

Supplementary Information

Table 1. LA–ICP–MS U/Pb detrital zircon data. Cauca–Patía Intra–arc Basin – Patía sector: Tuff level from middle Miocene strata (number of samples: 1; total number of analysis: 112).

Sample Fm. Galeón	U (ppm)	Th U	$^{238}\text{U}/^{206}\text{Pb}$	1 sigma % err	$^{207}\text{Pb}/^{206}\text{Pb}$	1 sigma % err	206/238 age	1 sigma abs err	207/206 age	1σ abs err	Best age (Ma)	1σ abs (Ma)
Use these for Tera–Wasserburg conc.												
Fm Galeon_112	1419	0.5	91.452	2.3	2.248	5.00	70.1	1.6	74.9	27.3	70.1	1.6
Fm Galeon_111	540	0.4	424.915	3.2	0.432	6.00	15.2	0.5	540.6	75.4	15.2	0.5
Fm Galeon_110	713	0.5	439.806	2.8	0.378	5.00	14.6	0.4	24.1	78.1	14.6	0.4
Fm Galeon_109	252	0.3	389.008	3.4	0.495	6.00	16.6	0.6	759.9	80.1	16.6	0.6
Fm Galeon_108	794	0.2	436.445	3.4	0.374	6.00	14.8	0.5	423.3	65.5	14.8	0.5
Fm Galeon_107	1440	0.4	41.751	2.1	5.751	5.00	152.6	3.1	166.9	21.7	152.6	3.1
Fm Galeon_106	1150	0.2	435.416	2.6	0.471	5.00	14.8	0.4	367.4	52.3	14.8	0.4
Fm Galeon_105	298	0.2	387.894	4.2	0.652	11.00	16.6	0.7	1743.2	72.6	16.6	0.7
Fm Galeon_104	1040	0.1	407.292	2.6	0.456	5.00	15.8	0.4	77.1	59.5	15.8	0.4
Fm Galeon_103	811	0.1	445.175	3.3	0.356	5.00	14.5	0.5	315.5	82.2	14.5	0.5
Fm Galeon_102	1140	0.2	431.014	2.4	0.439	5.00	14.9	0.4	0	48.8	14.9	0.4
Fm Galeon_101	729	0.1	386.419	3.1	0.435	5.00	16.7	0.5	279.7	61.1	16.7	0.5
Fm Galeon_100	219	0.2	393.553	4.2	0.373	6.00	16.4	0.7	650.3	78.6	16.4	0.7
Fm Galeon_99	388	0.4	279.991	2.1	1.111	7.00	23	0.5	832.2	66.5	23	0.5
Fm Galeon_98	380	0.4	384.788	2.9	0.438	5.00	16.7	0.5	110.2	77.2	16.7	0.5
Fm Galeon_97	343	0.4	263.549	3.3	3.494	30.00	24.4	0.8	3468.5	28.8	24.4	0.8
Fm Galeon_96	486	0.3	424.031	2.5	0.649	7.00	15.2	0.4	886.5	60.2	15.2	0.4
Fm Galeon_95	463	0.3	418.419	3.1	0.465	6.00	15.4	0.5	596.7	74.9	15.4	0.5
Fm Galeon_94	579	0.3	428.422	2.7	0.55	6.00	15	0.4	756.3	61.7	15	0.4
Fm Galeon_93	354	0.3	444.731	3.5	0.36	6.00	14.5	0.5	479.6	76.4	14.5	0.5
Fm Galeon_92	1043	0.3	422.8	2.1	0.564	5.00	15.2	0.3	203	59.2	15.2	0.3
Fm Galeon_91	251	0.3	404.802	4.4	0.326	6.00	15.9	0.7	529.3	85.2	15.9	0.7
Fm Galeon_90	1052	0.2	427.984	1.9	0.622	5.00	15	0.3	198.4	62.7	15	0.3
Fm Galeon_89	505	0.3	363.108	3.2	0.68	8.00	17.7	0.6	1200.1	71.1	17.7	0.6
Fm Galeon_88	459	0.3	439.969	2.7	0.403	5.00	14.6	0.4	81.6	76.4	14.6	0.4
Fm Galeon_87	862	0.5	88.547	1.5	3.73	5.00	72.4	1	95.3	30.2	72.4	1
Fm Galeon_86	82	0.3	447.522	11.4	0.24	12.00	14.4	1.6	1991.1	102.4	14.4	1.6
Fm Galeon_85	1469	0.3	424.145	1.8	0.628	5.00	15.2	0.3	140.6	52.6	15.2	0.3
Fm Galeon_84	341	0.3	441.145	3.6	0.33	5.00	14.6	0.5	273	73.5	14.6	0.5
Fm Galeon_83	742	0.3	409.43	2.5	0.479	5.00	15.7	0.4	183.7	69.2	15.7	0.4
Fm Galeon_82	1223	0.4	415.625	2.5	0.431	5.00	15.5	0.4	0	15.7	15.5	0.4
Fm Galeon_81	772	0.4	432.53	2.7	0.429	5.00	14.9	0.4	172.3	73.9	14.9	0.4
Fm Galeon_80	397	0.3	407.327	2.9	0.537	6.00	15.8	0.5	735.3	71.3	15.8	0.5
Fm Galeon_79	846	0.2	435.452	2.6	0.446	5.00	14.8	0.4	241.1	59.2	14.8	0.4
Fm Galeon_78	383	0.3	405.897	2.9	0.494	6.00	15.9	0.5	565	77.3	15.9	0.5
Fm Galeon_77	349	0.3	407.723	3.5	0.406	6.00	15.8	0.6	548.9	73.6	15.8	0.6
Fm Galeon_76	2299	0.3	428.369	1.9	0.588	5.00	15	0.3	60	46.3	15	0.3
Fm Galeon_75	898	0.3	407.869	2.3	0.54	5.00	15.8	0.4	184.9	60.9	15.8	0.4
Fm Galeon_74	624	0.4	450.089	2.8	0.4	5.00	14.3	0.4	211.5	76.2	14.3	0.4

Table 1. LA-ICP-MS U/Pb detrital zircon data. Cauca-Patía Intra-arc Basin – Patía sector: Tuff level from middle Miocene strata (number of samples: 1; total number of analysis: 112) (*continued*).

Sample Fm. Galeón	U (ppm)	Th U	$^{238}\text{U}/^{206}\text{Pb}$	1 sigma % err	$^{207}\text{Pb}/^{206}\text{Pb}$	1 sigma % err	206/238 age	1 sigma abs err	207/206 age	1 σ abs err	Best age (Ma)	1 σ abs (Ma)
Use these for Tera-Wasserburg conc.												
Fm Galeon_73	752	0.3	403.788	2.3	0.53	5.00	15.9	0.4	205.1	64.9	15.9	0.4
Fm Galeon_72	398	0.3	403.477	2.9	0.45	5.00	16	0.5	313.9	84.9	16	0.5
Fm Galeon_71	1309	0.3	397.176	2.1	0.587	5.00	16.2	0.3	112.5	54.2	16.2	0.3
Fm Galeon_70	539	0.3	310.531	2.5	0.688	5.00	20.7	0.5	357	67.1	20.7	0.5
Fm Galeon_69	213	0.2	391.367	3.9	0.428	6.00	16.5	0.6	759.4	80.5	16.5	0.6
Fm Galeon_68	397	0.3	426.161	3.2	0.387	5.00	15.1	0.5	306.8	85.6	15.1	0.5
Fm Galeon_67	332	1.6	10.191	1.7	35.692	6.00	603.4	9.5	616	22	603.4	9.5
Fm Galeon_66	2064	0.3	426.073	2	0.548	5.00	15.1	0.3	31.3	50.6	15.1	0.3
Fm Galeon_65	364	0.7	249.749	2.8	0.863	6.00	25.8	0.7	636.2	66.4	25.8	0.7
Fm Galeon_64	348	0.3	387.23	3.2	0.423	5.00	16.6	0.5	282.9	83.2	16.6	0.5
Fm Galeon_63	657	0.3	413.409	3	0.378	5.00	15.6	0.5	41.7	69.9	15.6	0.5
Fm Galeon_62	635	0.3	408.807	2.5	0.457	5.00	15.7	0.4	21.3	75	15.7	0.4
Fm Galeon_61	705	0.1	346.013	3	0.559	6.00	18.6	0.5	497.9	68.8	18.6	0.5
Fm Galeon_60	406	0.4	391.957	3.3	0.354	5.00	16.4	0.5	22	82.4	16.4	0.5
Fm Galeon_59	1149	0.6	91.926	1.7	3.027	5.00	69.7	1.2	63.3	33	69.7	1.2
Fm Galeon_58	868	0.2	415.665	2.4	0.491	5.00	15.5	0.4	96.9	70.3	15.5	0.4
Fm Galeon_57	523	0.5	81.766	2	3.084	5.00	78.4	1.5	169.9	39.3	78.4	1.5
Fm Galeon_56	393	0.3	398.988	2.7	0.596	6.00	16.1	0.4	754.6	71.4	16.1	0.4
Fm Galeon_55	698	0.8	164.113	2.3	1.278	5.00	39.2	0.9	64.7	74.6	39.2	0.9
Fm Galeon_54	470	0.3	432.514	3.1	0.4	5.00	14.9	0.5	328	70.5	14.9	0.5
Fm Galeon_53	605	0.3	423.198	2.8	0.425	5.00	15.2	0.4	170.4	80.1	15.2	0.4
Fm Galeon_52	411	0.4	403.938	6.6	0.275	7.00	15.9	1	1022.8	154.5	15.9	1
Fm Galeon_51	454	0.3	418.726	3.1	0.345	4.00	15.4	0.5	0	16.2	15.4	0.5
Fm Galeon_50	599	0.3	424.807	2.6	0.439	5.00	15.2	0.4	137.9	76.8	15.2	0.4
Fm Galeon_49	339	0.2	407.036	3.2	0.415	5.00	15.8	0.5	347.3	82.6	15.8	0.5
Fm Galeon_48	522	0.4	424.543	2.7	0.459	5.00	15.2	0.4	342	76.9	15.2	0.4
Fm Galeon_47	1263	0.3	109.085	1.9	2.378	5.00	58.8	1.1	128.9	37.7	58.8	1.1
Fm Galeon_46	256	0.3	402.253	3.6	0.34	5.00	16	0.6	164.9	86	16	0.6
Fm Galeon_45	473	0.4	410.224	2.8	0.433	5.00	15.7	0.4	153.4	79.5	15.7	0.4
Fm Galeon_44	1483	0.3	97.964	1.7	2.981	5.00	65.5	1.1	143.4	29.2	65.5	1.1
Fm Galeon_43	875	0.4	421.31	2.4	0.491	5.00	15.3	0.4	192.7	61.6	15.3	0.4
Fm Galeon_42	358	0.3	402.79	3.1	0.418	5.00	16	0.5	317.3	75.8	16	0.5
Fm Galeon_41	854	0.2	436.841	2.6	0.424	5.00	14.7	0.4	136.3	72.3	14.7	0.4
Fm Galeon_40	442	0.3	397.906	3.4	0.515	7.00	16.2	0.5	911.9	66.6	16.2	0.5
Fm Galeon_39	582	0.3	403.509	2.8	0.43	5.00	16	0.4	92.7	80.9	16	0.4
Fm Galeon_38	799	0.2	435.417	2.9	0.405	5.00	14.8	0.4	215.6	60.4	14.8	0.4
Fm Galeon_37	663	0.3	419.795	2.8	0.429	5.00	15.3	0.4	188.9	71.8	15.3	0.4
Fm Galeon_36	492	0.3	389.444	3.9	0.314	5.00	16.5	0.7	113.6	99.1	16.5	0.7
Fm Galeon_35	289	0.3	375.393	3.7	0.49	7.00	17.1	0.6	884.3	95.6	17.1	0.6
Fm Galeon_34	338	0.3	416.944	4	0.326	5.00	15.4	0.6	377.7	88.6	15.4	0.6
Fm Galeon_33	313	0.3	412.353	4	0.295	5.00	15.6	0.6	114.9	92.1	15.6	0.6

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Use these for Tera–Wasserburg conc.												
Fm Galeon_32	562	0.3	419.03	2.9	0.439	5.00	15.4	0.4	320.8	89.6	15.4	0.4
Fm Galeon_31	542	0.4	416.449	3.3	0.34	5.00	15.5	0.5	38.5	88.4	15.5	0.5
Fm Galeon_30	454	0.5	76.091	2.2	2.803	5.00	84.2	1.9	78.9	42	84.2	1.9
Fm Galeon_29	185	1.3	2.767	2	221.024	12.00	1988.7	34.6	2015.4	13.9	2015.4	13.9
Fm Galeon_28	237	0.3	389.023	3.6	0.422	6.00	16.5	0.6	562.6	99.5	16.5	0.6
Fm Galeon_27	2074	0.5	92.033	2.2	2.314	5.00	69.7	1.5	64.3	27	69.7	1.5
Fm Galeon_26	523	0.3	451.114	3.7	0.281	5.00	14.3	0.5	14.4	93.6	14.3	0.5
Fm Galeon_25	1699	0.2	417.085	2.5	0.447	5.00	15.4	0.4	17.2	55.6	15.4	0.4
Fm Galeon_24	363	0.3	431.94	4.4	0.231	4.00	14.9	0.6	0	0	14.9	0.6
Fm Galeon_23	656	0.4	415.839	3.3	0.338	5.00	15.5	0.5	0	107.7	15.5	0.5
Fm Galeon_22	430	0.4	73.263	2.5	2.506	5.00	87.4	2.2	36.5	63.4	87.4	2.2
Fm Galeon_21	597	0.4	427.272	3.4	0.312	5.00	15.1	0.5	0.2	104.6	15.1	0.5
Fm Galeon_20	280	0.4	534.66	6	0.183	6.00	12	0.7	536.9	122.3	12	0.7
Fm Galeon_19	350	0.3	474.711	4.3	0.19	4.00	13.6	0.6	0	0	13.6	0.6
Fm Galeon_18	518	0.3	450.672	3.7	0.293	5.00	14.3	0.5	116.8	102	14.3	0.5
Fm Galeon_17	673	0.3	403.552	3.7	0.448	7.00	16	0.6	826.2	68.6	16	0.6
Fm Galeon_16	383	0.4	301.133	5.1	0.967	15.00	21.4	1.1	2322.5	63.2	21.4	1.1
Fm Galeon_15	344	0.3	428.944	3.7	0.304	5.00	15	0.5	87.2	116.7	15	0.5
Fm Galeon_14	557	0.4	432.693	3.4	0.299	4.00	14.9	0.5	0	0	14.9	0.5
Fm Galeon_13	443	0.4	415.083	3.6	0.347	5.00	15.5	0.6	267.3	100.2	15.5	0.6
Fm Galeon_12	440	0.3	367.046	3.4	0.67	8.00	17.5	0.6	1276	72.8	17.5	0.6
Fm Galeon_11	553	0.5	449.404	5.4	0.183	4.00	14.3	0.8	0	27.5	14.3	0.8
Fm Galeon_10	550	0.3	444.535	3.8	0.332	6.00	14.5	0.6	463.1	89.5	14.5	0.6
Fm Galeon_9	471	0.2	444.506	3.7	0.276	5.00	14.5	0.5	0	81.2	14.5	0.5
Fm Galeon_8	426	0.4	257.898	3.2	0.663	5.00	24.9	0.8	373.1	71.1	24.9	0.8
Fm Galeon_7	500	0.4	373.064	4	0.459	7.00	17.3	0.7	884.6	57.4	17.3	0.7
Fm Galeon_6	613	0.3	407.453	3	0.377	5.00	15.8	0.5	7.1	82.8	15.8	0.5
Fm Galeon_5	460	0.3	378.731	4	0.35	5.00	17	0.7	348.2	71.4	17	0.7
Fm Galeon_4	405	0.3	427.947	3.9	0.286	5.00	15	0.6	111.5	88.3	15	0.6
Fm Galeon_3	667	0.3	402.18	2.9	0.517	6.00	16	0.5	588.2	69.2	16	0.5
Fm Galeon_2	754	0.4	415.294	3.1	0.427	6.00	15.5	0.5	434.5	65	15.5	0.5
Fm Galeon_1	84	0.4	394.347	3.4	0.404	5.00	16.3	0.6	367.8	84.5	16.3	0.6

Table 2. Organic geochemistry data: Total Organic Carbon–Pyrolysis.

Sample ID	LECO		RE		Tmax (°C)	HI	OI	S2/S3	S1/TOC *100	PI	Pyrogram comments	Laboratory ID
	TOC	S1	S2	S3								
OA-07D	0.85	0.04	1.41	0.14	436	165.3	16.4	10.1	4.8	0.03	n:lts2sh:hts2sh	R116966
OA-08	0.88	0.08	2.02	0.12	433	228.8	13.6	16.8	9.1	0.04	n:lts2sh:hts2sh	R116967
OA-17B	0.26											R116968
OA-32	0.87	0.03	1.24	0.27	428	142.4	31.0	4.6	3.5	0.02	n:lts2sh:hts2sh	R116969
OA-35	1.08	0.06	1.30	0.22	434	120.8	20.4	5.9	5.7	0.04	n:lts2sh:hts2sh	R116970

S1: volatile hydrocarbon (HC) content, mg HC/g rock.

S2: remaining HC generative potential, mg HC/g rock.

S3: carbon dioxide content, mg CO₂/g rock.

HI: Hydrogen index = S2 × 100/TOC, mg HC/g rock.

OI: Oxygen index = S3 × 100/TOC, mg CO₂/g rock.

PI: Production index = S1/(S1+S2).

Pyrogram: (f) flat S2 peak; (n) normal; (lts2sh) low temperature S2 shoulder; (lts2p) low temperature S2 peak; (hts2p) high temperature S2 peak; (hts2sh) high temperature S2 shoulder.

LECO: TOC on LECO instrument.

RE: programmed pyrolysis on Rock-Eval instrument.

Table 3. Sandstone petrography data (%). Monocrystalline quartz (Qm), monocrystalline quartz with undulatory extinction (Qmu), igneous polycrystalline quartz (Qpi), foliated polycrystalline quartz (Qpf), recrystallized polycrystalline quartz (Qpr), plagioclase (Pl), k-feldspar (Fk), undifferentiated feldspars (Fsp–u), acid and intermediate plutonic lithic (Lpa), volcanic lithic (Lv), metamorphic schistose lithic (Lms), sedimentary lithic (Ls), chert (Cht), biotite (Bt), muscovite (Ms), chlorite (Chl), hornblende (Hb), epidote (Ep), tourmaline (Tr), zircon (Zr), pyroxene (Px).

Sample	Compositional classification	Meters above base	Quartz					Feldspars					Lithics					Accessories							Interstitial material					
			Qm	Qmu	Qpi	Qpf	Qpr	Pl	Fk	Fsp–u	Lpa	Lv	Lms	Ls	Cht	Bt	Ms	Chl	Hb	Ep	Tr	Zr	Px	Ca cement	Si cement	Chl cement	Fe cement	Matrix	Pores	Total
OA–01	Feldspathic litharenite	0	13.9	14.5	0.3		0.6	16.1		6.4	0.6	12	2.1			0.9								8.5	12.1	4.8		0.6	6.4	100
OA–01B	Sublitharenite	3	9.4	16.8	0.9		0.9	1.2		0.6	0	6.2	0	0.9		0.9	4.4	0.6					0.9	16.5	15.3	2.4	11.5	10.6	100	
OA–04	Lithic arkose	23	12	12	0.0		2.3	4	1.3		0.0	0	5	0	3.3		3.0						0	40	0.0	0	5.7	11.3	100	
OA–06	Feldspathic litharenite	30.5	14.9	12.1	1.6	0.3	0.3	4.8	0.6		0.3	0.3	0	12	0.3		2.2	5.1	1.3				20.3	0.6	17.8	4.8	0	0.3	100	
OA–14	Quartzarenite	206	14.6	19.5	1.6		0.0	0.0			0.0	0	0	0.3	13	1.6	1		0.6	0.3	0.3		24	16.9	0.0	0.6	0	5.5	100	
OA–16	Litharenite	264.7	5.6	24.9	1.6	0.3	3.0	1.6			1.0	6.6	6.2	6.6	0.7	2.3	0.7	1.6	0.3	1.0			17.4	3.6	10.8	2.3	0	2	100	
OA–26	Arkose	368	18.2	0	0.3		0.6	28.6				6.3	3.0	0	4.5	0.6	0.6	8.3				1.8	3.3	1.2	0.0	0	8.9	13.4	100	
OA–29	Feldspathic litharenite	380	0.3	31.5	3	1.3	0.0	8.3				1.0	9.9	7.9	4.6	0.7	0.7	2.3	0.3				23.2	0.7	0.0	1	0	3.3	100	
OA–40	Mudstone	424																												
OA–41	Litharenite	452	13.8	10.7	3.1		1.3	1.3			0.0	0	17	0.0				0.3	0.3				20.1	4.4	6.0	1.3	17.9	2.5	100	
OA–43	Litharenite	469	2.1	27.7	4.5	5.4	2.1	6.9				2.4	15.1	7.8	5.1	1.8	3.9	3	0.3		1.2		0.3	2.1	1.5	0	3	3.6	100	
OA–45	Sublitharenite	472	18.6	10.2	3	0.6	1.5	1.2					0.3	2.4	6	0.9	2.1	0.9		0.3			22.5	0.3	10.2	6	9.3	3.9	100	
OA–46	Feldspathic litharenite	476	0.7	17	6.2	3	1.5	7.7	0.2	3.2			16.5	9.7	2	0	1.2	1.2	0.2		1.0		23.7	0	0.0	0	0.7	4	100	
OA–48	Litharenite	484	6.3	13	15.3	3.7	2.0	5.0				1.3	13.3	4.3	6	0	0.7		2.3				19.3	0	5.0	0.7	0	2	100	
OA–49	Litharenite	496	7.9	13.8	10.5	1.3	0.0	3.6					1.0	4.6	11	1.0			0.3	0.3			38.4	2	3.3	0.3	0.3	0.3	100	
OA–53*	Feldspathic litharenite	560	0.6	11.2	0.3		0.3	15.5				3.1	45.0	0	0.9	0	0.3		2.2	10.9	1.9		0	2.5	0.0	0	0.6	4.7	100	
OA–53	Feldspathic litharenite	561	2.5	8.8	0.3		0.6	8.5	1.6	11.4			39.7	0	0.3	0.0			1.3	5.7	0.3		0	5	0.0	0.3	8.2	5.4	100	

Table 4. Heavy minerals data (%).

Sample	Rutile	Zircon	Apatite	Tourmaline	Spinel	Muscovite	Glaucofane	Garnet	Hyperstene	Olivine	Enstatite	Epidote	Clinozoisite	Biotite	Chlorite	Hornblende
OA–01	0.0	4.5	25.0	1.0	0.0	0.0	0.0	1.9	0.3	1.3	0.0	18.2	0.0	1.6	0.0	46.1
OA–16	1.6	11.4	23.7	5.2	0.0	1.9	0.3	22.4	0.3	2.6	0.3	26.6	0.3	1.9	0.0	1.2
OA–48	1.9	29.9	8.7	4.8	0.0	3.2	0.6	1.9	6.4	3.2	1.0	21.9	2.6	1.0	0.0	12.9
OA–53	1.5	19.6	11.7	4.1	0.6	0.9	0.0	39.0	0.3	6.7	0.3	13.8	0.3	0.3	0.6	0.3