Table 1: M3 Global Spectral Parameter Summary Products

(global wavelengths used in formulas, rounded to nearest nm)

	CLASS	NAME	PARAMETER	FORMULATION	RATIONALE
1	Pipe	R750	0.75 µm reflectance	R749	Reference I/F (%)
2	Pipe	UVVIS	ultraviolet – visible ratio	R419/R749	UV-visible spectral ratio (relative I/F, %)
3	Pipe	VISUV	visible-ultraviolet ratio	R749/R419	Visible-UV spectral ratio (relative I/F, %)
4	Pipe	VISNIR	visible-nearIR ratio	R699/R1579	Optical maturity & mare-highland
5	Pipe	R950_750	Ratio of 950 nm to 750 nm, mafic absorption	R949/R749	Quick look at mafic absorption
6	Pipe	BD620	band depth at 620 nm	$1-\frac{R619}{\left(\frac{R749-R419}{749-419}\right)\cdot(619-419)+R419}$	Possible Ti or impact melt
7	Pipe	BD950	band depth at 950 nm	$1-\frac{R949}{\left(\frac{R1579-R749}{1579-749}\right)\cdot(949-749)+R749}$	OPX comparison with Kaguya
8	Pipe	BD1050	band depth at 1050 nm	$1-\frac{R1049}{\left(\frac{R1579-R749}{1579-749}\right)\cdot(1049-749)+R749}$	OLV comparison with Kaguya
9	Pipe	BD1250	band depth at 1250 nm	$1-\frac{R1249}{\left(\frac{R1579-R749}{1579-749}\right)\cdot(1249-749)+R749}$	PLAG comparison with Kaguya
10	Pipe	R1580	1.6 µm reflectance	R1579	IR albedo
11	Pipe	BDI1000	1 µm integrated band depth	$\sum_{n=0}^{26} 1-\frac{R(789+20n)}{R_C(789+20n)}$ R_C= 1µm continuum reflectance at the given wavelength (sums band depths from 789-1308nm)	Fe mineralogy
12	Pipe	1um_Min	1µm band center	Wavelength between 890-1349 nm at which $1-\frac{R_\lambda}{R_{C\lambda}}$ is maximized	Fe mineralogy
13	Pipe	1um_FWHM	1µm band width	locate the two points where continuum-removed reflectance intersects $0.5\cdot 1-\left[\frac{R(1um\_\min)}{R_C(1um\_\min)}\right]$	Fe mineralogy

14	Pipe	1um_Sym	1 µm symmetry	a = 1um_min - short wavelength point found in 1um_FWHM b = long wavelength point found in 1um_FWHM – 1um_min 1um_sym = b/a	Numbers greater than 1 may be enriched in olivine
15	Pipe	BD1um_Ratio	BD930/BD990	$BD930 = 1 - \frac{R929}{\left(\frac{R1579 - R699}{1579 - 699}\right)\cdot(929 - 699) + R699}$ $BD990 = 1 - \frac{R989}{\left(\frac{R1579 - R699}{1579 - 699}\right)\cdot(989 - 699) + R699}$ $BD1um\_Ratio = BD930 / BD990$	Enhancement in low Ca pyroxene relative to high Ca pyroxene
16	Pipe	2um_Ratio	2 µm ratio	R1578/R2538	
17	Pipe	BDI2000	2 µm integrated band depth	$\sum_{n=0}^{21} 1 - \frac{R(1658 + 40n)}{R_{C2}(1658 + 40n)}$ R_{C2}= 2µm continuum reflectance at the given wavelength (sums band depths from 1658-2498nm)	Fe mineralogy
18	Pipe	BD2um_Ratio	2um band depth ratio	$a = 1 - \frac{R1898}{\left(\frac{R2578 - R1578}{2578 - 1578}\right)\cdot(1898 - 1578) + R1578}$ $b = 1 - \frac{R2298}{\left(\frac{R2578 - R1578}{2578 - 1578}\right)\cdot(2298 - 1578) + R1578}$ $BD2um\_Ratio = a / b$	Enhancement in low Ca pyroxene relative to high Ca pyroxene
19	Pipe	Thermal_Ratio		R2538/R2978	
20	Pipe	BD3000	3 µm band depth using 2µm continuum	$1 - \frac{R2978}{\left(\frac{R2538 - R1578}{2538 - 1578}\right)\cdot(2978 - 1578) + R1578}$	H_2O
21	Pipe	R540	0.55 µm reflectance	R539	Reference I/F (%)
22	Pipe	Vis_Slope	UV-visible continuum slope	$\frac{R749 - R419}{749 - 419}$	UV-Vis slope (%/nm)
23	Supl	Tilt	1 µm tilt	R909-R1009	Tompkins and Pieters
24	Pipe	1um_Slope	Continuum slope between 0.70 and 1.6 µm	$\frac{R1579 - R699}{1579 - 699}$	Vis-NIR slope (%/nm)
25	Supl	Curvature	1 µm band curvature	$\frac{R749 + R1009}{2 \cdot R909}$	Tompkins and Pieters
26	Pipe	R2780	2.8 µm reflectance	R2778	Reference I/F (%)

27	Pipe	OLINDEX	Olivine index	$\left[0.1\frac{\left[\frac{R_{1750}-R_{650}}{1750-650}\right](860-650)+R_{650}}{R_{860}}+0.5\frac{\left[\frac{R_{1750}-R_{650}}{1750-650}\right](1047-650)+R_{650}}{R_{1047}}+0.25\frac{\left[\frac{R_{1750}-R_{650}}{1750-650}\right](1230-650)+R_{650}}{R_{1230}}\right]$	olivine will be strongly positive
28	Pipe	BD1900	Band depth at 1900nm: low Ca pyroxene index	$1-\frac{R1898}{\left(\frac{R2498-R1408}{2498-1408}\right)\cdot(1898-1408)+R1408}$	pyroxene will be positive; favors LCP
29	Pipe	BD2300	Band depth at 2300nm: high Ca pyroxene index	$1-\frac{R2298}{\left(\frac{R2578-R1578}{2578-1578}\right)\cdot(2298-1578)+R1578}$	pyroxene will be positive; favors HCP
30	Pipe	2um_Slope	Continuum slope between 1.6 and 2.5 μm	$\frac{R2538-R1578}{2538-1578}$	NIR slope (%/nm)
31	Pipe	Thermal_Slope		$\frac{R2978-R2538}{2978-2538}$	Thermal slope (%/nm)
32	Pipe	NBD1400	1.4 μm OH band	$RC=\frac{(R1348+R1368)}{2}$ $LC=\frac{(R1428+R1448)}{2}$ $BB=R1408$ $NBD1400=1-2\cdot\frac{BB}{(RC+LC)}$	H_2O
33	Pipe	NBD1480	1.48 μm OH band	$RC=\frac{(R1428+R1448)}{2}$ $LC=\frac{(R1508+R1528)}{2}$ $BB=R1488$ $NBD1480=1-2\cdot\frac{BB}{(RC+LC)}$	H_2O
34	Pipe	NBD2300	2.3 μm OH band	$RC=\frac{(R2218+R2258)}{2}$ $LC=\frac{(R2378+R2418)}{2}$ $BB=\frac{(R2298+R2338)}{2}$ $NBD2300=1-2\cdot\frac{BB}{(RC+LC)}$	H_2O

35	Pipe	HBD2700	2.7 μm OH band	$RC = \frac{(R2578 + R2618 + R2658)}{3}$ $BB = \frac{(R2698 + R2738)}{2}$ $HBD2700 = 1 - \frac{BB}{RC}$	H_2O
36	Pipe	HBD2850	3 μm ice band	$RC = \frac{(R2538 + R2578 + R2618)}{3}$ $BB = \frac{(R2817 + R2857 + R2897)}{3}$ $HBD2850 = 1 - \frac{BB}{RC}$	Ice
37	Supl	Lucey_OMAT	Optical Maturity – Clementine Legacy	$\left\{(R749 - X_0)^2 + \left[\left(\frac{R949}{R749}\right) - Y_0\right]^2\right\}^{1/2}$ X_o=0.08 Y_o=1.19 for Clementine data X_o=0.01 Y_o=1.26 for Adams data	Based on Lucey et al, JGR (2000)
38	Supl	Mare_OMAT	Optical Maturity Mare	$(R749 \cdot 0.1813) - \left[\left(\frac{R949}{R749}\right) \cdot 0.9834\right]$ most mature=-1.05, least mature=-0.65	Based on Wilcox et al. 2005 - untested
39	Pipe	Hlnd_IsFeO	Optical Maturity Highlands	$I_s / FeO = e^{\left[\frac{\left(1.82 - \frac{R749}{R889}\right)}{0.057}\right]}$	Based on Fischer
40	IP	LSCC_Maturity	Optical Maturity – revised for hyperspectral data	$\log[I_s / FeO] = \sum_{k=1}^{46} W_k \cdot \frac{R_k}{R_{k+1}} \cdot 10 + C$ k in 50nm increments from 300-2600nm W_k is weighting coefficient from table	Based on all Lunar Soil Consortium data
41	Supl	FE_est	Iron Estimate	$\left[17.427 \cdot \left(-\arctan\left\{\left[\left(\frac{R949}{R749}\right) - Y_0\right] / (R749 - X_0)\right\}\right)\right] - 7.565$ X_0 = 0.08 Y_0 = 1.19	Iron estimate based on Lucey's work
42	Supl	FE_est_mare	Iron Estimate Mare	$-137.97 \cdot \left[(R749 \cdot 0.9834) + \left(\frac{R949}{R749} \cdot 0.1813\right)\right] + 57.46$	Wilcox et al, JGR (2005), Clementine based

Class codes:

Pipe = currently classified as "pipeline" in M3tools
Supl = currently classified as "supplemental" in M3tools
IP = currently classified as "in progress" in M3tools