CLAY MINERAL CONTENT OF CONTINENTAL SHELF AND RIVER SEDIMENTS, SOUTHERN CALIFORNIA

By

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EXPLANATION

This report contains data on the clay mineral content of 250 shelf surface-sediment samples from the California Continental Borderland (Tables 1, 2; Figures 1-7), 79 samples with depth in cores from Santa Monica Bay (Table 3; see Table 1 for surface sediment data for those same cores and for core locations), 24 suspended and 13 bottom sediment samples from rivers draining Southern California (Table 4), and six rock samples or composite rock samples from the Palos Verdes Headland (Table 4). This report is designed as the data repository and these data are discussed in a paper by Hein et al. (2001). Summary tables of the data presented here and table 4 presented here are included in that paper. The techniques used in sample preparation and analyses are repeated here.

METHOD OF CLAY MINERAL ANALYSIS

The procedure used to determine clay mineral suites includes the following steps of sample treatment. 1. About 5-15 cc of sediment were soaked for 2 days in Morgan's solution (sodium acetate, glacial acetic acid, and water) to remove carbonate; and 30% hydrogen peroxide to remove organic matter, after which the samples were washed several times with Morgan's solution and then removed from suspension by centrifugation. 2. The washed sediment was suspended again with a magnetic stirrer in 0.01% sodium carbonate solution and the <2 μm size fraction was isolated by centrifugation. 3. The clay-sized material was concentrated by centrifuging; magnesium saturated by washing 4 times with 1M magnesium chloride; and excess salts were removed by washing with distilled water. 4. The clay was spread evenly over a plastic or glass insert of an aluminum sample holder and dried in a desiccater, after which the sample was placed over a bowl of ethylene glycol in an oven at 65° C for 1 hour and then in a desiccater for 1 day to expand the smectite clay mineral lattice so that smectite could be distinguished from chlorite and vermiculite.

The glycolated samples were analyzed using a Philips X-ray diffractometer with carbon monochromator and Cukα radiation. Continuous scans were run from 3-70˚ 2Θ using a step size of 0.02˚ 2Θ at 1 s/step, and scan speed of 0.02˚ 2Θ/s. A second scan was run from 24-26° 2Θ using a step size of 0.02˚ 2Θ at 5 s/step, and scan speed of 0.004˚ 2Θ/s. This second scan was used to attempt to distinguish chlorite from kaolinite (Biscaye, 1964), which was not routinely possible. So, kaolinite and chlorite percentages are listed together. Semi-quantitative estimates of relative clay mineral percentages were obtained from measurement of peak-areas, which were multiplied times the weighting factors of Biscaye (1965), which are 4 times the illite peak area, 2 times the kaolinite + chlorite peak area, and 1 times the smectite peak area, then summed to 100%. This procedure allows us to compare our results with many other studies of marine clay minerals that use those same weighting factors. In addition, the un-weighted clay mineral contents are listed in table 2. Smectite is a smectite/illite mixed layer clay mineral and the amount of expandable layers (the smectite portion) was also calculated based on the difference in the height of the base line from the high and low 2Θ sides of the 5.2° 2Θ peak (see Perry and Hower, 1970; and Reynolds and Hower, 1970).

In order to measure analytical precision, duplicate analyses were run on 10% of the samples (Table 5). Reproducibility was within 3 percentage points for 80% of the duplicate samples and within 5 points for 90% of the samples. Samples with total peak areas less than about 550-650 mm^2 generally had poor reproducibility and those data are not used for surface sediment samples, but are used for some core samples when the clay mineral contents calculated from those diffractograms are comparable with clay mineral contents from either underlying or overlying samples; these samples are listed in the tables as LCMC, low clay mineral content. The potentially useable LCMC data listed in table 3 from the cores are flagged by parentheses around the clay mineral contents. A less than 2 μm fraction exists for those LCMC samples, but the clay minerals are either absent or very poorly crystalline. Accuracy depends on the applicability of the weighting factors to the clay minerals analyzed in this study, and that cannot be evaluated.

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Key Search Words: Clay mineralogy, illite, smectite, kaolinite, chlorite, expandable layers, Southern California Borderland, continental shelf, shelf sediments, fine-grained sediment, clay-size fraction, river sediments

Table 1. Weighted* clay mineral content of the <2 μm size-fraction of Southern California Borderland shelf surface sediments (locations in Fig. 1)

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)	Latitude (°N)	Longitude (°W)
1	2354	31	43	26	50	34.45885	120.31283
2	2370	39	41	20	56	34.29863	119.36180
3	2338	26	44	30	50	34.26987	119.34127
4	2340	24	47	29	49	34.26512	119.34163
5	2339	22	48	30	55	34.25232	119.28482
6	2331	40	37	23	60	34.24563	119.28873
7	2329	LCMC	LCMC	LCMC	LCMC	34.25008	119.27637
8	2330	0	54	46	0	34.23993	119.28082
9	2328	0	57	43	0	34.21907	119.28765
10	2375	23	49	28	49	34.18795	119.35537
11	2376	21	48	31	52	34.17882	119.34637
12	2129	14	59	27	75	34.17317	119.22782
13	2130	0	55	45	0	34.17183	119.22330
14	2131	32	47	21	62	34.16277	119.22467
15	2132	0	80	20	0	34.15490	119.22723
16	2273	6	49	45	40	34.13045	119.19843
17	2275	27	53	20	41	34.13072	119.19548
18	2274	49	28	23	65	34.12380	119.19745
19	2276	11	72	17	48	34.12367	119.18282
20	2341	31	43	26	58	34.08998	119.15002
21	2342	23	45	32	59	34.07048	119.15975
22	2310	52	32	16	64	34.09157	119.08910
23	2308	31	48	21	60	34.08305	119.09022
24	2377	LCMC	LCMC	LCMC	LCMC	34.03890	118.94028
25	2378	LCMC	LCMC	LCMC	LCMC	34.03253	118.92253
26	2343	20	66	14	47	34.02463	118.85227
27	2344	52	30	18	70	34.01922	118.85678
28	2379	40	34	26	55	34.01922	118.83677
29	S2-97-SC 26B1/0-2	46	34	20	70	33.99433	118.77200
30	2381	41	36	23	67	34.00250	118.76933
31	2380	52	32	16	62	34.01825	118.76010
32	S2-97-SC 54B1/0-2	53	25	22	56	34.02267	118.65900
33	S2-97-SC 6B1/0-2	41	39	20	62	34.02117	118.65417
34	2382	54	30	16	70	34.02307	118.59257
35	S2-97-SC 4B1/0-2	19	53	28	56	34.01350	118.53405
36	S2-97-SC 24B1/0-2	39	39	22	63	33.97117	118.65150
37	S2-97-SC 18B1/0-2	33	41	26	61	33.97933	118.57517
38	S2-97-SC 22B1/0-2	39	39	22	62	33.98017	118.55683
39	S2-97-SC 20B1/0-2	41	34	25	58	33.96883	118.53217
40	2305	24	61	15	47	33.97573	118.47113
41	2307	LCMC	LCMC	LCMC	LCMC	33.96225	118.47670
42	S2-97-SC 16B1/0-2	23	49	28	50	33.94183	118.58983
43	S2-97-SC 51B1/0-2	21	47	32	56	33.94283	118.57483
44	2192	44	31	25	51	33.94450	118.51908
45	S2-97-SC 49B1/0-2	22	59	19	42	33.95033	118.48233
46	S2-97-SC 53B3/0-2	LCMC	LCMC	LCMC	LCMC	33.92833	118.55433
47	S2-97-SC 10B1/0-2	38	41	21	53	33.92133	118.56017
48	S2-97-SC 52B1/0-2	40	31	29	47	33.91383	118.57233
49	S2-97-SC 50B1/0-2	41	35	24	64	33.92783	118.53500
50	S2-97-SC 40B1/0-2	42	37	21	65	33.92517	118.53450
51	S2-97-SC 42B1/0-2	34	46	20	64	33.93333	118.50667
52	2306	0	87	13	0	33.93588	118.45358
53	2384	30	44	26	58	33.92987	118.50390

Table 1 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)	Latitude (°N)	Longitude (°W)
54	S2-97-SC 44B1/0-2	22	56	22	50	33.92483	118.50050
55	2195	52	31	17	65	33.91088	118.52502
56	S2-97-SC 55B1/0-2	34	40	26	43	33.90900	118.52517
57	2197	44	36	20	61	33.90387	118.50077
58	S2-97-SC 34B2/0-2	38	37	25	65	33.88667	118.47800
59	2386	4	88	8	41	33.87808	118.42445
60	S2-97-SC 28B1/0-2	41	40	19	52	33.83850	118.55133
61	S2-97-SC 36B1/0-2	26	49	25	61	33.83333	118.51133
62	S2-97-SC 33B1/0-2	34	42	24	59	33.84717	118.46100
63	2387	30	45	25	61	33.84833	118.45215
64	S2-97-SC 48B1/0-2	31	43	26	55	33.83850	118.42700
65	2200	37	40	23	58	33.74790	118.42902
66	2201	35	44	21	56	33.72067	118.39237
67	2202	46	34	20	60	33.72207	118.37248
68	2389	LCMC	LCMC	LCMC	LCMC	33.70948	118.32180
69	2204	32	45	23	54	33.69690	118.33898
70	2205	27	48	25	57	33.67685	118.30577
71	2206	32	44	24	65	33.67510	118.29328
72	2390	17	48	35	60	33.69353	118.26472
73	2394	34	47	19	61	33.65108	118.24908
74	2392	12	69	19	42	33.70513	118.15537
75	2391	21	54	25	52	33.70947	118.13780
76	2393	0	78	22	0	33.68292	118.08832
77	2395	6	72	22	48	33.67270	118.05412
78	2396	15	53	32	65	33.64805	118.14943
79	2397	29	45	26	56	33.65007	118.12595
80	2398	31	35	34	60	33.61928	118.14298
81	2400	22	52	26	61	33.60333	118.09537
82	2207	23	49	28	70	33.61262	118.06588
83	2208	34	40	26	58	33.60222	118.05647
84	2209	36	44	20	65	33.59203	118.06285
85	2210	29	45	26	45	33.59022	118.04122
86	2399	25	48	27	50	33.63473	117.99482
87	2325	10	68	22	42	33.62767	117.98723
88	2453	0	59	41	0	33.62787	117.97487
89	2326	7	76	17	47	33.62273	117.95618
90	2211	24	50	26	58	33.58802	118.01003
91	2212	28	48	24	57	33.59005	117.98927
92	2213	30	43	27	50	33.57152	117.97777
93	2401	26	51	23	65	33.59168	117.95748
94	2402	34	52	14	65	33.55740	117.83023
95	2403	36	47	17	70	33.51870	117.80285
96	2303	15	55	30	40	33.51870	117.78187
97	2304	LCMC	LCMC	LCMC	LCMC	33.52132	117.76962
98	2279	45	35	20	70	33.51542	117.76638
99	2280	31	49	20	70	33.50842	117.76908
100	2302	34	47	19	70	33.50998	117.77635
101	2345	34	45	21	73	33.50668	117.76847
102	2346	38	43	19	75	33.49363	117.77703
103	2405	31	45	24	55	33.29462	117.55857
104	2406	26	51	23	53	33.28140	117.47188
105	2407	19	50	31	53	33.26032	117.52368
106	2286	26	48	26	65	33.16665	117.38845

Table 1 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)	Latitude (°N)	Longitude (°W)
107	2285	15	52	33	61	33.15912	117.39795
108	2288	22	51	27	65	33.15862	117.38435
109	2287	20	55	25	62	33.15913	117.38960
110	2292	26	52	22	59	33.11928	117.35648
111	2290	19	56	25	67	33.11623	117.35880
112	2455	13	70	17	51	33.10973	117.34688
113	2408	21	59	20	67	33.10512	117.36183
114	2289	22	52	26	61	33.10245	117.35848
115	2291	28	50	22	65	33.09985	117.35260
116	2456	20	54	26	47	33.01013	117.30225
117	2294	21	53	26	57	33.00282	117.30477
118	2409	5	82	13	48	33.00405	117.28200
119	2293	LCMC	LCMC	LCMC	LCMC	32.99953	117.29225
120	2296	19	53	28	53	32.99895	117.29713
121	2295	19	51	30	60	32.99040	117.29865
122	2349	31	40	29	65	32.89455	117.26883
123	2350	17	51	32	70	32.88863	117.27770
124	2351	16	61	23	56	32.82150	117.32023
125	2410	LCMC	LCMC	LCMC	LCMC	32.77215	117.35455
126	2411	24	54	22	61	32.75255	117.34298
127	2412	12	75	13	41	32.72142	117.29627
128	2215	23	57	20	65	32.68123	117.31000
129	2216	19	54	27	50	32.67618	117.32203
130	2219	25	53	22	61	32.65480	117.33142
131	2220	15	58	27	55	32.65968	117.28002
132	2414	5	81	14	40	32.67698	117.18978
133	2415	6	76	18	50	32.65873	117.18228
134	2417	2	89	9	47	32.62497	117.21460
135	2418	20	65	15	50	32.59530	117.31480
136	2419	8	85	7	41	32.58938	117.26360
137	2353	15	65	20	49	32.55213	117.26375
138	2352	24	58	18	54	32.54187	117.19028
139	2335	10	76	14	41	32.54470	117.15480
140	2169	21	54	25	60	33.76823	118.27835
141	2174	16	54	30	58	33.73425	118.26655
142	2178	21	53	26	55	33.72800	118.27103
143	2184	21	54	25	50	33.72060	118.26907
144	2170	18	59	23	53	33.76432	118.25600
145	2176	26	39	35	60	33.73098	118.26112
146	2182	22	45	33	60	33.72382	118.26233
147	2428	23	48	29	58	33.71883	118.25853
148	2168	28	48	24	63	33.71192	118.25063
149	2421	23	48	29	61	33.76625	118.24090
150	2172	15	53	32	61	33.74922	118.24268
151	2177	14	46	40	45	33.73478	118.24262
152	2162	24	46	30	63	33.71345	118.24173
153	2173	20	49	31	60	33.74727	118.23767
154	2300	25	48	27	60	33.71802	118.23905
155	2299	31	44	25	64	33.72058	118.23400
156	2297	24	52	24	60	33.72285	118.23532
157	2298	23	48	29	56	33.72892	118.23398
158	2427	23	48	29	58	33.73087	118.23550
159	2426	28	49	23	63	33.73415	118.23143

Table 1 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)	Latitude (°N)	Longitude (°W)
160	2175	23	50	27	61	33.74087	118.22667
161	2432	18	56	26	56	33.75080	118.23037
162	2430	25	51	24	57	33.76910	118.22448
163	2431	23	51	26	57	33.75337	118.22408
164	2179	14	58	28	55	33.73895	118.21028
165	2158	23	51	26	59	33.72830	118.20863
166	2159	26	50	24	63	33.72253	118.21038
167	2450	39	50	11	53	33.76025	118.19937
168	2185	15	58	27	58	33.73318	118.19975
169	2160	20	54	26	54	33.72357	118.20468
170	2161	27	51	22	65	33.72352	118.20167
171	2186	21	51	28	59	33.73137	118.19300
172	2311	43	39	18	62	33.75550	118.18500
173	2187	29	48	23	60	33.73118	118.18402
174	2451	39	45	16	57	33.75188	118.17423
175	2155	19	60	21	55	33.74330	118.16753
176	2156	34	53	13	63	33.73997	118.17133
177	2163	20	54	26	58	33.72793	118.16683
178	2152	18	60	22	50	33.75932	118.16267
179	2153	25	51	24	61	33.75350	118.15783
180	2154	26	54	20	60	33.74902	118.15887
181	2388	31	50	19	63	33.74833	118.14870
182	2157	17	58	25	50	33.74232	118.15318
183	2167	30	49	21	63	33.73557	118.15765
184	2319	30	52	18	62	33.73712	118.14350
185	2320	14	66	20	46	33.73297	118.12148
186	2321	7	60	33	51	33.72932	118.13347
187	2318	33	48	19	65	33.72370	118.12690
188	2188	26	54	20	61	33.73383	118.08880
189	2164	25	53	22	62	33.73033	118.08262
190	2134	25	55	20	50	33.71543	118.06218
191	2136	37	53	10	64	33.61888	117.92720
192	2137	41	48	11	65	33.61300	117.92387
193	2138	36	53	11	67	33.61408	117.91412
194	2142	48	43	9	70	33.60773	117.91003
195	2143	52	40	8	75	33.60697	117.90633
196	2141	42	49	9	75	33.61135	117.90223
197	2144	43	49	8	70	33.60747	117.90060
198	2147	37	52	11	75	33.60123	117.89268
199	2145	43	47	10	70	33.60382	117.88868
200	2146	44	46	10	75	33.60188	117.88743
201	2148	53	37	10	75	33.59435	117.87972
202	2423	12	65	23	64	32.78068	117.24913
203	2424	23	57	20	60	32.76645	117.24747
204	2425	21	62	17	62	32.76725	117.23562
205	2442	8	62	30	46	32.68920	117.23708
206	2441	5	68	27	43	32.69115	117.23802
207	2224	16	65	19	50	32.71308	117.23410
208	2226	13	70	17	49	32.71112	117.23165
209	2435	9	72	19	50	32.71153	117.22292
210	2225	11	72	17	51	32.71340	117.23020
211	2223	8	75	17	50	32.71542	117.23052
212	2222	11	73	16	48	32.71878	117.22585

Table 1 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)	Latitude (°N)	Longitude (°W)
213	2433	13	65	22	55	32.72235	117.20922
214	2227	16	66	18	52	32.72373	117.20803
215	2221	11	71	18	50	32.72785	117.20512
216	2439	11	73	16	52	32.72610	117.18952
217	2434	10	69	21	51	32.72490	117.18363
218	2228	21	62	17	55	32.72407	117.17817
219	2440	12	68	20	56	32.71848	117.17482
220	2436	13	68	19	57	32.71503	117.18312
221	2263	17	65	18	56	32.71605	117.17598
222	2229	17	65	18	50	32.70895	117.17603
223	2230	20	64	16	59	32.70253	117.17865
224	2251	6	71	23	46	32.70230	117.16207
225	2231	20	63	17	59	32.69465	117.15655
226	2252	18	63	19	55	32.69187	117.15285
227	2233	20	62	18	61	32.68582	117.15183
228	2253	21	53	26	65	32.68813	117.13810
229	2264	28	56	16	60	32.68538	117.13282
230	2239	8	66	26	58	32.68240	117.14010
231	2265	25	56	19	58	32.68388	117.14030
232	2254	8	65	27	61	32.67725	117.16323
233	2255	23	58	19	58	32.67797	117.12940
234	2258	18	63	19	70	32.67592	117.13213
235	2257	10	68	22	50	32.67683	117.13408
236	2256	20	63	17	60	32.67685	117.13587
237	2241	17	62	21	61	32.67027	117.13648
238	2240	17	64	19	56	32.66753	117.15408
239	2259	21	59	20	59	32.67022	117.12473
240	2242	16	64	20	60	32.66497	117.14975
241	2260	17	62	21	55	32.66718	117.12998
242	2243	15	64	21	63	32.66450	117.14265
243	2244	8	69	23	51	32.65972	117.13182
244	2245	14	64	22	58	32.65083	117.14270
245	2262	12	66	22	58	32.65150	117.12293
246	2235	9	64	27	55	32.64080	117.13693
247	2247	13	63	24	49	32.64233	117.12473
248	2238	13	66	21	55	32.62542	117.12865
249	2249	14	64	22	53	32.62133	117.12812
250	2438	13	68	19	53	32.62230	117.10170

*weighting factors used are 4 times the illite, 2 times the k+c, and 1 times the smectite peak areas; K+C = kaolinite + chlorite; LCMC = low clay mineral content

Table 2. Un-weighted clay mineral content of the <2 μm size-fraction of Southern California Borderland shelf surface sediments

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)
1	2354	56	20	24	50
2	2370	66	17	17	56
3	2338	50	21	29	50
4	2340	48	23	29	49
5	2339	44	25	31	55
6	2331	66	15	19	60
7	2329	LCMC	LCMC	LCMC	LCMC
8	2330	0	37	63	0
9	2328	0	40	60	0
10	2375	47	25	28	49
11	2376	44	25	31	52
12	2129	33	35	32	75
13	2130	0	38	62	0
14	2131	58	22	20	62
15	2132	0	67	33	0
16	2273	15	30	55	40
17	2275	54	26	20	41
18	2274	73	10	17	65
19	2276	29	49	22	48
20	2341	56	20	24	58
21	2342	46	22	32	59
22	2310	76	12	12	64
23	2308	57	23	20	60
24	2377	LCMC	LCMC	LCMC	LCMC
25	2378	LCMC	LCMC	LCMC	LCMC
26	2343	46	38	16	47
27	2344	76	11	13	70
28	2379	65	14	21	55
29	S2-97-SC 26B1/0-2	71	13	16	70
30	2381	68	14	18	67
31	2380	77	11	12	62
32	S2-97-SC 54B1/0-2	75	9	16	56
33	S2-97-SC 6B1/0-2	68	15	17	62
34	2382	77	11	12	70
35	S2-97-SC 4B1/0-2	42	28	30	56
36	S2-97-SC 24B1/0-2	66	16	18	63
37	S2-97-SC 18B1/0-2	59	18	23	61
38	S2-97-SC 22B1/0-2	66	16	18	62
39	S2-97-SC 20B1/0-2	66	14	20	58
40	2305	52	32	16	47
41	2307	LCMC	LCMC	LCMC	LCMC
42	S2-97-SC 16B1/0-2	46	25	29	50
43	S2-97-SC 51B1/0-2	44	24	32	56
44	2192	68	12	20	51
45	S2-97-SC 49B1/0-2	47	32	21	42
46	S2-97-SC 53B3/0-2	LCMC	LCMC	LCMC	LCMC
47	S2-97-SC 10B1/0-2	65	17	18	53
48	S2-97-SC 52B1/0-2	64	13	23	47
49	S2-97-SC 50B1/0-2	66	15	19	64
50	S2-97-SC 40B1/0-2	68	15	17	65
51	S2-97-SC 42B1/0-2	62	20	18	64
52	2306	0	76	24	0
53	2384	56	20	24	58

Table 2 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)
54	S2-97-SC 44B1/0-2	48	29	23	50
55	2195	76	12	12	65
56	S2-97-SC 55B1/0-2	59	18	23	43
57	2197	70	14	16	61
58	S2-97-SC 34B2/0-2	64	15	21	65
59	2386	12	75	13	41
60	S2-97-SC 28B1/0-2	67	17	16	52
61	S2-97-SC 36B1/0-2	52	24	24	61
62	S2-97-SC 33B1/0-2	60	18	22	59
63	2387	56	21	23	61
64	S2-97-SC 48B1/0-2	56	20	24	55
65	2200	64	16	20	58
66	2201	62	19	19	56
67	2202	72	12	16	60
68	2389	LCMC	LCMC	LCMC	LCMC
69	2204	59	20	21	54
70	2205	52	24	24	57
71	2206	58	20	22	65
72	2390	37	26	37	60
73	2394	62	21	17	61
74	2392	32	44	24	42
75	2391	45	29	26	52
76	2393	0	64	36	0
77	2395	17	51	32	48
78	2396	34	30	36	65
79	2397	55	21	24	56
80	2398	55	15	30	60
81	2400	45	27	28	61
82	2207	46	25	29	70
83	2208	59	18	23	58
84	2209	63	19	18	65
85	2210	55	20	25	45
86	2399	50	24	26	50
87	2325	25	45	30	42
88	2453	0	42	58	0
89	2326	21	55	24	47
90	2211	49	25	26	58
91	2212	54	23	23	57
92	2213	55	20	25	50
93	2401	52	25	23	65
94	2402	63	24	13	65
95	2403	64	21	15	70
96	2303	35	31	34	40
97	2304	LCMC	LCMC	LCMC	LCMC
98	2279	70	14	16	70
99	2280	58	23	19	70
100	2302	62	21	17	70
101	2345	62	20	18	73
102	2346	65	19	16	75
103	2405	58	20	22	55
104	2406	51	26	23	53
105	2407	41	26	33	53
106	2286	52	23	25	65

Table 2 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)
107	2285	33	30	37	61
108	2288	44	27	29	65
109	2287	43	30	27	62
110	2292	52	26	22	59
111	2290	42	30	28	67
112	2455	33	45	22	51
113	2408	46	32	22	67
114	2289	46	27	27	61
115	2291	54	25	21	65
116	2456	43	29	28	47
117	2294	44	29	27	57
118	2409	15	65	20	48
119	2293	LCMC	LCMC	LCMC	LCMC
120	2296	41	29	30	53
121	2295	40	28	32	60
122	2349	56	18	26	65
123	2350	38	27	35	70
124	2351	38	35	27	56
125	2410	LCMC	LCMC	LCMC	LCMC
126	2411	50	28	22	61
127	2412	31	51	18	41
128	2215	49	30	21	65
129	2216	41	30	29	50
130	2219	50	27	23	61
131	2220	34	34	32	55
132	2414	17	62	21	40
133	2415	18	55	27	50
134	2417	5	79	16	47
135	2418	45	37	18	50
136	2419	25	64	11	41
137	2353	35	40	25	49
138	2352	50	31	19	54
139	2335	29	52	19	41
140	2169	46	28	26	60
141	2174	37	30	33	58
142	2178	45	28	27	55
143	2184	44	29	27	50
144	2170	40	34	26	53
145	2176	48	19	33	60
146	2182	44	22	34	60
147	2428	46	24	30	58
148	2168	54	23	23	63
149	2421	46	24	30	61
150	2172	34	30	36	61
151	2177	30	26	44	45
152	2162	47	23	30	63
153	2173	41	26	33	60
154	2300	50	23	27	60
155	2299	57	20	23	64
156	2297	49	26	25	60
157	2298	46	25	29	56
158	2427	47	24	29	58
159	2426	54	24	22	61

Table 2 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)
160	2175	47	25	28	61
161	2432	40	31	29	56
162	2430	51	25	24	57
163	2431	47	26	27	57
164	2179	33	34	33	55
165	2158	48	26	26	59
166	2159	51	25	24	63
167	2450	69	22	9	53
168	2185	35	34	31	58
169	2160	43	29	28	54
170	2161	53	25	22	65
171	2186	44	27	29	59
172	2311	70	15	15	62
173	2187	55	23	22	60
174	2451	67	19	14	57
175	2155	43	34	23	55
176	2156	64	24	12	63
177	2163	44	28	28	58
178	2152	41	34	25	50
179	2153	50	26	24	61
180	2154	53	27	20	60
181	2388	58	24	18	63
182	2157	38	34	28	50
183	2167	57	23	20	63
184	2319	58	25	17	62
185	2320	34	41	25	46
186	2321	17	40	43	51
187	2318	61	21	18	65
188	2188	53	27	20	61
189	2164	50	27	23	62
190	2134	52	27	21	50
191	2136	67	24	9	64
192	2137	70	20	10	65
193	2138	66	24	10	67
194	2142	76	17	7	70
195	2143	79	15	6	75
196	2141	72	21	7	75
197	2144	72	21	7	70
198	2147	67	23	10	75
199	2145	71	20	9	70
200	2146	72	20	8	75
201	2148	79	14	7	75
202	2423	29	41	30	64
203	2424	48	30	22	60
204	2425	46	35	19	62
205	2442	20	41	39	46
206	2441	12	49	39	43
207	2224	39	39	22	50
208	2226	33	45	22	49
209	2435	25	49	26	50
210	2225	30	47	23	51
211	2223	24	52	24	50
212	2222	29	50	21	48

Table 2 continued

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)
213	2433	32	41	27	55
214	2227	39	39	22	52
215	2221	30	46	24	50
216	2439	29	50	21	52
217	2434	28	45	27	51
218	2228	46	35	19	55
219	2440	30	44	26	56
220	2436	32	44	24	57
221	2263	40	39	21	56
222	2229	40	39	21	50
223	2230	45	36	19	59
224	2251	15	51	34	46
225	2231	45	35	20	59
226	2252	42	37	21	55
227	2233	45	35	20	61
228	2253	44	28	28	65
229	2264	56	28	16	60
230	2239	21	44	35	58
231	2265	52	29	19	58
232	2254	21	43	36	61
233	2255	48	31	21	58
234	2258	42	36	22	70
235	2257	26	45	29	50
236	2256	44	36	20	60
237	2241	39	36	25	61
238	2240	40	37	23	56
239	2259	47	32	21	59
240	2242	39	38	23	60
241	2260	39	36	25	55
242	2243	36	38	26	63
243	2244	22	46	32	51
244	2245	35	38	27	58
245	2262	30	42	28	58
246	2235	23	42	35	55
247	2247	32	39	29	49
248	2238	32	42	26	55
249	2249	34	39	27	53
250	2438	33	43	24	53

K+C = kaolinite + chlorite; LCMC = low clay mineral content

Table 3. Clay mineral content of samples with depth in cores from Santa Monica Bay; core locations and surface sediment data for the same cores are listed in table 1

Map #	Sample Identification/ sample interval in cm	Smectite (%)	Illite (%)	K+C (%)	Ex Layers (%)
29	S2-97-SC 26B1/4-6	58	28	14	63
29	S2-97-SC 26B1/10-12	44	38	18	69
29	S2-97-SC 26B1/18-20	40	40	20	69
29	S2-97-SC 26B1/24-26	38	50	12	49
32	S2-97-SC 54B1/18-20	LCMC	LCMC	LCMC	LCMC
32	S2-97-SC 54B1/32-34	46	34	20	55
33	S2-97-SC 6B1/10-12	45	30	25	65
33	S2-97-SC 6B1/22-24	56	26	18	75
35	S2-97-SC 4B1/4-6	31	43	26	41
35	S2-97-SC 4B1/10-12	26	49	25	55
35	S2-97-SC 4B1/14-16	(31)	(49)	(20)	(41)
36	S2-97-SC 24B1/4-6	(40)	(41)	(19)	(48)
36	S2-97-SC 24B1/10-12	53	31	16	70
36	S2-97-SC 24B1/20-22	46	33	21	70
36	S2-97-SC 24B1/30-32	52	31	17	69
37	S2-97-SC 18B1/6-8	32	47	21	50
37	S2-97-SC 18B1/12-14	LCMC	LCMC	LCMC	LCMC
37	S2-97-SC 18B1/18-20	LCMC	LCMC	LCMC	LCMC
37	S2-97-SC 18B1/24-26	19	53	28	41
37	S2-97-SC 18B1/26-28	49	36	15	50
38	S2-97-SC 22B1/10-12	(29)	(57)	(14)	(44)
38	S2-97-SC 22B1/18-20	29	51	20	49
39	S2-97-SC 20B1/4-6	31	43	26	50
39	S2-97-SC 20B1/10-12	(28)	(47)	(25)	(44)
39	S2-97-SC 20B1/18-20	31	47	22	59
39	S2-97-SC 20B1/20-22	LCMC	LCMC	LCMC	LCMC
39	S2-97-SC 20B1/22-24	21	58	21	48
42	S2-97-SC 16B1/4-6	23	51	26	50
42	S2-97-SC 16B1/8-10	40	37	23	62
42	S2-97-SC 16B1/16-18	30	48	22	60
42	S2-97-SC 16B1/26-28	33	45	22	65
43	S2-97-SC 51B1/2-4	(31)	(45)	(24)	(44)
43	S2-97-SC 51B1/4-6	28	40	32	50
43	S2-97-SC 51B1/10-12	25	50	25	50
43	S2-97-SC 51B1/16-18	29	50	21	50
43	S2-97-SC 51B1/20-22	32	45	23	62
45	S2-97-SC 49B1/14-16	40	34	26	53
45	S2-97-SC 49B1/22-24	37	44	19	59
46	S2-97-SC 53B3/24-26	LCMC	LCMC	LCMC	LCMC
46	S2-97-SC 53B3/42-44	(27)	(47)	(26)	(41)
47	S2-97-SC 10B1/10-12	LCMC	LCMC	LCMC	LCMC
47	S2-97-SC 10B1/22-24	LCMC	LCMC	LCMC	LCMC
47	S2-97-SC 10B1/36-38	36	42	22	55
47	S2-97-SC 10B1/40-42	41	37	22	55
47	S2-97-SC 10B1/42-44	33	45	22	50
48	S2-97-SC 52B1/2-4	26	53	21	40
48	S2-97-SC 52B1/4-6	15	59	26	41
48	S2-97-SC 52B1/8-10	(39)	(42)	(19)	(45)
48	S2-97-SC 52B1/22-24	46	33	21	50
49	S2-97-SC 50B1/6-8	(33)	(46)	(21)	(40)
49	S2-97-SC 50B1/16-18	(27)	(51)	(22)	(44)
49	S2-97-SC 50B1/22-24	29	42	29	50
50	S2-97-SC 40B1/8-10	34	41	25	56

Table 3 continued

Map #	Sample Identification/ sample interval in cm	Smectite (%)	Illite (%)	K+C (%)	Ex Layers (%)
50	S2-97-SC 40B1/18-20	(34)	(44)	(22)	(45)
51	S2-97-SC 42B1/4-6	(31)	(53)	(16)	(44)
51	S2-97-SC 42B1/10-12	27	47	26	53
51	S2-97-SC 42B1/20-22	23	53	24	50
54	S2-97-SC 44B1/8-10	26	52	22	--
54	S2-97-SC 44B1/18-20	31	49	20	44
56	S2-97-SC 55B1/10-12	34	41	25	59
56	S2-97-SC 55B1/24-26	(32)	(47)	(21)	(42)
58	S2-97-SC 34B2/2-4	(29)	(41)	(30)	(41)
58	S2-97-SC 34B2/6-8	30	45	25	50
58	S2-97-SC 34B2/14-16	11	56	33	50
58	S2-97-SC 34B2/26-28	28	46	26	55
60	S2-97-SC 28B1/2-4	37	40	23	48
60	S2-97-SC 28B1/8-10	39	38	23	50
60	S2-97-SC 28B1/14-16	37	42	21	50
60	S2-97-SC 28B1/24-26	24	49	27	50
61	S2-97-SC 36B1/2-4	38	36	26	46
61	S2-97-SC 36B1/6-8	30	45	25	65
61	S2-97-SC 36B1/10-12	38	39	23	60
61	S2-97-SC 36B1/20-22	(42)	(37)	(21)	(44)
62	S2-97-SC 33B1/4-6	45	40	15	46
62	S2-97-SC 33B1/8-10	(50)	(33)	(17)	(42)
64	S2-97-SC 48B1/4-6	37	38	25	49
64	S2-97-SC 48B1/8-10	29	42	29	51
64	S2-97-SC 48B1/16-18	33	43	24	58
64	S2-97-SC 48B1/28-30	27	49	24	55

k + c is kaolinite plus chlorite; Ex is expandable, which represents the percent smectite layers in the smectite-illite mixed layer phase, listed simply as smectite in column 3; LCMC is low clay mineral content, below the amount needed for quantification; numbers in parenthesis are samples with LCMC, but with mineral contents that are comparable with those of adjacent sample(s)

Table 4. Clay mineral content of Southern California river samples and Palos Verdes Headland (first 6) samples. Rivers listed from north to south.

Sample Identification	Smectite (%)	Illite (%)	K + C (%)	Expandable layers (%)
05-1C-10-99	44	21	35	70
06-1E-10-99	100	0	0	50
06-3B-10-99	43	35	22	58
06-3C-10-99	87	13	0	49
06-3D-10-99	100	0	0	52
06-3E-10-99	86	7	7	65
Santa Ynez R. 1975B	28	38	34	--
Santa Ynez R. 061300 B	20	41	39	50
Ventura R. 061300 W	LCMC	LCMC	LCMC	LCMC
Ventura R. 061300 B	22	50	28	56
Santa Clara R. 061400 B	42	41	17	55.5
Calleguas R. 061300 W	LCMC	LCMC	LCMC	LCMC
Calleguas R. 061300 B	50	38	12	62.5
Malibu Cr 022400 W	73	19	8	75
Malibu Cr 041800 W	64	29	7	70
Malibu R. 061300 W	LCMC	LCMC	LCMC	LCMC
Malibu R. 061300 B	LCMC	LCMC	LCMC	LCMC
Ballona Cr 022400 W	41	43	16	62
Ballona Cr 022800 W	43	38	19	59
Ballona Cr 041800 W	40	43	17	59.5
LA River 022400 W	22	55	23	55
LA River 022800 W	0	62	38	0
LA River 041900 W	20	57	23	46
LA River 061300 W	47	40	13	64.5
LA River 061300 B	42	44	14	55
San Gabriel R 022400 W	30	52	18	65
San Gabriel R 022800 W	49	36	15	78
San Gabriel R 041900 W	33	53	14	65
San Gabriel R. 061400 W	LCMC	LCMC	LCMC	LCMC
San Gabriel R. 061400 B	22	57	21	51
Coyote Cr 022400 W	10	64	26	50
Coyote Cr 022800 W	28	54	18	52
Coyote Cr 041900 W	LCMC	LCMC	LCMC	LCMC
Santa Ana R 020998 W	22	52	26	70
Santa Ana R. 061400 B	37	41	22	59
San Juan Cr. 061400 B	28	69	3	65
S. Margarita R. 061400 W	6	74	20	43
S. Margarita R. 061400 B	16	61	23	55
San Luis Rey R. 061400 W	LCMC	LCMC	LCMC	LCMC
San Luis Rey R. 061400 B	5	51	44	41
San Diego R. 061400 W	4	75	21	50
San Diego R. 061400 B	63	29	8	64.5
Chollas Cr 021200 W	32	48	20	65

05-1C is composite of Monterey Fm; 06-1E is sediment produced from weathering of basalt; 06-3B-3E are from toe of Portuguese Bend Landslide; numbers following river names are dates of collection and w is suspended sediment and B is bottom sediment; the first sample from Santa Ynez R. is from Griggs and Hein (1980); LCMC means low clay mineral content, below semi-quantifiable limits

Table 5. Duplicate sample (with the asterix) analyses used to calculate precision

Map #	Sample Identification	Smectite (%)	Illite (%)	K+C (%)	Expandable Layers (%)
14	2131	32	47	21	62
14	2131*	29	48	23	55
24	2377	(46)	(22)	(32)	(44)
24	2377*	42	32	26	50
25	2378	(60)	(21)	(19)	(50)
25	2378*	58	21	21	44
32	S2-97-SC 54B1/0-2	53	25	22	56
32	S2-97-SC 54B1/0-2*	51	26	23	56
72	2390	17	48	35	60
72	2390*	22	46	32	63
73	2394	34	47	19	61
73	2394*	31	48	21	60
79	2397	29	45	26	56
79	2397*	26	48	26	69
81	2400	22	52	26	61
81	2400*	29	48	23	65
98	2279	45	35	20	70
98	2279*	51	31	18	75
108	2288	22	51	27	65
108	2288*	17	55	28	67
124	2351	16	61	23	56
124	2351*	17	58	25	50
131	2220	15	58	27	55
131	2220*	22	57	21	63
143	2184	21	54	25	50
143	2184*	22	56	22	59
144	2170	18	59	23	53
144	2170*	15	62	23	55
146	2182	22	45	33	60
146	2182*	22	45	33	61
180	2154	26	54	20	60
180	2154*	27	53	20	58
192	2137	41	48	11	65
192	2137*	34	52	14	58
198	2147	37	52	11	75
198	2147*	36	51	13	75
202	2423	12	65	23	64
202	2423*	14	66	20	69
208	2226	13	70	17	49
208	2226*	13	68	19	56
224	2251	6	71	23	46
224	2251*	10	66	24	57
241	2260	17	62	21	55
241	2260*	9	64	27	54

K+C = kaolinite + chlorite

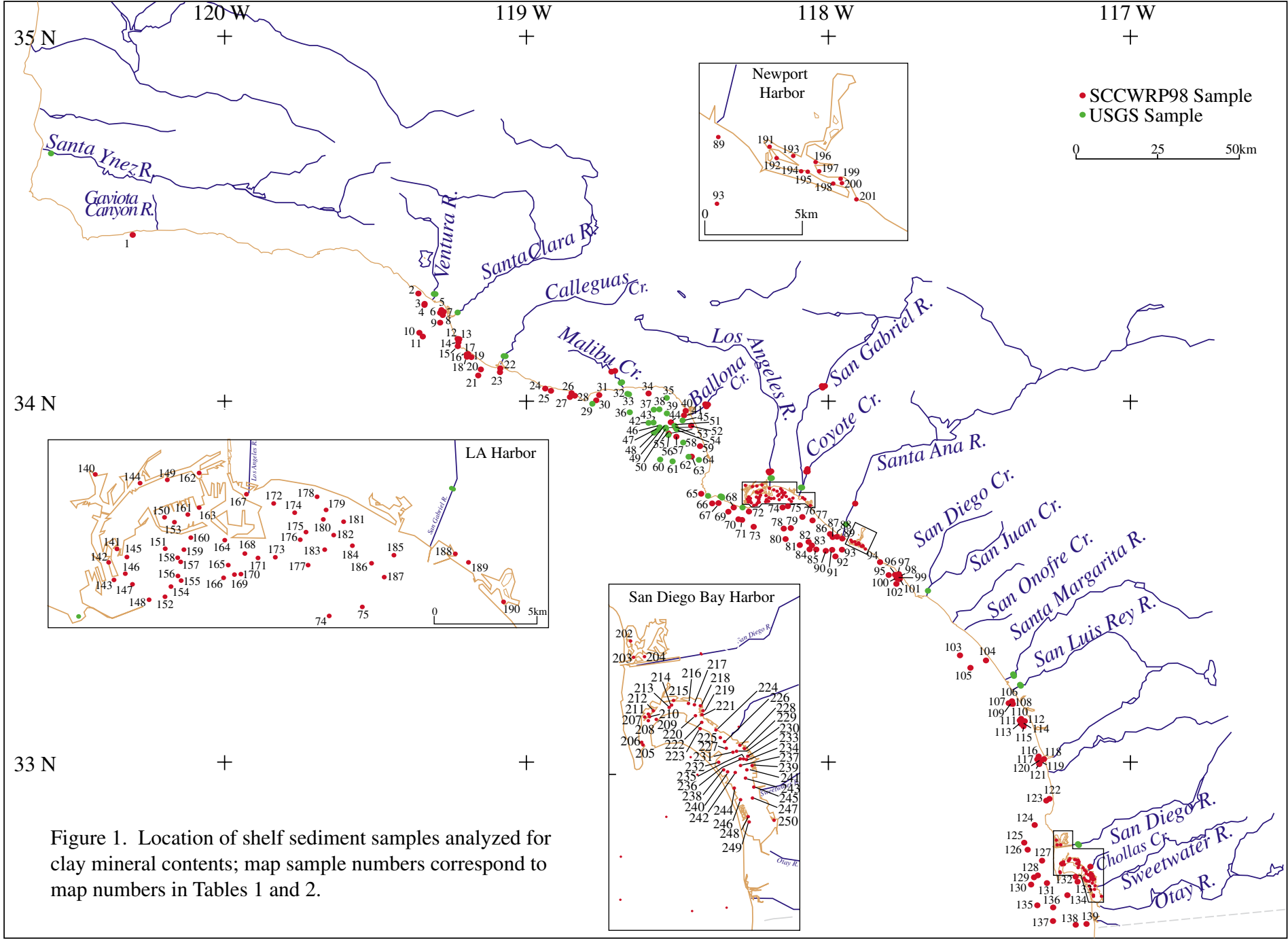

Figure 1. Location of shelf sediment samples analyzed for clay mineral contents; map sample numbers correspond to map numbers in Tables 1 and 2.

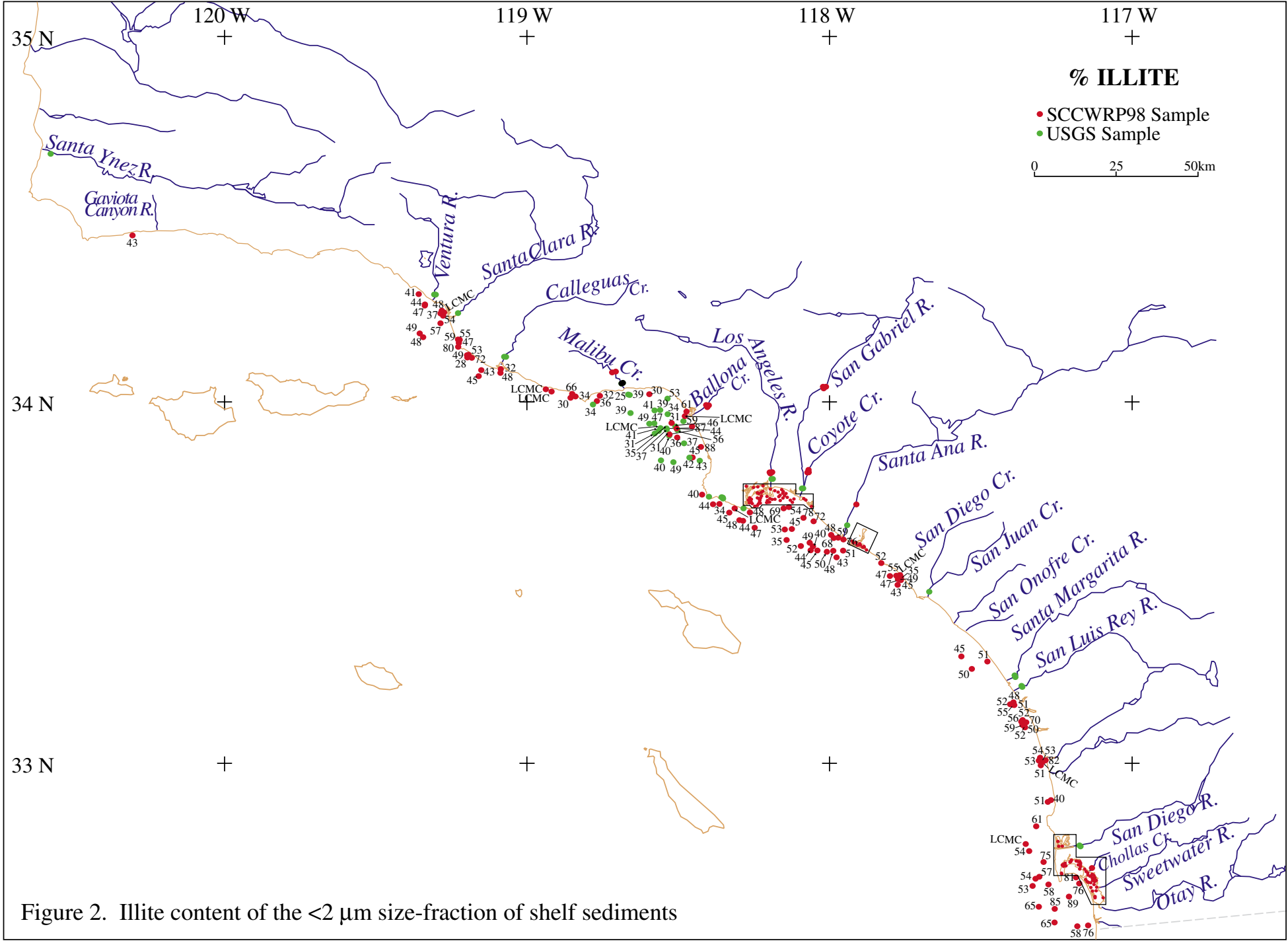

Figure 2. Illite content of the <2 µm size-fraction of shelf sediments

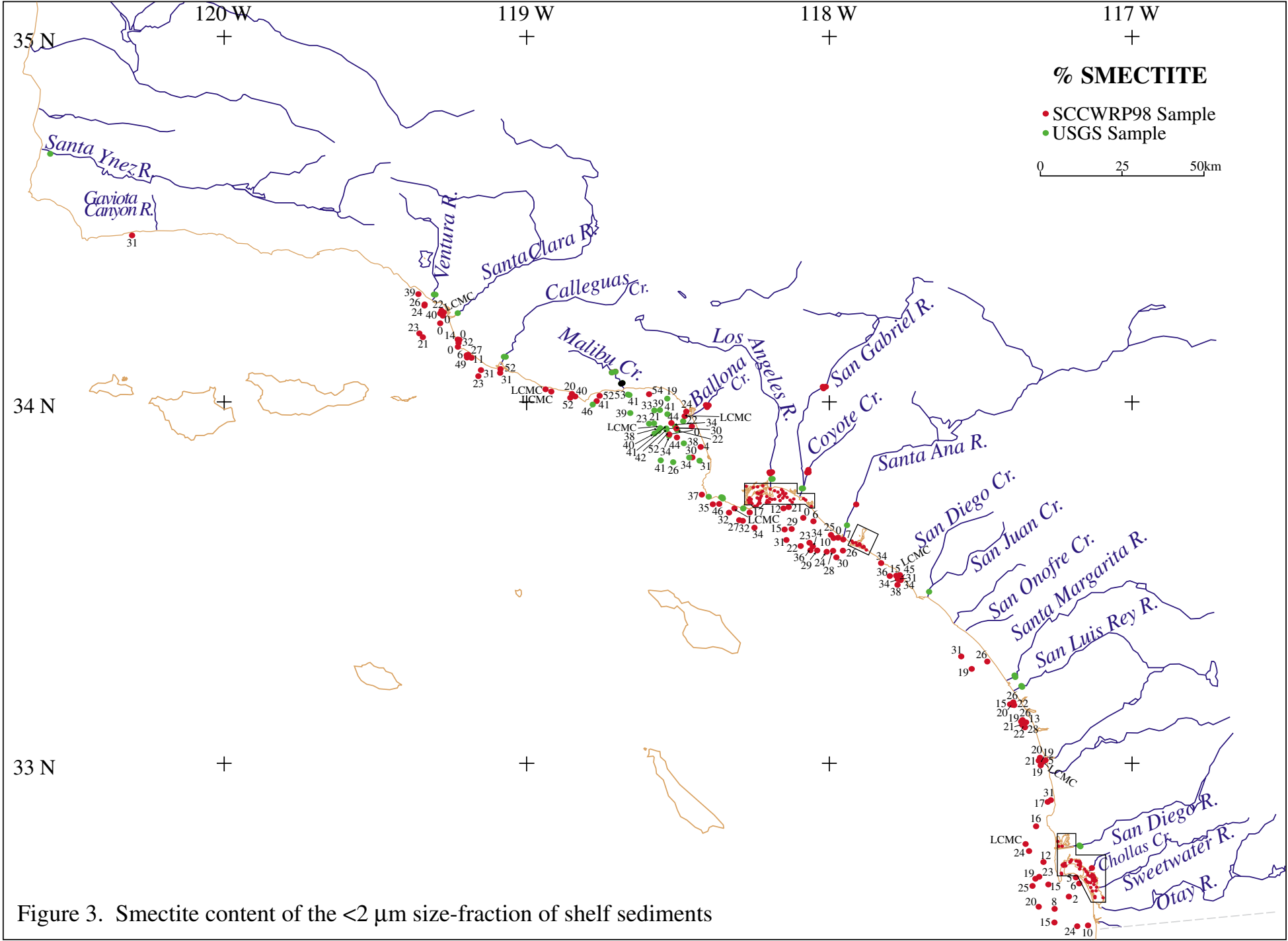

Figure 3. Smectite content of the <2 µm size-fraction of shelf sediments

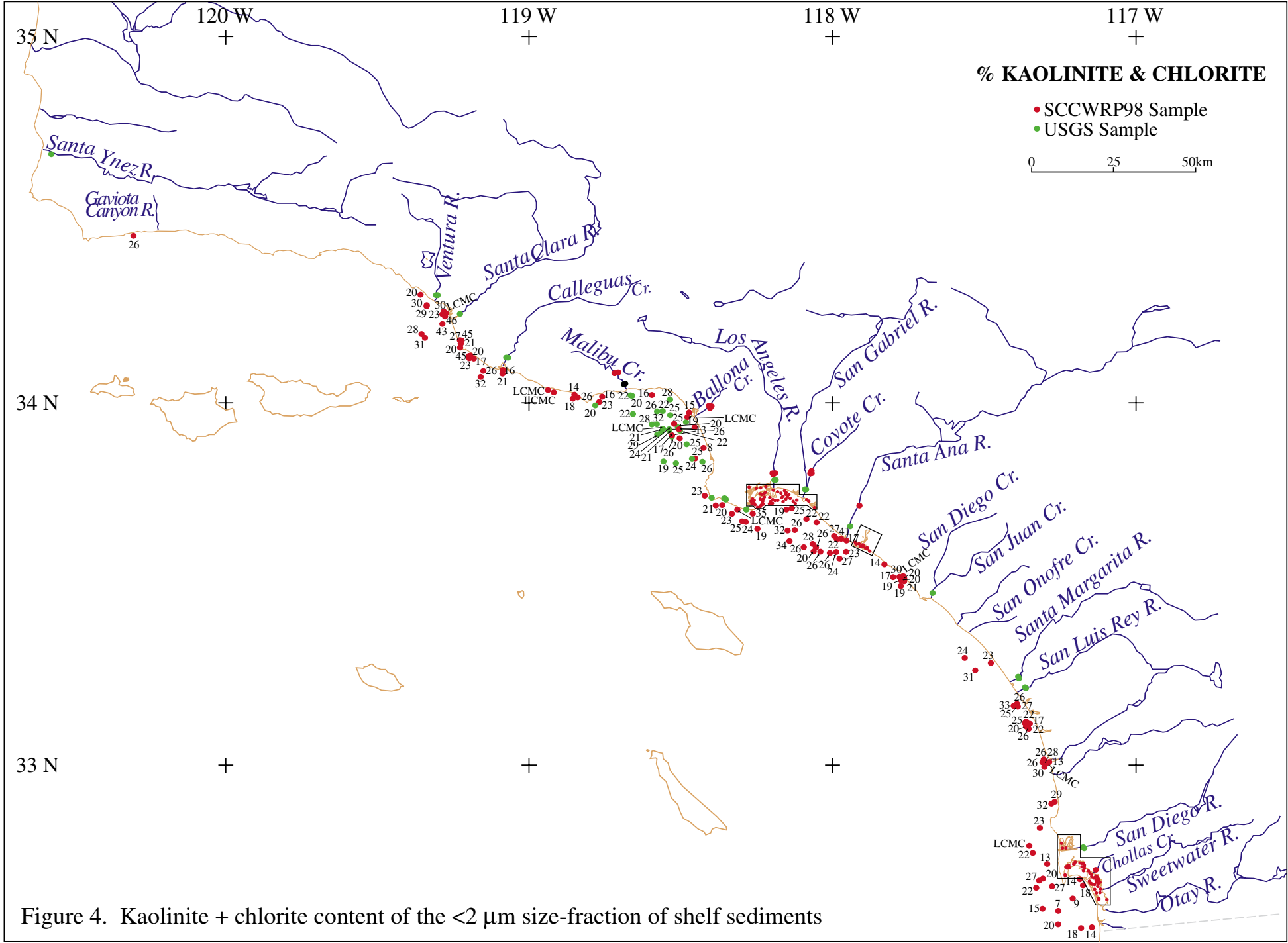

Figure 4. Kaolinite + chlorite content of the <2 µm size-fraction of shelf sediments

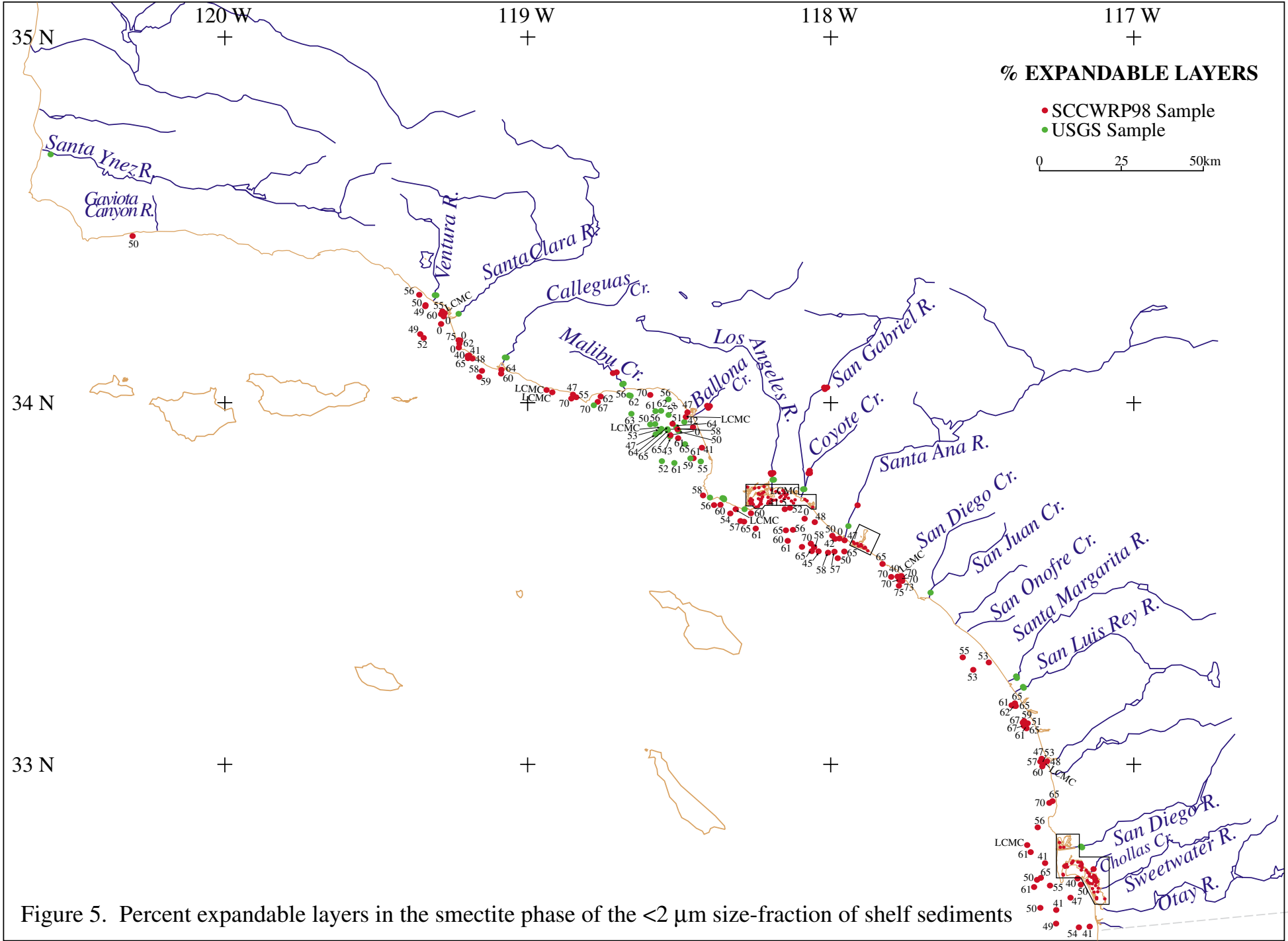

Figure 5. Percent expandable layers in the smectite phase of the <2 µm size-fraction of shelf sediments

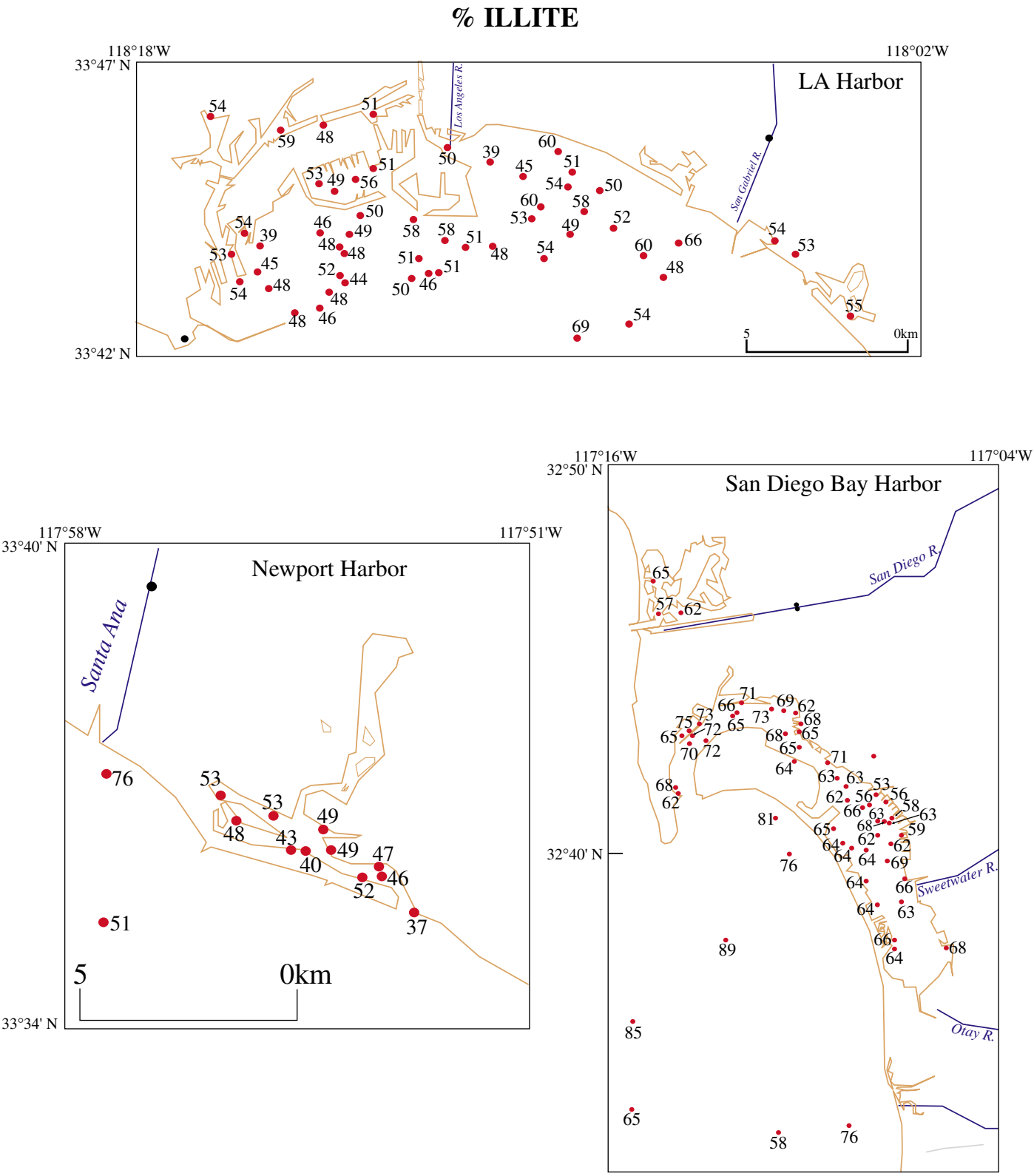

Figure 6. Illite content of the <2 µm size-fraction of harbor sediments

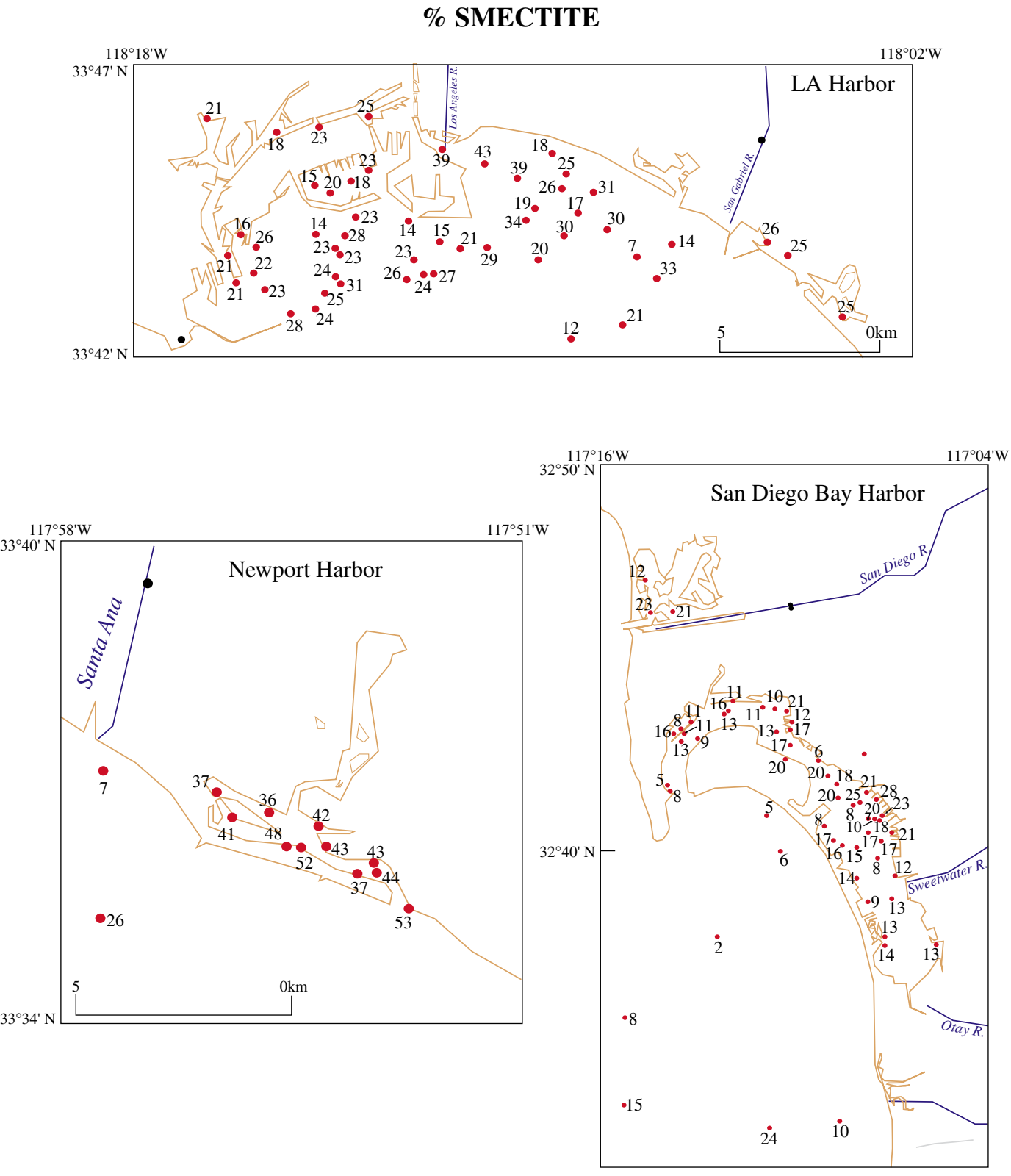

Figure 7. Smectite content of the <2 µm size-fraction of harbor sediments

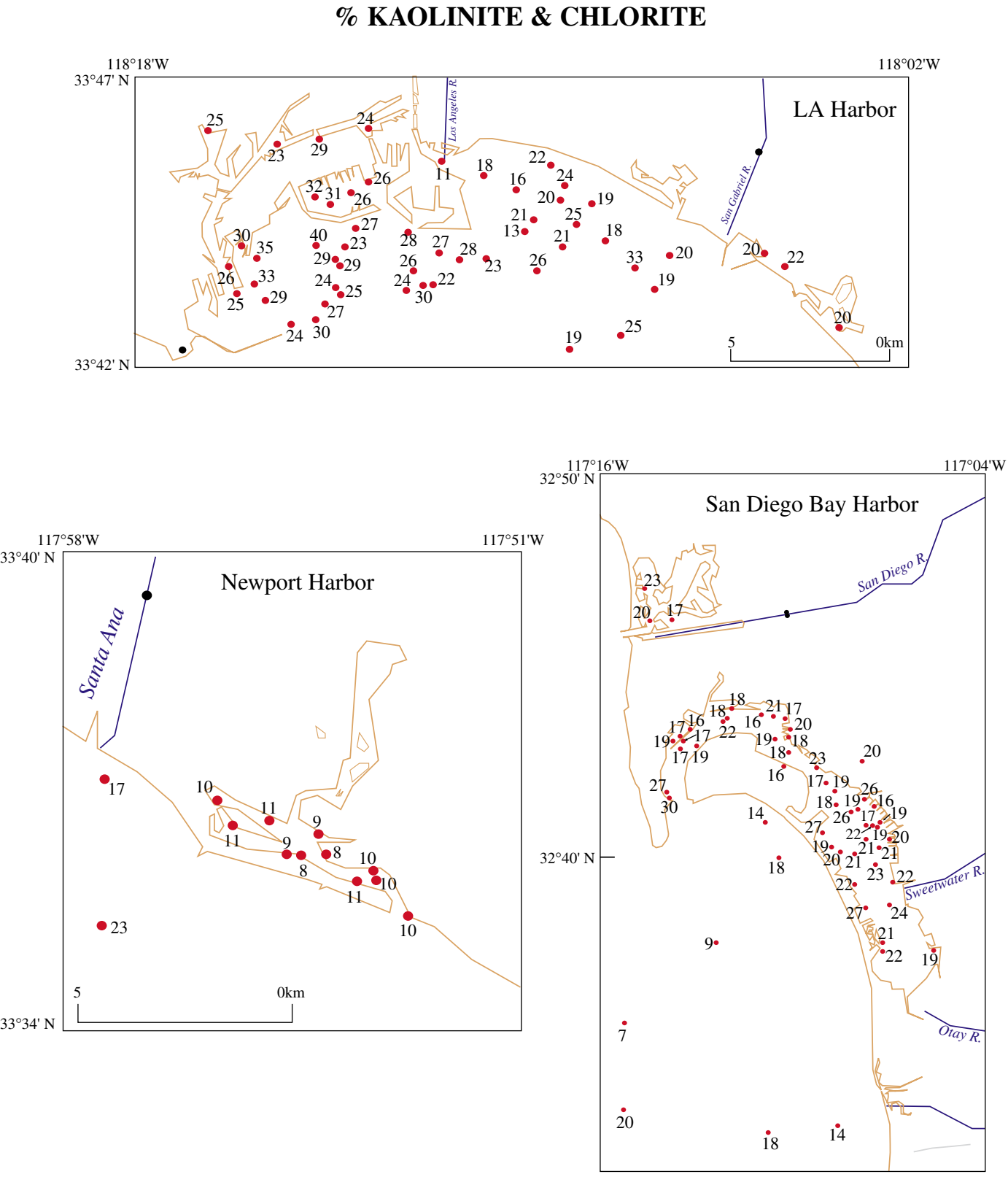

Figure 8. Kaolinite + chlorite content of the <2 µm size-fraction of harbor sediments

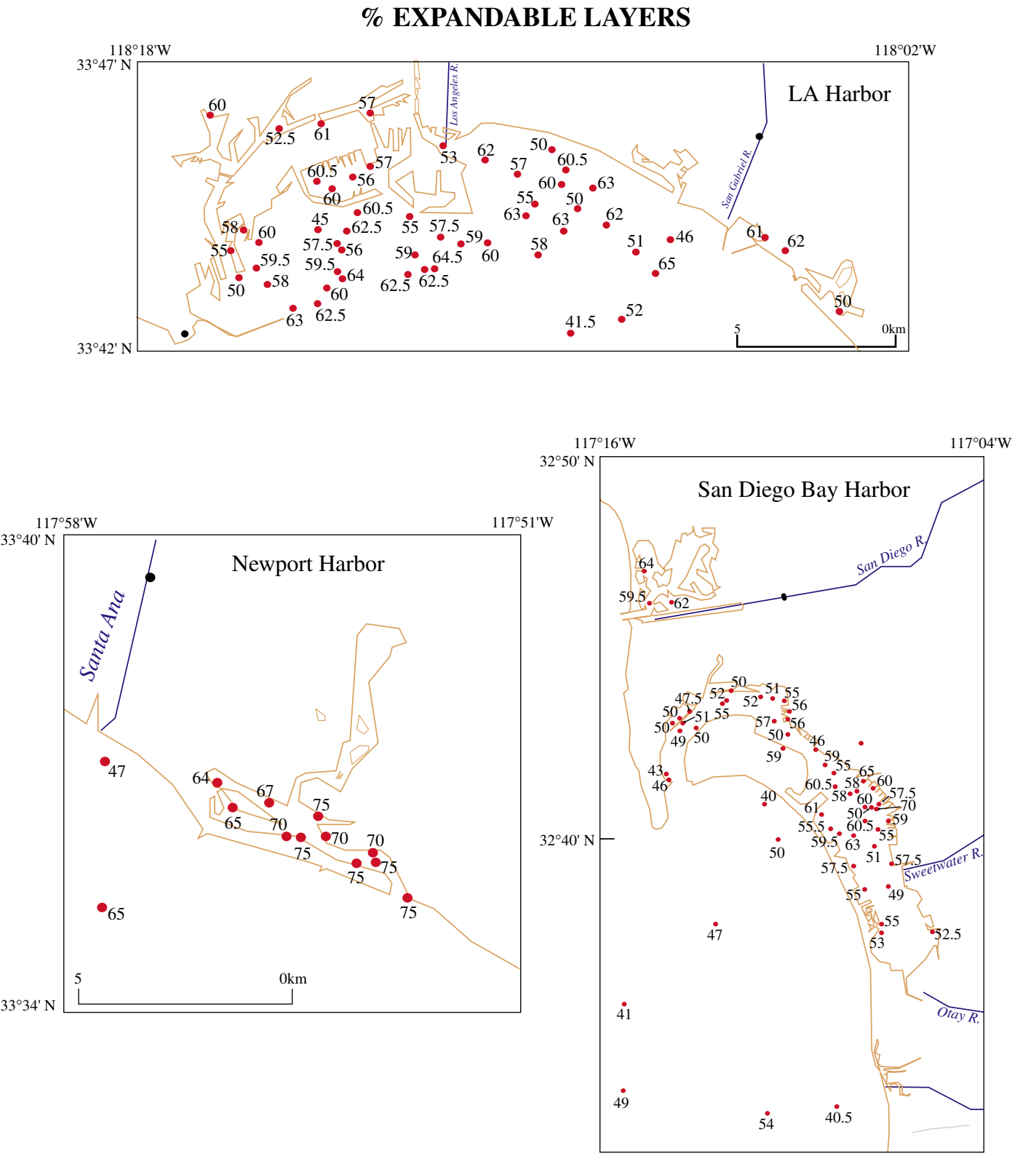

Figure 9. Percent expandable layers in the smectite phase of the <2 µm size-fraction of harbor sediments