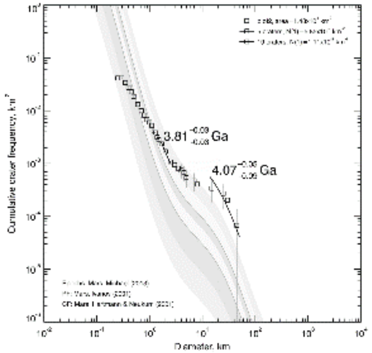
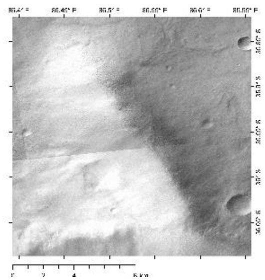
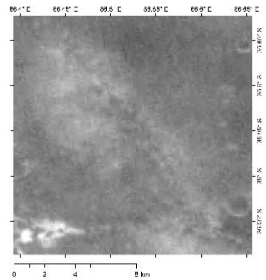
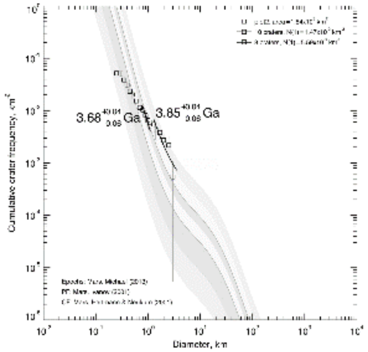
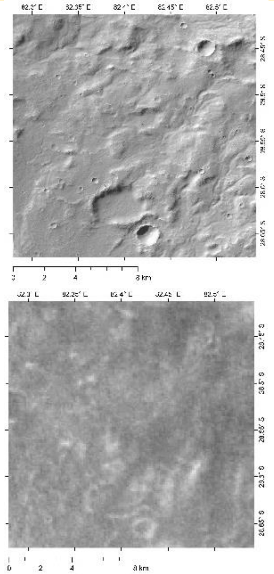
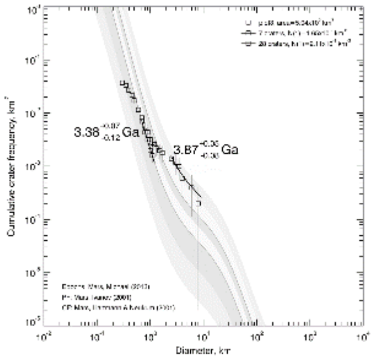
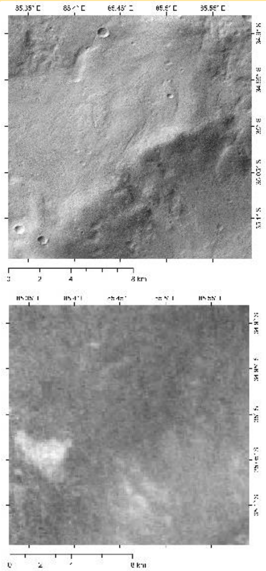
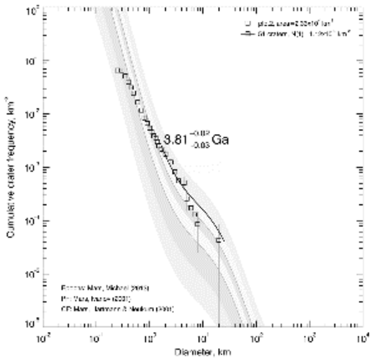
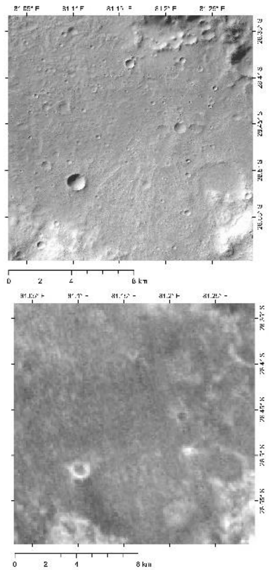
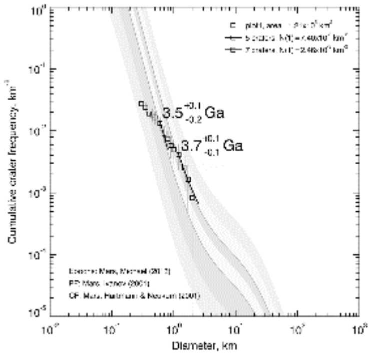
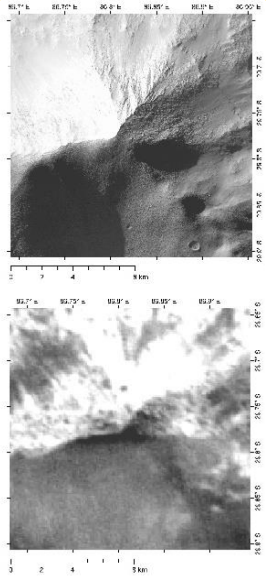
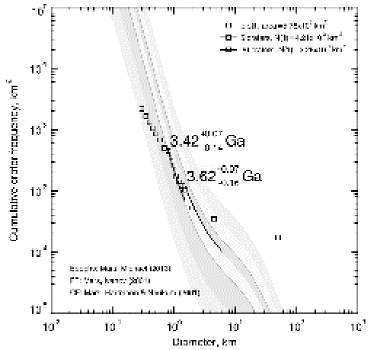
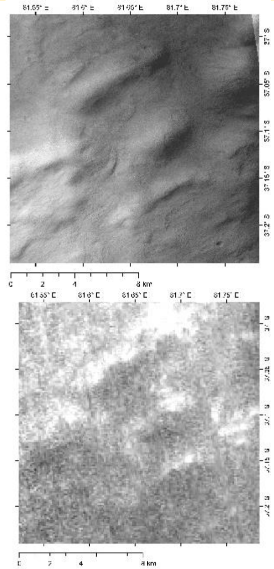
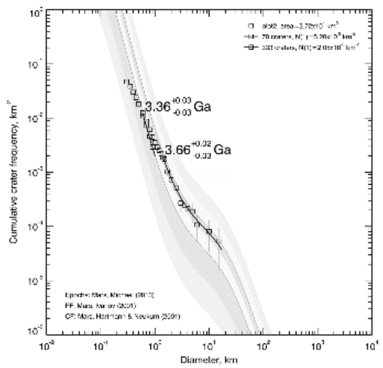
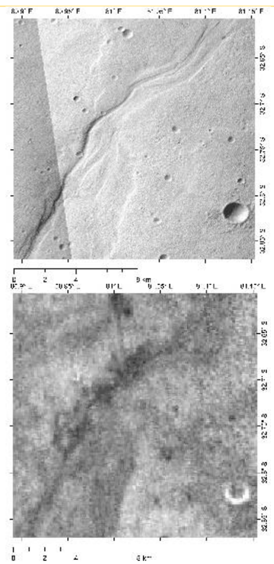
Detailed Descriptions of the Map Units

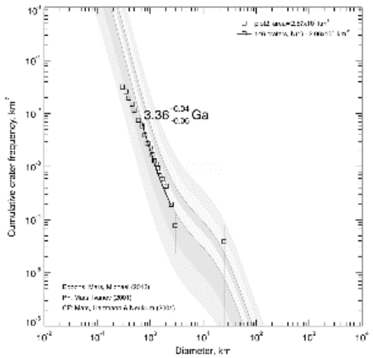
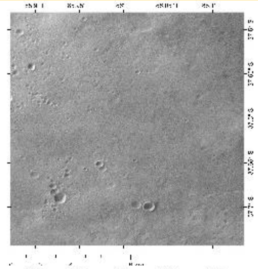
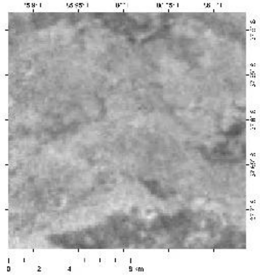
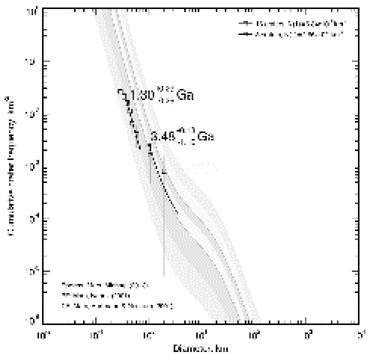
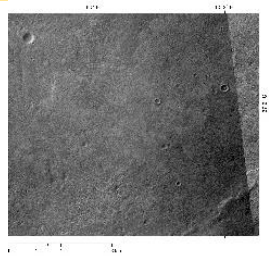
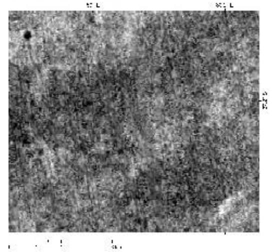
***Supplement to the* Geologic Map of the Navua Valles region, Mars**

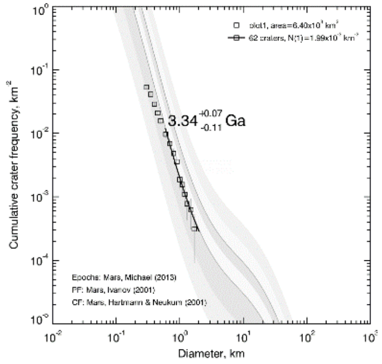
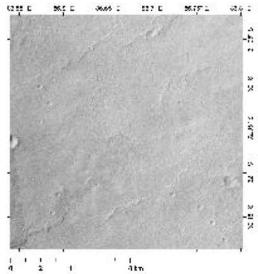
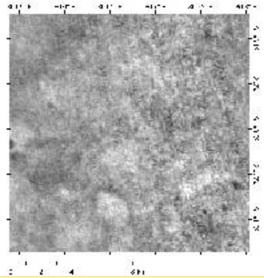
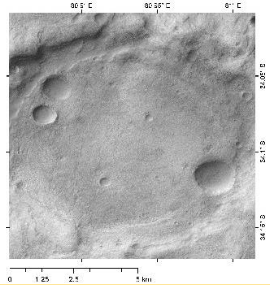
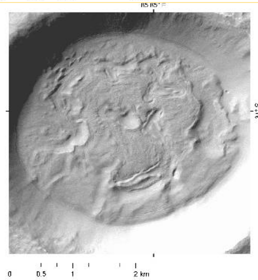
Symbol	**Name**	**N**	**N(1)** $\mathbf{10^{-5}}$ $\mathbf{km^2}$	**Age assessments (formation and re-surfacing)** Default is counting from craters >300 m diameter. “Small craters” are all craters visible on CTX (>15 m)	**Thermal Inertia**	**Description**	**Interpretation**	**Visual example** Visible CTX (mosaic) and corresponding THEMIS night IR	**Unit Frag-mentation** Map Area km^2, / number of continu-ous map units
				BASEMENT					
Nm	*Mountain peaks*	5 19	5850 1110	4.07 Ga +0.05 -0.09 3.81 Ga +0.03 -0.03 Noachian 	low to very high	Rounded hills or outcrops of rough bedrock morphol-ogy	Remnant outcrops of the Hellas Basin rim material, or peaks of an uplifted inner ba-sin ring, consisting of upper crust base-ment uplift or ejecta.	 	15078/154

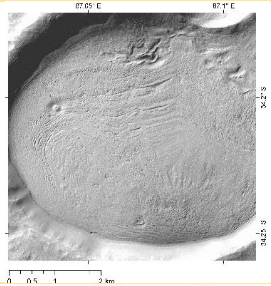
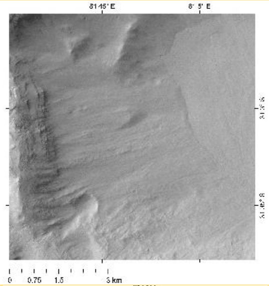
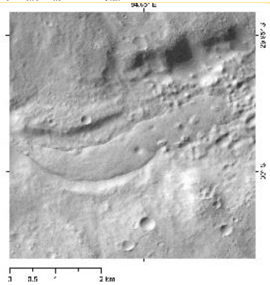
HNa	*Apron*	10 8	1470 559	3.85 Ga +0.04 -0.06 3.68 Ga +0.04 -0.06 Noachian Hesperian 	Low	Thick layer of material surrounding / overlying a Nm ridge, end with steep cliffs.	Megabreccia, sediments and airfall deposits, dissected		1549/1
HNmi	*Inter-montan terra, SE*	7 28	1650 211	3.87 Ga +0.05 -0.08 3.38 Ga +0.07 -0.12 Noachian Hesperian 		See Nmi	See Nmi, but with a different modification history		4718/2

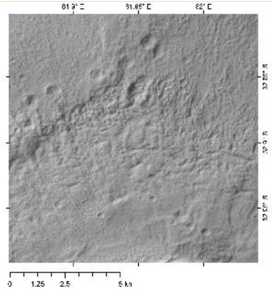
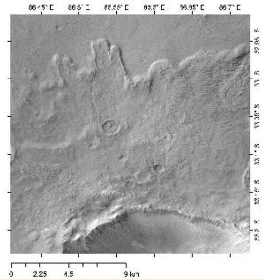
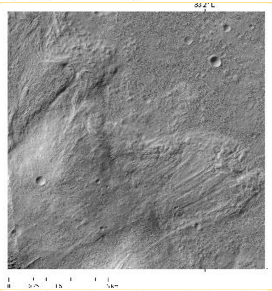
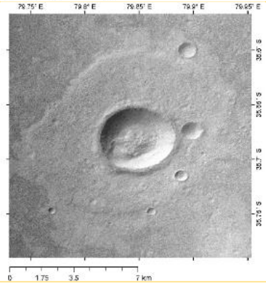
Nmi	*Inter-montan terra, NW*	51	1120	3.81 Ga +0.02 -0.03 Noachian  	low to moder-ate-low	Rolling terra sur-face surrounding Nm units, includ-ing layered mate-rials and de-graded craters.	Megabreccia, sedi-ments and airfall de-posits that buried Nm in the Noachian.		24494/19
HNms	*Sharp-crested mountain (Anseris Mons)*	5 7	740 246	3.7 Ga +0.1 -0.1 3.5 Ga +0.1 -0.2 Noachian Hesperian *Only steep slopes which may compro-mise data.*  	low to very high	Mountain peak	Impact-derived crus-tal material. May be Nm modified differ-ently or volcanic ma-terial.		1209/1

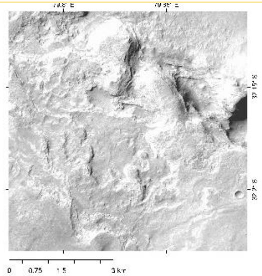
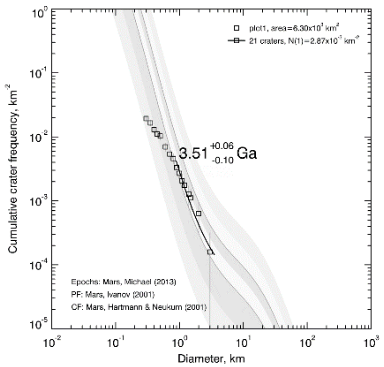
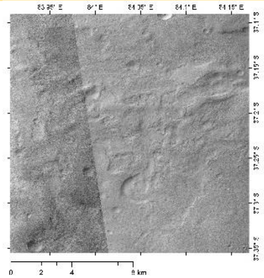
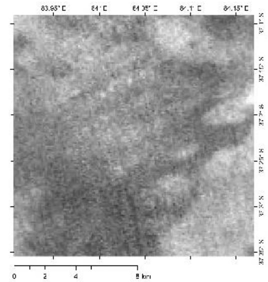
Hmib	*Rolling or flat plains or hills in the basin*	5 20	421 228	3.62 Ga +0.07 -0.16 3.42 Ga +0.07 -0.14 Hesperian 	low to high	Intermontan and interflow rolling or flat plains on the basin floor, including degraded impact forms.	The basin or shelf floor underlying the last flow material emplacements. Impact megabreccia, lacustrine sediments, volcanic deposits, mass wasting materials		5891/14
				FLOWS OR SEDIMENTS					
Hpd	*Plains, dissected by a discontinuous drainage*	70 333	520 205	3.66 Ga +0.02 -0.03 3.36 Ga +0.03 -0.03 Hesperian 	moderate-variable	Plains dissected, wrinkle ridged with degraded / ghost craters, composed of several layers of smooth, horizontal materials	Layers of volcanic flows or airfall deposits		37600/9

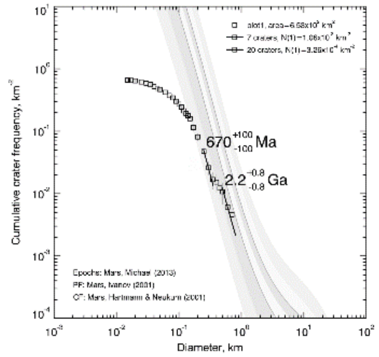
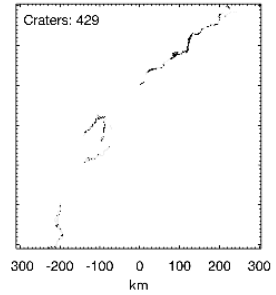
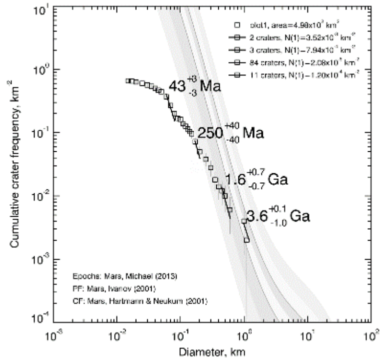
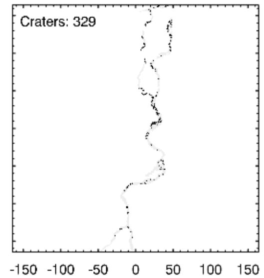
AHpb	*Plains, IR-bright, in basin*	146	206	3.36 Ga +0.04 -0.06 Amazonian–Hesperian boundary 	Defined by its high to very high thermal inertia.	Lobate flows of high thermal inertia material in the basin, in many places in small patches.	The most recent episodes of lobate (lava or mud) flow activity in the basin	 	28402/16
AHpb2	*Plain, in the basin, not IR-bright*	3 16	266 63	3.48 Ga +0.13 -1.10 1.30 Ga +0.29 -0.29 Amazonian 	low-moderate	Plains in the basin with not bright IR signature.	Volcanic plains, flow or airfall	 	1246/1

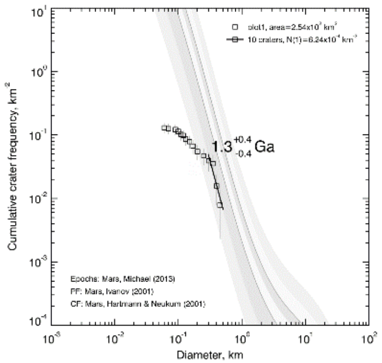
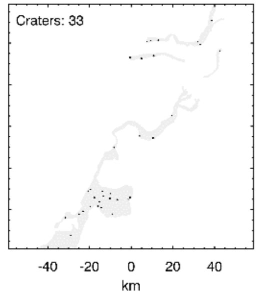
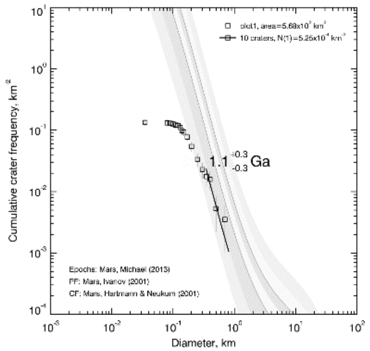
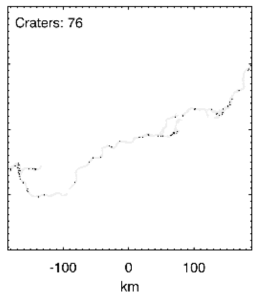
AHp	*Plains*	62	199	3.34 Ga +0.07 -0.11 Amazonian–Hesperian boundary 	moderate-variable	Wrinkle ridged smooth plains.	The latest Hesperian volcanic lava fields, probably directly originates from Hadriacus Mons. Flow and/or volcaniclastic airfall. Lava channels.	 	6615/1
				FILLS All ages are combined of all individual occurrences.					
f	*Fill*	8	1770	3.9 Ga +0.1 -0.1 Amazonian to Hesperian		Smooth, flat, densely cratered fill commonly in craters, large secondaries or depressions.	Airfall debris and/or flows and/or lacustrine sediments		4369/44
fc	*Complex crater or valley fill*			N/A		Complex (rumpled, lineated, ridged) material within craters	Recent glacial material deformed by sublimation, collapse		567/39

fl	*Complex lineated crater or valley fill*	6	20	0.43 Ga +0.1 -0.2		Lineated material within craters, channels and valleys	Recent glacial material lineated by creep		430/29
b	*Intra-crater bajada*	22 1	28 1.9	Large craters: 0.59 Ga +0.1 -0.1 Small craters: 0.04 Ga +0.04 -0.04		Merged fan shaped deposits on crater interior slopes	Dry mass wasting materials		1717/10
db	*Valley-blocking fill deposit*	2	5.8	0.12 Ga +0.08 -0.08		Material that is collected in channels and valleys, with smooth or patterned/cracked surface	Glacier, rock glacier, ice-rich material or indurated mud		18/6
				IMPACT MATERIALS					
c	*Impact craters*			N/A		Undifferentiated, impact crater materials, not exhibiting grooves, rampart, lobate or pedestal morphologies	Dry ejecta or degraded impact material.		599/8

cg	*Grooved ejecta crater material*	14 147	816 62	3.8 Ga +0.0 -0.1 1.3 Ga +0.1 -0.1 Noachian to Amazonian, combined age		Radially lineated crater ejecta. The ejecta's primary characteristic is the grooves but it may be accompanied with secondary, different degrees of pedestal and lobate characteristics	Fluidized impact crater ejecta		
cr	*Rampart ejecta crater material*	4	381	3.6 Ga +0.1 -0.3 After the Hesperian, combined age		Rampart crater ejecta. Likely similar to lobate ejecta, but fresher. Degraded lobate ejecta craters may also have remnant rampart.	Fluidized impact crater ejecta		1907/1
cl	*Lobate ejecta crater material*	45	402	3.6 Ga +0.0 -0.0 Noachian to Amazonian, combined age		Primariy characteristic is well developed lobes often with grooves but no rampart.	Fluidized impact crater ejecta		8459/23
cp	*Pedestal ejecta crater material*	7	320	3.5 Ga +0.1 -0.2 Since the Hesperian, Combined age		Quasi-circular crater ejecta with steep terminus, not lobate. Often grooved, may be lobate. Often with disintegrating - knobby - edge and interior	Fluidized impact crater ejecta		2811/33
				LAYERED MATERIALS					

				Age reflects a combination of formation, exhumation, surface exposure times					
e	*Erosional windows / Etched terrain*	13 30	512 136	3.7 Ga +0.0 -0.1 2.8 Ga +0.3 -0.4 Hesperian to Amazonian	low	Light toned, typically layered material outcrops and cliffs in depressions. ways layered.	Eroded and exhumed layered deposit, inliers.		4442/41
Hml	*Layered mountains and hills in the basin*	21	287	3.51 Ga +0.06 -0.10 	low	Mountaneous to rolling regions between flat plains exhibiting stepped slopes.	Outliers or inliers, eroded layered basin deposits formed by horizontal sedimentation. Outcrops differentially eroded or blanket showing solifluction terraces. May be similar to the layers of “e” .	 	4466/21
				CHANNEL MATERIALS					
cm	*Channel-related materials*	4 82 135	255 45 50	Combined age (large craters): 3.5 Ga +0.1 -0.8 0.93 Ga +0.09 -0.09 Combined age (small craters) 1.0 Ga +0.1 -0.1		Channel, and channel belt materials, terminal and overbank deposits	Fluvial deposits		4920/152
				DATED INDIVIDUAL FEATURES					

CHAN-NELS SYS-TEMS				Combined ages of all channel reaches and deposits likely reflect different evolutions of different reaches. Measurements on small craters.	*Stratigraphy*			*map of the craters counted*	
Navua A*		7 20	106 32	2.2 Ga +0.8 -0.8 0.67 Ga +0.1 -0.1 	Younger than Hpd, AHpb, Hcl35 because it cuts into them. Valleys filled with material from Acl336				653
Navua B*		*2* *3* *11* *84* *5* *13*	*352* *79* *12* *2* *35* *2.8*	*3.6 Ga+0.1-1.0 (background)* 1.6 Ga +0.7 -0.7 0.25 Ga +0.04 -0.04 0.04 Ga +0.003 -0.003 Confluence: 0.73 +0.3 -0.3 0.057 +0.009 -0.009 	Younger than AHpb because it deflects, younger than HclM because it cuts into it. Overlain by Acg2204.				498

Navua C* (All)		10	62	1.3 Ga +0.4 -0.4 	Cuts into Hmib				254
Channel D* (All)		10	52	1.1 Ga +0.3 -0.33 	Cuts into AHpb, Hml, Hmib, AcrP				568
	Robbins crater catalog ID or name			**IMPACT CRATER EJECTA BLANKETS**	*Terrain type (terra [high-land] or basin)*				
HNcl431	28-431	6 29	889 317	3.8 Ga +0.1 -0.1 3.5 Ga +0.0 -0.1	T				4301
Ncl126	21-126	19	621	3.7 Ga +0.1 -0.1	T				3646
Hcl724	28-724	6	679	3.7 Ga +0.1 -0.1	T				871
Hcl346	28-346	11	526	3.7 Ga +0.1 -0.1	B				3674
HclM	Majuro	12	387	3.6 Ga +0.1 -0.1	T				10059/8
Hcl35	28-35	69	348	3.6 Ga +0.0 -0.0	T				17955
AcrP	Poti	30	197	3.29 Ga +0.08 -0.13	B				7585

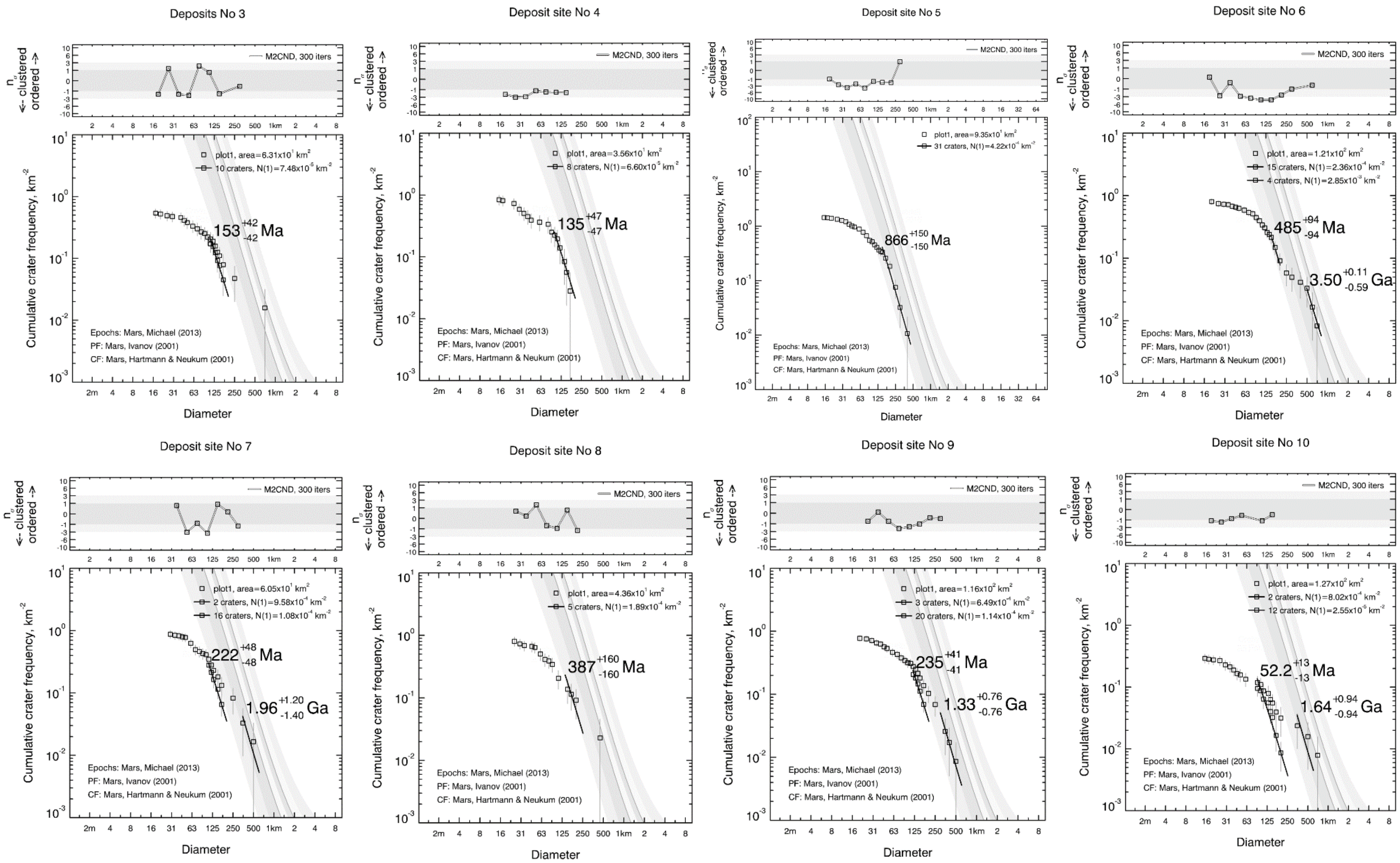
Acl336	28-336	28	128	2.6 Ga +0.4 -0.4	T				8213
Acp1579	28-1579	20	121	2.5 Ga +0.5 -0.5	B				219
Acg1089	28-1089	12	43	0.89 Ga +0.3 -0.3	B				746
Acl475	28-475	8	40	0.83 Ga +0.3 -0.3	B				1890
Acg2204	28-2204	9	8.8	0.18Ga +0.06 -0.06	T				51
CRATER FILLS									
Nf126	21-126	7	1110	3.8 Ga +0.1 -0.1	T				694
HfM	Majuro South	2	270	3.5 Ga +0.1 -2.0	T				291
Af35	21-35	5 48	122 22	2.5 Ga +0.7 -1.0 0.45 Ga +0.06 -0.06	T				1763
AbM	Majuro North	3	3.6	0.075 Ga +0.04 -0.04	T				267
Af76	28-76	15	188	3.30 Ga +0.13 -0.45	B	Crater fill exhibit-ing dense field of mounds			1520

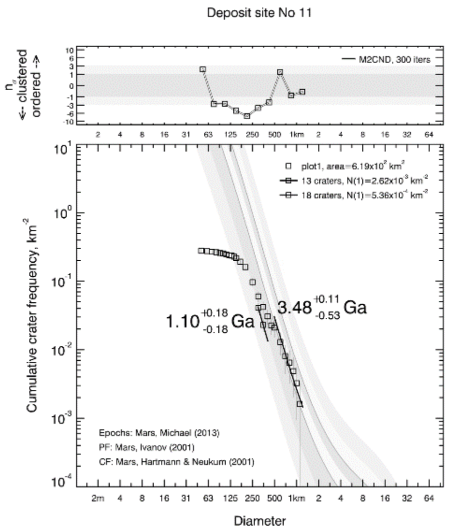
Supporting Table 1. **Characteristics, ages, crater size frequency diagrams and type examples of the geologic units**.

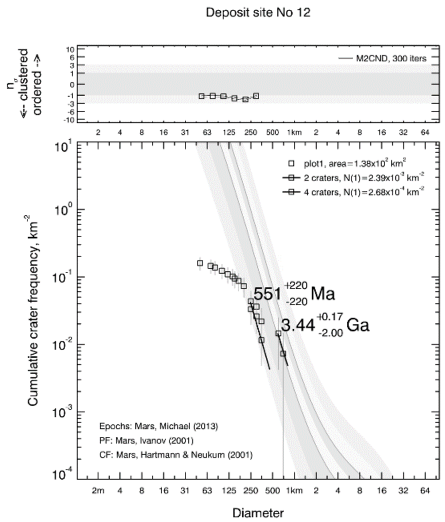
Unit	No (ID)	Area km²	N	N(1) 10^{-5} km²	Formation (Ga)	Error +	Error -	N*resurf*	N(1) *resurf* 10^{-5} km²	Resurfacing age Ga	Error +	Error -
3A--	3	63	10	7.48	0.153	0.42	0.42					
4A-	4	35	8	6.6	0.135	0.47	0.47					
5A-	5	93	31	42	0.866	0.15	0.15					
6A-	6	121	4	285	3.5	0.11	0.59	15	23.6	0.485	0.094	0.094
7A-	7	60	2	95.8	1.96	1.2	1.4	16	10.8	0.222	0.048	0.048
8Ar	8	43	5	18.9	0.387	0.16	0.16					
9Ar	9	116	3	65	1.33	0.76	0.76	20	11	0.235	0.041	0.041
10A+	10	127	2	80	1.64	0.94	0.94	12	2.5	0.052	0.013	0.013
11A++	11	619	13	262	3.48	0.11	0.53	18	53	1.1	0.18	0.18
12A++	12	138	2	239	3.44	0.17	2	4	27	0.551	0.22	0.22
13G++	13	93	25	23	0.469	0.089	0.089					
14E++	14	182	12	24.5	0.503	0.14	0.14					
16B--	16	152	19	16	0.331	0.072	0.072					
18B+r	18	165	2	107	2.2	1.1	1.5	8	18	0.374	0.12	0.12
19B+l	19	122	4	48	1	0.44	0.44	12	11	0.226	0.053	0.053
18-19B+	18-19	215	2	814	3.75	0.09	0.31	1	71	1.47	0.73	0.73
20B+	20		3	6.2	0.12	0.073	0.073					
21B+tr	21	118	4	51	1.04	0.52	0.52	27	8.8	0.181	0.032	0.032
22B++	22	221	21	69	1.42	0.31	0.31					
23B++	23	207	5	67	1.38	0.61	0.61	14	2.3	0.047	0.008	0.008
24B++ss	24	106	5	179	3.26	0.21	1.2					
31C	31	242	5	50	1.0	0.4	0.4					
25D-	25	332	2	64	1.31	0.92	0.92	6	16	0.339	0.11	0.11
26D+	26	968	6	50	1.03	0.39	0.39					

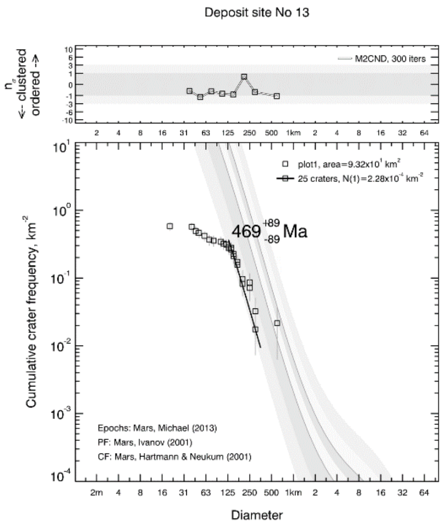
Supporting Table 2. **Channel sequence channel floor model ages** (numbers refer to sequences and deposits marked in FIG. 1). Some sequences were not datable. Unit IDs are composites of site ID (number), drainage system designation (A-G) and Approximate position of site within a system (-- upper, -, mid-dle, + lower middle, ++ lower reaches). r=right branch, l=left branch, s=southern. All ages are in Ga.

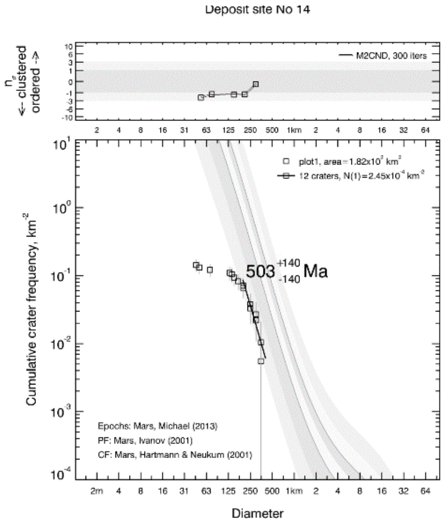
Crater size frequency diagrams of the channel sections (see Fig. 1 for locations of deposit sites)

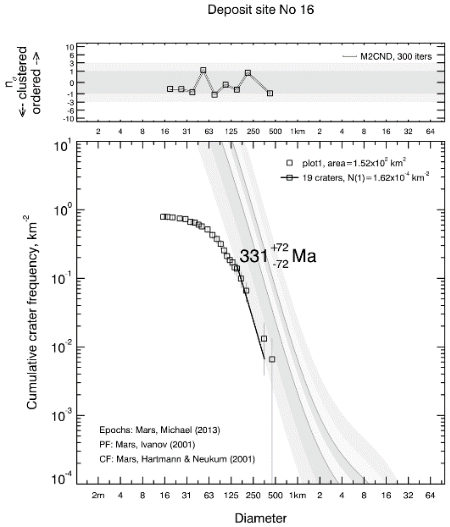


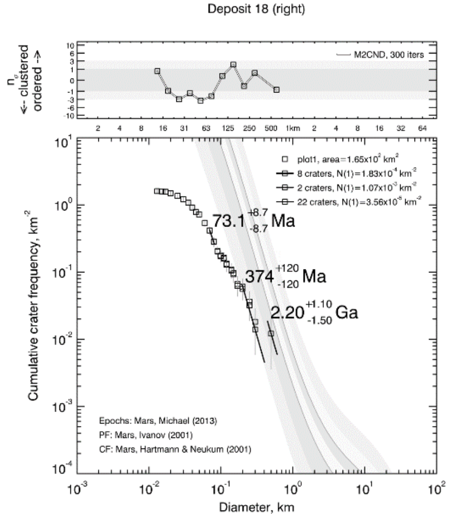

Deposit site No 11
1.10 +0.18 -0.18 Ga
3.48 +0.11 -0.53 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter
Cumulative crater frequency, km⁻²

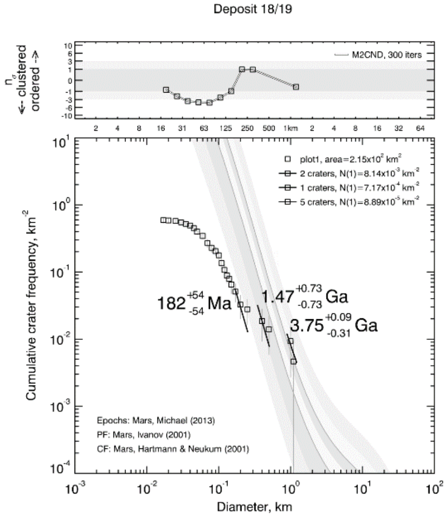

Deposit site No 12
551 +220 -220 Ma
3.44 +0.17 -2.00 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter
Cumulative crater frequency, km⁻²

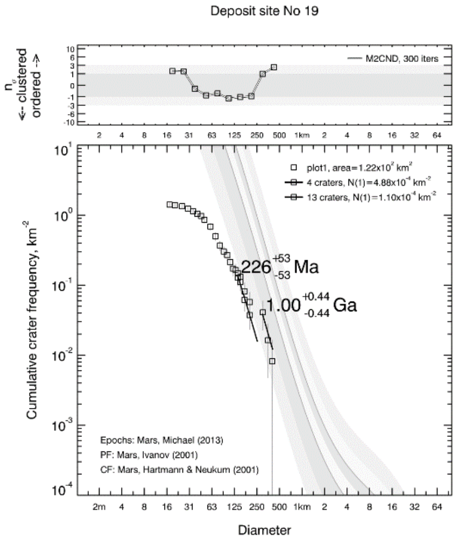

Deposit site No 13
469 +89 -89 Ma
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter
Cumulative crater frequency, km⁻²

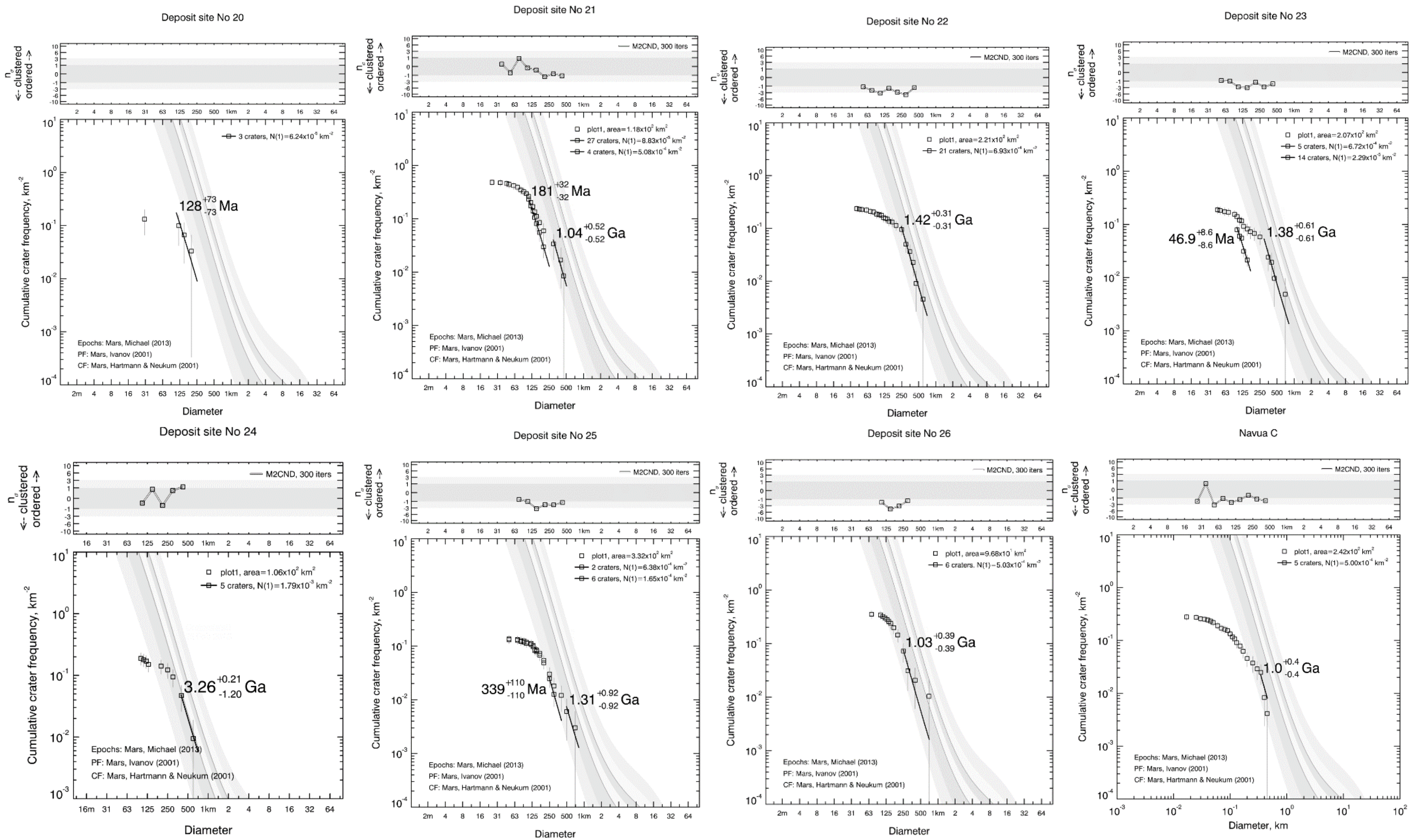

Deposit site No 14
503 +140 -140 Ma
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter
Cumulative crater frequency, km⁻²


Deposit site No 16
331 +72 -72 Ma
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter
Cumulative crater frequency, km⁻²


Deposit 18 (right)
73.1 +8.7 -8.7 Ma
374 +120 -120 Ma
2.20 +1.10 -1.50 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter, km
Cumulative crater frequency, km⁻²


Deposit 18/19
182 +54 -54 Ma
1.47 +0.73 -0.73 Ga
3.75 +0.09 -0.31 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter, km
Cumulative crater frequency, km⁻²


Deposit site No 19
226 +53 -53 Ma
1.00 +0.44 -0.44 Ga
Epochs: Mars, Michael (2013)
PF: Mars, Ivanov (2001)
CF: Mars, Hartmann & Neukum (2001)
Diameter
Cumulative crater frequency, km⁻²



Supporting table 2 – contd. Crater size frequency diagrams of the channel sections.