-	2,28	2,16	0,19	0,22
ophiolite mixed after Searle & Cox 2002**	3133	-	3,50	3,07	0,18	0,20
serpentinized ophiolite mixed after Searle & Cox 2002	3069	-	2,38	2,24	0,19	0,22
Limestone (shaly)	2730	68,65	2,30	2,18	0,20	0,23
Limestone (organic rich - 1-2% TOC)	2710	86,51	2,63	2,42	0,20	0,23
Limestone (organic rich - 10% TOC)	2550	95,68	1,45	1,55	0,20	0,23
Limestone (ooid grainstone)	2740	0,20	3,00	2,69	0,20	0,23
Sandstone (arkose, quartz rich)	2690	26,71	4,05	3,46	0,21	0,24
Conglomerate (typical)	2700	14,21	2,30	2,18	0,20	0,23

* Peridotite 64.4%, Gabbro 20%, Basalt 5.7 %Quarztonalite 4.6%, , Amphibolite 3%, Granodiorite 2.3%

** Peridotite 64.4%, Gabbro 16.7%, Dunite 11.1%, Basalt 5.6%, Amphibolite 2.2%

S10: Petrophysical parameters of the used lithologies in the numerical basin model.