



*Supplement of*

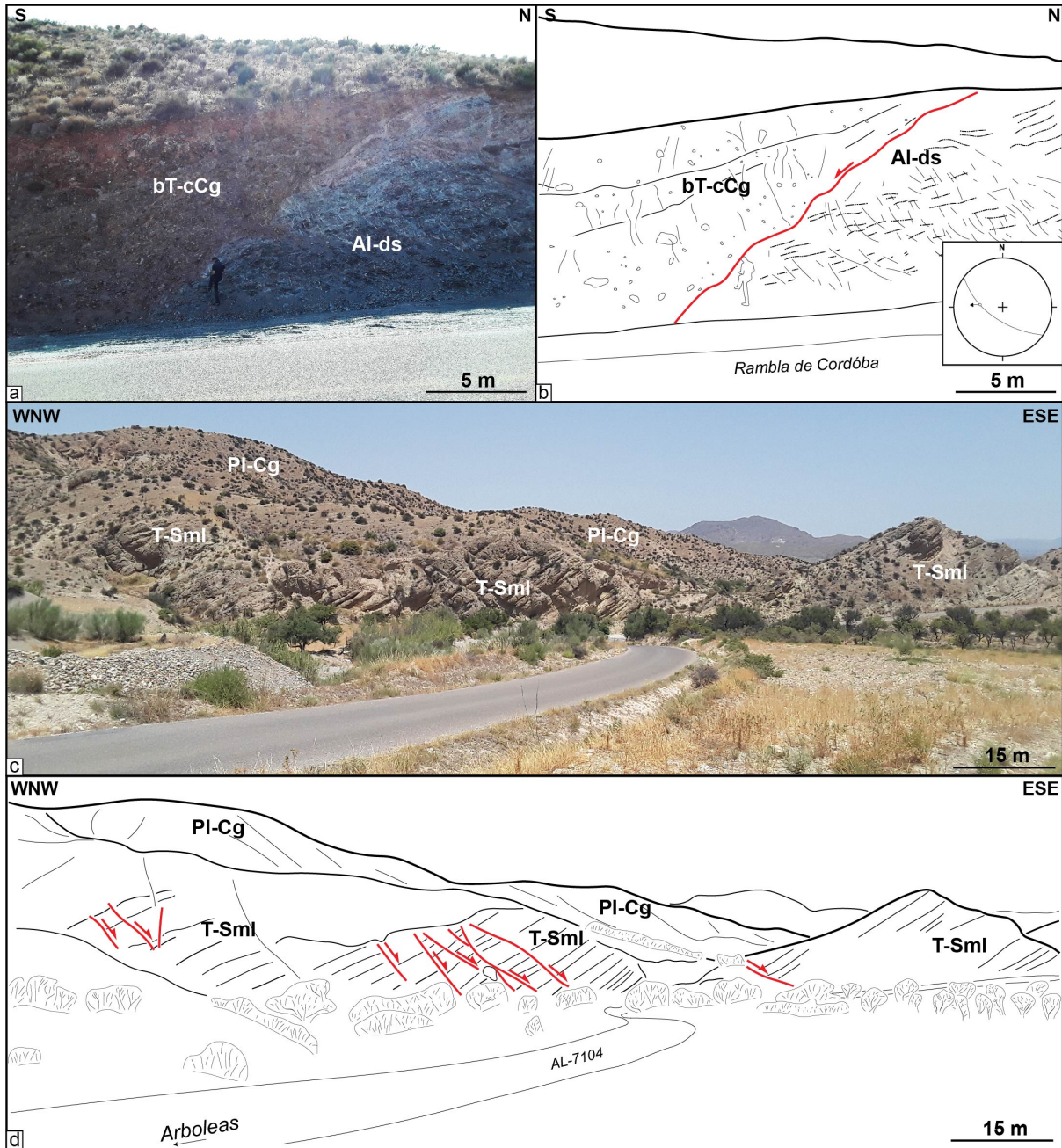
## **Oblique rifting triggered by slab tearing: the case of the Alboran rifted margin in the eastern Betics**

**Marine Larrey et al.**

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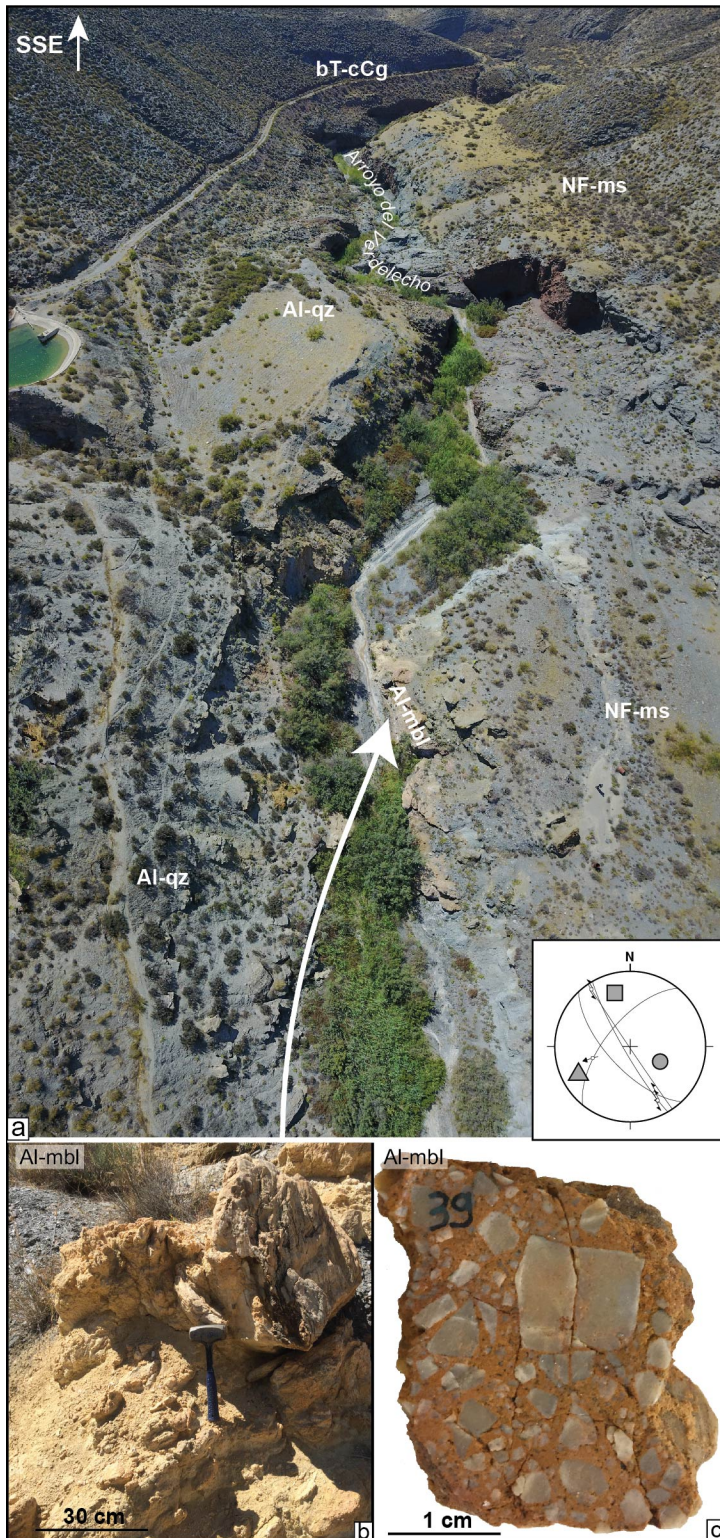
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## Supplementary materials



**Figure S1** : (a, b) Contact between the lower Tortonian red conglomerates and the Alpujarride units in the southern part of the HOB (Rambla de Cordoba, 2km NW Arboleas, see Figure 5 for location) that is reactivated as a normal fault with a dextral shear component consistent with the NE-SW extension described regionally. (c, d) NW-SE faults cutting through the late Tortonian sand and marls series south of HOB (1 km south of Arboleas). Al-ds: Alpujarride dark shists; bT-cCg: basal Tortonian continental Conglomerates; T-Sml: Tortonian Sandstones-marls; PI-Cg: Pliocene Conglomerates. Coordinates





**Figure S2:** (a) Drone view of the NW-SE valley (Arroyo de Verdelecho, same area as Figure 11) in the eastern border of the Alhabia basin showing the tectonic contact between quartzites of the Alpujarride complex (Al-qz) and micaschists of the Nevado-Filabrides complex (NF-ms). (b, c). The NW-SE major fault, parallel to the NW-SE valley is outlined by cataclastic breccias made of Alpujarride complex marbles. It consists of the juxtaposition of left-lateral and normal fault slips with an unclear chronological succession. Al-mbl: Alpujarride marbles.

Location	Stratigraphic age	References	$\sigma_1$		$\sigma_2$		$\sigma_3$		Extension and compression axes	
			Strike	Plung.	Strike	Plung.	Strike	Plung.		
	L. Tortonian		263	86	101	4	11	1	E	NNE-SSW
	Lower Tortonian		133	82	292	7	23	3	E	NNE-SSW
	Serr.- L.Tortonian		322	80	61	2	152	10	E	NW-SE
	Serr.- L.Tortonian		86	86	290	4	200	2	E	NNE-SSW
	Serr.- L.Tortonian		104	87	287	3	204	2	E	NNE-SSW
	Serr.- L.Tortonian		341	1	252	39	69	54	C	NNW-SSE
	Lower Messinian		348	2	82	61	256	29	C	NNW-SSE
	Lower Messinian		265	84	110	5	19	2	E	NNE-SSW
	Serr.- L.Tortonian		32	84	243	5	153	3	E	NNW-SSE
	Serr.- L.Tortonian		2	83	240	3	150	6	E	NNW-SSE
	Serr.- L.Tortonian		347	4	77	5	221	84	C	NNE-SSW
	Lower Tortonian		22	77	280	3	189	13	E	NNE-SSW
	Lower Tortonian		278	87	104	3	14	0	E	NNE-SSW
	L.Tort.- L.Messinian		355	89	264	0	174	1	E	N-S
Huerca-Overa basin	L.Tort.- L.Messinian	Augier et al. (2005c)	15	7	281	27	117	62	C	NNE-SSW
	L.Tort.- L.Messinian		324	87	110	2	200	2	E	NNE-SSW
	Serr.- L.Tortonian		1	16	243	59	99	26	C	N-S
	Lower Messinian		177	4	70	76	268	14	C	N-S
	Permo-Trias		144	82	282	8	12	6	E	N-S
	Serr.- L.Tort.		343	82	97	3	187	7	E	N-S
	Lower Tort.		267	88	98	2	8	0	E	N-S
	Serr.- L.Tortonian		239	82	62	9	153	4	E	NW-SE
	L.Tort.- L.Messinian		99	87	265	3	355	1	E	N-S
	Serr.- L.Tort.		174	87	41	2	311	2	E	NW-SE
	Serr.- L.Tortonian		74	80	271	9	181	3	E	N-S
	Serr.- L.Tortonian		146	76	40	4	309	13	E	NW-SE
	Lower Tortonian		119	79	276	10	6	4	E	N-S
	Lower Tortonian		52	78	276	9	184	8	E	N-S

	L.Tort.- L.Messinian		344	13	83	36	237	51	C	NNW-SSE
	Lower Tortonian		324	85	119	5	209	2	E	NNE-SSW
	Lower Tortonian		325	79	96	7	187	8	E	N-S
	Permo-Trias		214	86	99	2	8	4	E	N-S
	Permo-Trias		126	72	239	7	321	16	E	NNW-SSE
	Permo-Trias		8	80	103	1	194	10	E	N-S
	Lower Tortonian		348	81	101	4	192	8	E	N-S
	L.Tort.- L.Messinian		129	80	266	7	357	7	E	N-S
	Serr.- L.Tortonian		9	9	100	4	214	80	C	NNE-SSW
	Serr.- L.Tortonian		156	82	253	1	343	8	E	NNW-SSE
	Serr.- L.Tortonian		308	79	57	4	148	11	E	NW-SE
	Serr.- L.Tortonian		175	78	276	2	7	11	E	N-S
	Serr.- L.Tortonian		304	87	207	0	117	3	E	WNW-ESE
	L.Tort.- L.Messinian		203	79	297	1	27	11	E	NNE-SSW
	Serr.- L.Tortonian		185	76	281	1	30	14	E	N-S
	Serr.- L.Tortonian		355	7	221	80	85	7	C	N-S
	Serr.- L.Tortonian		51	86	242	2	355	4	E	NW-SE
	Serr.- L.Tortonian		12	87	277	2	188	1	E	N-S
	Serr.- L.Tortonian		322	87	235	1	149	3	E	NW-SE
	Serr.- L.Tortonian		353	9	228	44	878	39	C	N-S
	Serr.- L.Tortonian		281	87	97	12	194	2	E	N-S
	Serr.- L.Tortonian		66	86	246	3	336	1	E	NNW-SSE
	Serr.- L.Tortonian		281	87	104	12	13	7	E	N-S
	Serr.- L.Tortonian		171	4	242	27	69	64	C	N-S
	Serr.- L.Tortonian		129	80	235	7	316	4	E	NW-SE
	Serr.- L.Tortonian		128	86	304	3	29	2	E	NNE-SSW
	Serr.- L.Tortonian		297	78	124	17	207	9	E	NNE-SSW
	Lower Tortonian		117	85	298	7	32	5	E	NNE-SSW
	Lower Tortonian		117	85	298	7	32	5	E	NNE-SSW
	Serr.- L.Tortonian		91	89	284	2	192	1	E	NNE-SSW
Huercal-Overa basin	Serr.- L.Tortonian	Pedrera et al. (2010)	183	86	336	4	66	27	E	NE-SW/NW-SE
	Serr.- L.Tortonian		273	80	104	10	14	27	E	NNE-SSW
	Serr.- L.Tortonian		163	82	28	6	297	6	E	NNE-SSW

	Upper Tortonian		23	70	289	1	198	20	E	NNW-SSE
	Upper Tortonian		207	86	360	4	90	2	E	E-W
	Upper Tortonian		205	76	360	13	91	6	E	E-W
	Upper Tortonian		174	86	354	47	84	0	E	ENE-WSW
	Upper Tortonian		84	14	327	61	181	25	E	ENE-WSW
	Upper Tortonian		313	8	52	48	216	41	C	NNW-SSE
	Upper Tortonian		184	20	78	38	296	45	C	NNW-SSE
	Serr.- L.Tortonian		82	23	119	6	28	6	E	NE-SW
	Serr.- L.Tortonian		324	12	179	76	56	8	E	NW-SE/ENE-WSW
	Serr.- L.Tortonian		94	81	210	4	301	8	E	NW-SE/ENE-WSW
	Serr.- L.Tortonian		14	56	272	8	177	33	E	NW-SE
	Serr.- L.Tortonian		232	65	66	24	334	5	E	NW-SE
	Serr.- L.Tortonian		42	68	136	1	227	22	E	NE-SW
	Serr.- L.Tortonian		202	57	101	7	7	32	E	NNE-SSW
	Lower Tortonian		45	80	221	10	311	1	E	NE-SW
	Upper Tortonian		200	42	20	48	110	0	E	NW-SE
	Serr.- L.Tortonian		25	62	116	1	207	28	E	NNE-SSW
	Permo-Trias		167	77	14	12	283	6	E	NNE-SSW/ESE-WSW
	Serr.- L.Tortonian		137	35	0	46	244	23	C	NW-SE
	Serr.- L.Tortonian		136	2	137	80	46	10	C	NW-SE
	Serr.- L.Tortonian		289	78	141	10	50	6	E	NE-SW
	Serr.- L.Tortonian		233	81	80	8	349	4	E	NE-SW
	Serr.- L.Tortonian		337	70	163	20	72	2	E	NNW-SSE/ENE-WSW
Almonzora basin	Upper Tortonian	Pedrera et al. (2007)	122	84	302	6	32	0	E/C	NE-SW / NW-SE
	Upper Tortonian		285	35	48	38	168	33	E/C	NE-SW / NW-SE
	Upper Tortonian		302	3	51	82	211	8	C	NW-SE
	Upper Tortonian		312	72	119	18	210	4	E	NE-SW
	Upper Tortonian		116	16	296	74	26	0	C	ESE-WNW
	Upper Tortonian		6	14	239	67	101	17	C	ESE-WNW
	Serr.- L.Tortonian		45	88	175	1	265	2	C	E-W
	Upper Tortonian		274	6	6	22	171	67	C	NW-SE
	Upper Tortonian		150	2	60	6	258	84	C	NW-SE
	Upper Tortonian		348	84	150	6	240	2	E	NE-SW
	Serr.- L.Tortonian		215	30	334	40	100	35	E	ESE-WNW
Upper Tortonian	306	4	41	48	213	42	C	NW-SE		

	Serr.- L.Tortonian		224	43	122	13	19	44	E	NNE-SSW
	Upper Tortonian		159	0	68	80	250	10	E/C	NE-SW / NW-SE
	Upper Tortonian		202	48	109	3	16	42	E/C	NE-SW / NW-SE
	Upper Tortonian		199	69	2	20	94	6	E	ESE-WNW
	Serr.- L.Tortonian		176	30	356	60	86	0	E/C	E-W / NW-SE
	Serr.- L.Tortonian		160	13	278	64	64	22	E/C	E-W / NW-SE
			262	89	142	0	52	1		
Sorbas basin	Upper Tortonian	Do Couto et al.	7	4	250	81	97	8	E/C	E-W / N-S
	U. Serr.- U.Tort.	(2014)	47	86	149	1	239	4	E	NE-SW
Tabernas basin	U. Serr.- U.Tort.		182	4	301	81	92	8	C	N-S
Arroyo del Verdelecho	Tortonian	Fig. 11e	122	49	358	27	252	29	E	NE-SW
Arroyo del Verdelecho	Tortonian	Fig. 11e	164	70	315	18	48	9	E	NE-SW
Arroyo del Verdelecho	Tortonian	Fig. 11c	5	14	226	72	98	11	E	E-W
Arroyo del Verdelecho	Trias	Fig. S2	116	53	242	23	344	27	E	N-S
Rambla de Tabernas	Early Tortonian	Fig. 12	217	77	319	3	50	13	E	E-W
Rambla de Tabernas	Tortonian	Fig. 12	162	72	302	14	34	11	E	NE-SW

**Table S1:** Synthesis of principal stresses orientations determined from inversion of fault slip data in the Almanzora basin, Huercál-Overa basin and Tabernas and Sorbas basins. Orientation of extension and compression axes are indicated.