REGOLITH-TERRAIN MAPPING FOR MDRS FIELD AREA

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Introduction

Regolith is everything between fresh rock and fresh air and comprises the land surface of the earth and all planetary bodies with a solid surface. Regolith terrain mapping is a way of describing the landscape that captures the landforms, materials of which it is made, and any secondary induration. It is a useful tool for soil mapping, environmental geology, geomorphology mapping, regolith studies, planetary exploration, land systems mapping, soil ecology, groundwater studies, and mineral exploration. Key references for regolith studies include Taylor and Eggleton (2001), Ollier and Pain (1996) and Eggleton (2002).

For MDRS the system has been optimized at two scales: map and site specific scale. At both scales each regolith terrain unit is captured by three main descriptors, a landform descriptor in lower case letters, a regolith material descriptor in upper case letters, and a numerical induration modifier (surface crusts at the site scale). Each descriptor is unique within itself.

Map Scale

Landforms

Erosional rise	er	(knob, small hill, etc.) figure 1.
Smooth slope	ss	(smooth steep slope) figure 2.
Dissected slope	ds	(gullied slope) figure 3.
Wash	ew	(flat floored erosional valley) figure 4.
Channel	ch	(unconfined stream) figure 5.
Smooth plain	ep	(smooth erosional plain) figure 6.
Rough plain	dp	(dissected erosional plain) figure 7.
Erosional terrace	et	(eroded terrace along bank of creek) figure 8.
Alluvial plain	ap	(flood plain) figure 9.
Talus deposit	ta	(talus cone, stream, or apron) figure 10.
Colluvial fan	fc	(mass flow deposited fan) Figure 11.
Aeolian plain	wp	(plain of windblown deposits, sand sheets, loess, etc.) figure 12.
Dunes	wd	(sand dunes) figure 13.
Relict deposit	rl	(residual remnant of sediment of various origins) figure 14.

Regolith materials

Clay rich bedrock	C	(undifferentiated)
Non-cracking clay	K	(kaolinite, illite) figure 15.
Cracking clay	S	(smecitite) figure 16.
Quartz rich bedrock	Q	(quartz dominant – sandstone etc.) figure 17.
Silt	L	(silty sediment) figure 18.
Sand	A	(sandy sediment) figure 19.
Gravel	G	(gravelly sediment) figure 20.
Boulders	B	(boulder-sized material) figure 21.
Silt+sand	LA	(bimodal mixed sediment)

Silt+gravel	LG	(bimodal mixed sediment)
Silt+boulders	LB	(bimodal mixed sediment)
Sand+gravel	AG	(bimodal mixed sediment)
Sand+boulders	AB	(bimodal mixed sediments)
Polymict sediment	PM	(silt+sand+gravel)
Weathered	W	(prefix to other codes indicating significant weathering)

Induration

None	0	
Calcrete	1	(carbonate, hard, sheets, or nodules, fizzes with acid)
Gypcrete	2	(gypsum, powdery, or with clear gypsum crystals)
Ferricrete	3	(iron, hard, red-brown)
Salcrete	4	(salt, salty to taste)

Symbols

Drainage	-->-->-->	(arrow points down flow direction)
Ridge line	-X---X---X-	(top of ridge)
Hill top	X	(where there is a distinct peak)
Escarpment	-v---v---v-	(cliff, v is on the lower side) figure 22
Spire	*	(sharp pinnacle of rock) figure 23
Fin	-*---*---*-	(narrow, vertical sided ridge) figure 24
Natural arch	][	(oriented as on ground)

Site Scale

Landforms

Erosional rise	er	(knob, small hill, etc.) figure 1.
Rills	el	(small parallel channels cut into slope or plain) figure 25
Gullies	eg	(large V-shaped channels cut into slope or plain) figure 26
Smooth slope	ss	(smooth steep slope.
Dissected slope	ds	(gullied slope)
Alluvial plain	ap	(flood plain)
Wash	ew	(flat floored erosional valley)
Pockets	dp	(local depressions <1m)
Basins	dl	(local depressions 1-10m) figure 27
Pans	lp	(depressions >10 m)
Channel	ch	(unconfined stream)
Bar	ab	(streamline sediment island in wash or channel)
Talus deposit	ta	(talus cone, stream, or apron)
Colluvial fan	fc	(mass flow deposited fan)
Downflow pipes	pd	(holes in clay materials into which runoff flows) figure 28
Outflow pipes	po	(holes in clay materials from which water discharges) figure 29
Dunes	wd	(sand dunes)
Relict deposit	rl	(residual remnant of sediment of various origins)

Regolith materials

Clay rich bedrock	C	(undifferentiated)
Non-cracking clays	K	(kaolinite, illite)
Cracking clays	S	(smectites)
Quartz rich	Q	(quartz dominant – sandstone etc.)
Carbonate rich		(fizzes with acid)
Sulfate rich	S	(gypsum and/or anhydrite dominant) figure 30
Organic-rich	O	(coal) figure 31
volcanic bedrock	V	(tuffs, etc.) figure 32
Silt	L	(silty sediment)
Sand	A	(sandy sediment)
Gravel	G	(gravelly sediment)
Boulders	B	(boulder-sized material)
Silt+sand	LA	(bimodal mixed sediment)
Silt+gravel	LG	(bimodal mixed sediment)
Silt+boulders	LB	(bimodal mixed sediment)
Sand+gravel	AG	(bimodal mixed sediment)
Sand+boulders	AB	(bimodal mixed sediments)
Polymict sediments	PM	(three of silt/sand/gravel/boulders)
Weathered	W	(prefix to other codes indicating significant weathering)

Surface crusts and efflorescence

None	0	
Carbonate	1	(reacts with acid)

Sulphate	2	(soft, powderly, clear crystals, or hard) figure 33
Iron	3	(iron, hard, red-brown)
Halite	4	(salty to taste) figure 34
Cryptogamic	5	(bound by microbial crusts, lichens, etc.) figure 35.
Manganese	6	(typically brown or black) figure 36.

Symbols

Drainage	->-→-→-	(arrow points down flow direction)
Ridge line	-X---X---X-	(top of ridge)
Hill top	X	
Escarpment	-v---v---v-	(v is on the lower side)
Mushroom rock	**T**	(mushroom-shaped rock with hard cap on soft pedestal)
Sample	o	(sample location)

Methodology

1. Examine the feature of interest and decides what sort of landform it is (hill, rough plain etc.) and assigns an appropriate lower case two-character code.
2. Decide what material the feature is made of (quartz or clay rich rock, sand silt, gravel etc.) and assign the appropriate upper case character.
3. Determine whether there is any surficial induration or binding to form a duricrust (gypcrete, ferricrete, etc.) and assign the correct numeric code. So far no such induration has been identified in the MDRS field area, because of their importance the codes for such features are included should they ever be found. For site scale description this includes surface efflorescence, organic binding, or varnish.

Examples

Small sandstone hill	erQ0
Dissected clay slope	dsC0
Calcreted gravel terrace	atG1

References

Eggleton, R. A. 2002. The regolith glossary. CRC LEME, Floreat Park, Perth, Australia.

Eggleton, R. A. and Taylor, G. 2001. Regolith geology and geomorphology. John Wiley & Sons.

Ollier, C. D. and Pain, C. 1996. Regolith, soils, and landforms. John Wiley & Sons.
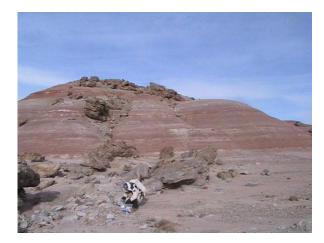
Figures

Figure 1. Erosional rise near hab.

Figure 2. Smooth slope near hab.

Figure 3. Dissected slope, hab ridge.

Figure 4. Wash, north of hab.

Figure 5. Channel east of hab

Figure 6. Smooth plain east of Skyline Rim.

Figure 7. Rough plain.

Figure 8. Erosional terrace

Figure 9. Flood plain of Fremont River.

Figure 10. Talus deposit

Figure 11. Colluvial fan

Figure 12. Aeolian plain

Figure 13. Dunes, east of hab

Figure 14. relict gravels above White Rock Canyon

Figure 15. Non-cracking clay surface, top of hab ridge.

Figure 16. Smecitite (swelling) clay slope, hab ridge.

Figure 17. Sandstone, White Rock Canyon

Figure 18. Silt in small channel near hab.

Figure 19. Sand in small channel near hab.

Figure 20. Gravel.

Figure 21. Boulders in Coal Mine Wash

Figure 22. Escarpment in box canyon near highway, east of hab.

Figure 23. Spire along highway, west of hab

Figure 24. Factory Butte, a fin.

Figure 25. Rills on hab ridge

Figure 26. Gully on hab ridge

Figure 27. Basin. Pocket similar, but < 1 m, pan larger (>10 m).

Figure 28. Large down flow pipe, Lith Canyon.

Figure 29. Large out flow pipe, hab ridge

Figure 30. Nodular anhydrite bed behind hab.

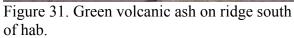Figure 31. Green volcanic ash on ridge south of hab.

Figure 32. Coal layers, Coal Mine Wash

Figure 33. Gypcrete north of Factory Butte

Figure 34. Pustular cryptogamic crust east of hab

Figure 35. Halite and gypsum efflorescence, Factory Bench

Figure 36. Desert varnish on boulder, road to Lith Canyon