GSA Data Repository item 2012153

GSA Today, v. 22, no. 6, doi: 10.1130/GSATG144A.1.

Wave-cut or water-table platforms of rocky coasts and rivers?

Gregory J. Retallack (gregr@uoregon.edu) **and Joshua J. Roering**

Dept. of Geological Sciences, University of Oregon, Eugene, Oregon 97403, USA

Table 1. Statistical comparisons of rock platforms and flanking cliffs

Locality	Lithology	Measure	Platform mean ± standard deviation (number)	Cliff mean ± standard deviation (number)	Similarity t-test probability	Similarity t-test p<0.01
Sunset Bay	shale	Schmidt hardness	17.2 ± 4.0 (76)	10.4 ± 1.2 (162)	$1.67 \cdot 10^{-21}$	yes
Sunset Bay	shale	slaking %	65.7 ± 5.0 (5)	46.5 ± 12.3 (8)	$1.56 \cdot 10^{-3}$	yes
Sunset Bay	shale	hue	14.5 ± 1.1 (5)	8.1 ± 2.1(8)	$6.95 \cdot 10^{-6}$	yes
Sunset Bay	shale	bulk density	2.22 ± 0.04 (5)	2.22 ± 0.04 (8)	0.95	no
Sunset Bay	sandstone	Schmidt hardness	16.4 ± 3.6 (35)	12.4 ± 3.9 (229)	$2.29 \cdot 10^{-7}$	yes
Sunset Bay	sandstone	slaking %	97.6 ± 4.6 (3)	97.1 ± 3.8 (8)	0.85	no
Sunset Bay	sandstone	hue	15.0 ± 0 (3)	8.9 ± 2.5 (8)	$8.95 \cdot 10^{-5}$	yes
Sunset Bay	sandstone	bulk density	2.11 ± 0.04 (3)	2.20 ± 0.11 (8)	0.11	no
Days Creek	shale	Schmidt hardness	21.4 ± 9.4 (120)	10.4 ± 1.9 (270)	$3.24 \cdot 10^{-24}$	yes
Days Creek	shale	slaking %	98.8 ± 2.2 (5)	33.2 ± 14.0 (8)	$1.74 \cdot 10^{-4}$	yes
Days Creek	shale	hue	15.0 ± 0 (5)	11.4 ± 2.1 (8)	$1.55 \cdot 10^{-4}$	yes
Days Creek	shale	bulk density	2.59 ± 0.1 (5)	2.55 ± 0.02 (8)	$1.68 \cdot 10^{-3}$	yes
Days Creek	sandstone	Schmidt hardness	34.2 ± 12.4 (150)	11.0 ± 2.7 (270)	$3.61 \cdot 10^{-51}$	yes
Days Creek	sandstone	slaking %	99.2 ± 0.7 (5)	99.1 ± 1.1 (8)	0.93	no
Days Creek	sandstone	hue	15.0 ± 0 (5)	11.4 ± 2.2 (8)	$1.17 \cdot 10^{-3}$	yes
Days Creek	sandstone	bulk density	2.61 ± 0.04(5)	2.53 ± 0.09 (8)	0.04	no

Table 2. Field and analytical data for samples of shale from Sunset Bay, Oregon.

Sample	Munsell hue	Rock	Intertidal zones	Level vs. MSL (m)	Horizontal distance (m)	Ferran hue (Munsell)	Schmidt recoil (*R*)	Pre-slaking size (mm)	Slaked size (%)	Density ($g.cm^{-3}$)
SH1	dark bluish gray 10B3/1	massive gray shale low (<1 m) on platform	low intertidal with *Penitella penita*, *Adula falcata*, and sea weeds common	–1.9	89.4	15	18.5 ± 3.1	60.6	64.4 ± 8.8	2.19
SH2	dark bluish gray 10B3/1	massive gray shale low (<1 m) on platform	low intertidal with *Penitella penita*, *Adula falcata*, and sea weeds common	–1.4	86.2	15		51.4	78.1 ± 12.0	2.22
SH3	dark bluish gray 10B3/1	massive gray shale low (<1 m) on platform	mid-intertidal with seaweeds common	–1.1	84.5	15	14.9 ± 3.3	54.3	72.6 ± 17.5	2.11
SH4	dark bluish gray 10B4/1	massive gray shale	mid- intertidal with seaweeds common	0.1	74.9	15	16.5 ± 2.6	51	73.8 ± 9.4	2.27
SH5	dark bluish gray 10B4/1	gray shale	upper intertidal with limpets and periwinkles	0.6	45.3	15	20.6 ± 2.8	67.1	63.6 ± 6.2	2.25
SH6	dark bluish gray 10B4/1	gray shale	upper intertidal with limpets and periwinkles	1.1	27.2	15	19.4 ± 3.1	55.8	62.4 ± 10.7	2.19
SH7	dark bluish gray 10B4/1	gray shale	upper intertidal with limpets and periwinkles	1.7	14.9	15	12.3 ± 1.9	62.6	61.5 ± 14.2	2.19
SH8	dark bluish gray 10B4/1 with 1 mm ferrans dark grayish brown 2.5Y4/2	slaking gray shale in slope break seep zone	upper intertidal with limpets and periwinkles	2.0	13.1	12.5	11.0 ± 2.0	57.6	67.2 ± 33.3	2.20
SH9	dark bluish gray 10B4/1 with 1 mm ferrans dark grayish brown 2.5Y4/2	slaking gray shale in slope break seep zone	spray zone with limpets and lichens	2.4	12.7	12.5	10.2 ± 0.6	60.9	70.5 ± 21.7	2.23
SH10	dark bluish gray 10B4/1 with 1 mm ferrans brownish yellow 10YR6/6	slaking gray shale	spray zone with limpets and lichens	2.7	11.7	10	10.8 ± 1.4	60.3	44.0 ± 11.6	2.22
SH11	dark bluish gray 10B4/1 with 1 mm ferrans strong brown 7.5YR5/6	slaking gray shale	spray zone with lichens	3.2	10.5	7.5	10.2 ± 0.7	60.1	32.4 ± 11.7	2.28
SH12	dark bluish gray 10B4/1 with 1 mm ferrans strong brown 7.5YR5/6	slaking gray shale with ferrans	bare rock with lichens and some grassy cover	4.2	7.5	7.5		62.8	37.1 ± 13.5	2.27
SH13	dark bluish gray 10B4/1 with 1 mm ferrans strong brown 7.5YR4/6	slaking gray shale with ferrans	bare rock with lichens and some grassy cover	5.0	6.8	7.5		41.8	53.7 ± 12.5	2.23
SH14	dark bluish gray 10B4/1 with 1 mm ferrans strong brown 7.5YR4/6	slaking gray shale with ferrans	bare rock with lichens and some grassy cover	6.0	5.7	7.5		53.1	53.6 ± 15.1	2.21
SH15	dark bluish gray 10B4/1 with 1 mm ferrans strong brown 7.5YR4/6	slaking gray shale with ferrans	bare rock with lichens and some grassy cover	7.5	4.5	7.5		64.6	53.3 ± 9.7	2.16
SH16	dark bluish gray 10B4/1 with 1 mm ferrans strong brown 7.5YR4/6	slaking gray shale with ferrans	bare rock with lichens and some grassy cover	9.1	3.6	7.5		51.6	37.0 ± 13.5	2.16
SH17	dark bluish gray 10B4/1 with 3 mm ferrans yellowish red 5YR5/6	red mottled gray shale	bare rock with lichens and some grassy cover	11.5	2.1	5		57.7	36.5 ± 11.6	2.22

Note: Mean sea level was calculated from tide level at Sunset Bay at 8.02 hrs, 13-Jul-2010, taken as –0.67 at Charleston tide gauge[9], with vertical and horizontal distances measured with level and tape. Munsell hues show redness with lower values on a scale in which 5Y is 15 and 5YR is 5. Schmidt recoil values (*R*) and percentage size change after 4 cycles of slaking experiment are given as mean and standard deviation. Bulk densities were measured using the clod method[13] and have standard deviation of 0.02 $g.cm^{-3}$.

Table 3. Field and analytical data for samples of sandstone from Sunset Bay, Oregon.

Sample	Munsell colour	Rock	Intertidal zones	Level vs. MSL (m)	Horizontal distance (m)	Ferran hue (Munsell)	Schmidt recoil (*R*)	Preslaking size (mm)	Slaked size (%)	Density ($g.cm^{-3}$)
SS1	dark bluish gray 10B4/1 with diffusion ferran 4 mm thick olive gray 5Y4/2	sandstone low (<1 m) on platform	low intertidal with *Penitella penita*, *Adula falcata*, and sea weeds common	–1.9	89.4	15	22.5 ± 3.5	64.6	100 ± 0	2.14
SS2	dark bluish gray 10B4/1 with diffusion ferran 4 mm thick olive gray 5Y4/2	sandstone low (<1 m) on platform	low intertidal with *Penitella penita*, *Adula falcata*, and sea weeds common	–1.4	86.2	15		65.9	100 ± 0	2.05
SS3	dark bluish gray 10B4/1 with diffusion ferran 4 mm thick olive gray 5Y4/2	sandstone low (<1 m) on platform	mid-intertidal with seaweeds common	–1.1	84.5	15		55.2	100 ± 0	2.13
SS4	bluish gray 10B5/1 with diffusion ferran 2 mm thick olive gray 5Y4/2	sandstone wall (1 m) with rare ferrans	mid- intertidal with seaweeds common	0.1	74.9	15	18.7 ± 2.2	68.6	100 ± 0	2.12
SS5	bluish gray 10B5/1 with diffusion ferran 2 mm thick yellowish brown 10YR5/6	common ferrans in sandstone wall to 1.4 m	upper intertidal with limpets and periwinkles	0.6	45.3	10	20.9 ± 3.9	56.4	100 ± 0	2.17
SS6	bluish gray 10B5/1 with diffusion ferran 2 mm thick yellowish brown 10YR5/6	common ferrans in sandstone wall to 2 m	upper intertidal with limpets and periwinkles	1.1	27.2	10	27.6 ± 4.0	64.1	100 ± 0	2.42
SS7	bluish gray 10B5/1 with diffusion ferran 2 mm thick strong brown 7.5YR5/6	common ferrans in sandstone wall to 3 m	upper intertidal with limpets and periwinkles	1.7	14.9	7.5	24.1 ± 4.0	56.1	92.2 ± 16.4	2.12
SS8	bluish gray 10B5/1 with diffusion ferran 2 mm thick strong brown 7.5YR5/6	case hardened sandstone wall to 3 m	upper intertidal with limpets and periwinkles	2.0	13.1	7.5	20.5 ± 2.6	57.1	91.6 ± 25.9	2.17
SS9	bluish gray 10B5/1 with diffusion ferran 2 mm thick strong brown 7.5YR5/6	case hardened sandstone wall	spray zone with limpets and lichens	2.4	12.7	7.5	25.2 ± 2.8	56.8	100 ± 0	2.12
SS10	bluish gray 10B5/1 with diffusion ferran 2 mm thick strong brown 7.5YR5/6	case hardened sandstone wall	spray zone with limpets and lichens	2.7	11.7	7.5	21.7 ± 6.1	53.3	100 ± 0	2.12
SS11	greenish gray 5GY5/1 with diffusion ferran 2 mm thick strong brown 7.5YR5/6	case hardened sandstone wall	spray zone with lichens	3.2	10.5	7.5		57.1	100 ± 0	2.34
SS12	greenish gray 5GY5/1 with diffusion ferran 2 mm thick strong brown 7.5YR5/6	case hardened sandstone wall	bare rock with lichens and some grassy cover	4.2	7.5	7.5		63.7	100 ± 0	2.18

Note: Mean sea level was calculated from tide level at Sunset Bay at 8.02 hrs 13-Jul-2010 of –0.67 at Charleston tide gauge[9], with vertical and horizontal distances measured with level and tape. Munsell hues show redness with lower values on a scale in which 5Y is 15 and 5YR is 5. Schmidt recoil values (*R*) and percentage size change after 4 cycles of slaking experiment are given as mean and standard deviation. Bulk densities were measured using the clod method[13] and have standard deviation of 0.02 $g.cm^{-3}$.

Table 4. Field and analytical data for samples of shale from Days Creek, Oregon.

Sample	Munsell color	Rock	Vegetation zones	Level vs. water 18-Jul-2010 (m)	Horizontal distance (m)	Ferran hue (Munsell)	Schmidt recoil (*R*)	Pre-slaking size (mm)	Slaked size (%)	Density ($g.cm^{-3}$)
DH1	bluish gray 10B5/1	clayey siltstone	bare rock with pond scum	0.2	57	15	20.4 ± 5.2	50.3	100 ± 0	2.59
DH2	bluish gray 10B5/1	clayey siltstone	bare rock with pond scum	0.3	53	15	35.0 ± 4.6	40.1	99.8 ± 46.6	2.60
DH3	bluish gray 10B5/1	clayey siltstone	bare rock with pond scum	0.3	50.6	15	24.8 ± 6.2	48.6	99.2 ± 40.2	2.60
DH4	bluish gray 10B5/1	clayey siltstone	bare rock with pond scum	0.3	41	15	29.8 ± 7.0	43.6	94.9 ± 40.8	2.57
DH5	bluish gray 10B5/1	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	1.3	28.5	15	17.2 ± 9.6	63.5	100 ± 0	2.58
DH6	bluish gray 10B5/1	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	2.1	26	15	13.9 ± 4.3	69.3	100 ± 0	2.55
DH7	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	3.0	21.6	12.5	12.0 ± 4.5	55.8	75.6 ± 29.5	2.52
DH8	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	3.5	19.5	12.5	10.2 ± 0.5	65.6	75.7 ± 25.6	2.54
DH9	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	4.0	18.3	12.5	10.6 ± 2.0	62.7	79.4 ± 23.5	2.55
DH10	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	4.5	17.1	12.5	10 ± 0	58.9	52.7 ± 32.7	2.54
DH11	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	clayey siltstone	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	5.8	14.4	12.5	10 ± 0	43.6	81.4 ± 38.6	2.55
DH12	olive gray 5Y5/2 with ferrans dark yellowish brown 10YR4/4	clayey siltstone	grassy slope with poison oak	9.1	11.8	10	10 ± 0	44.8	72.4 ± 22.1	2.58
DH13	olive gray 5Y5/2 with ferrans dark yellowish brown 10YR4/4	clayey siltstone	grassy slope with poison oak	11.7	9.4	10	10.6 ± 1.7	55.9	73.8 ± 30.7	2.58
DH14	olive gray 5Y5/2 with ferrans dark yellowish brown 10YR4/4	clayey siltstone	grassy slope with poison oak	14.2	8.1	10	10.4 ± 1.4	48.1	67.2 ± 35.5	2.56
DH15	olive gray 5Y5/2 with ferrans strong brown 7.5YR5/6	clayey siltstone	grassy slope with poison oak	16.0	5.7	10	10 ± 0	49	83.2 ± 24.4	2.54

Note: Vertical levels are relative to river levels a Days Creek at 11.00 hrs 18-Jul-2010, with vertical and horizontal distances measured with level and tape. Munsell hues show redness with lower values on a scale in which 5Y is 15 and 5YR is 5. Schmidt recoil values (*R*) and percentage size change after104 cycles of slaking experiment are given as mean and standard deviation. Bulk densities were measured using the clod method[13] and have standard deviation of 0.02 $g.cm^{-3}$.

Table 5. Field and analytical data for samples of sandstone from Days Creek, Oregon.

Sample	Munsell color	Rock	Vegetation zones	Level vs. water 18-Jul-2010 (m)	Horizontal distance (m)	Ferran hue (Munsell)	Schmidt recoil (*R*)	Pre-slaking size (mm)	Slaked size (%)	Density ($g.cm^{-3}$)
DS1	bluish gray 10B5/1	sandstone band 20 cm wide	bare rock with pond scum	0.2	57	15	23.6 ± 8.3	52.7	100 ± 54.1	2.61
DS2	bluish gray 10B5/1	hard sandstone nodules 30 cm thick	bare rock with pond scum	0.3	53	15	36.5 ± 11.8	66.7	99.0 ± 69.4	2.65
DS3	bluish gray 10B5/1	hard sandstone nodules 30 cm thick	bare rock with pond scum	0.3	50.6	15	44.4 ± 5.4	58	98.8 ± 69.3	2.64
DS4	bluish gray 10B5/1	hard sandstone nodules 15 cm thick	bare rock with pond scum	0.3	41	15	43.5 ± 6.5	57.5	100 ± 0	2.62
DS5	bluish gray 10B5/1	sandstone band 20 cm wide	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	1.3	28.5	15	23.1 ± 8.1	52.7	100 ± 0	2.55
DS6	bluish gray 10B5/1	sandstone band	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	2.1	26	15	13.4 ± 3.9	55.3	98.4 ± 47.5	2.54
DS7	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	sandstone band	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	3.0	21.6	12.5	10.5 ± 1.2	52.7	100 ± 63.5	2.60
DS8	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	sandstone band	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	3.5	19.5	12.5	11.9 ± 4.7	69.2	100 ± 0	2.54
DS9	olive gray 5Y5/2 with ferrans olive brown 2.5YR4/4	sandstone band	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	4.0	18.3	12.5	10.5 ± 1.7	46.1	100 ± 0	2.46
DS10	olive gray 5Y5/2 with ferrans dark yellowish brown 10YR4/4	sandstone band	blackberry (*Rubus*), anise (*Daucus*) and willow (*Salix*)	4.5	17.1	12.5	10.2 ± 0.9	53.7	100 ± 0	2.65
DS12	olive gray 5Y5/2 with ferrans dark yellowish brown 10YR4/4	sandstone band	grassy slope with poison oak	9.1	11.8	10	15.1 ± 7.9	52.5	99.6 ± 55.5	2.40
DS14	olive gray 5Y5/2 with ferrans dark yellowish brown 10YR4/4	hard sandstone band 15 cm thick	grassy slope with poison oak	14.2	8.1	10	10.6 ± 1.7	54.1	99.5 ± 55.7	2.45
DS15	olive gray 5Y5/2 with ferrans strong brown 7.5YR5/6	hard sandstone band 15 cm thick	grassy slope with poison oak	16.0	5.7	10	10.8 ± 1.7	50.4	99.9 ± 58.6	2.60

Note: Vertical levels are relative to river levels a Days Creek at 11.00 hrs 18-Jul-2010, with vertical and horizontal distances measured with level and tape. Munsell hues show redness with lower values on a scale in which 5Y is 15 and 5YR is 5. Schmidt recoil values (*R*) and percentage size change after104 cycles of slaking experiment are given as mean and standard deviation. Bulk densities were measured using the clod method[13] and have standard deviation of 0.02 $g.cm^{-3}$.