

THE AGE OF THE CRISIUM IMPACT BASIN. "E0J 0'xcp" fgt "Dqi gt³." J 0'J lguipi gt³." R0'Ur wf ku⁴." M0'F 0'Twp {qp⁷." cpf "D0'Y 0'F gpgxk0³ kpuksww hA' Rrcpvgvni kg." Y guh@uej g"Y kj gm u/Wpkxgtuk@." O Apugt." I gto cp {"xcpf gtdqi gtB wpl'o wgpugt f g="4Nwpc" cpf "Rrcpvc { "kpuksww." WUTC." J qwvqp. "VZ." WUC=" 5Laj pu"J qr nku"Cr r rkgf "Rj { uku"Ncdqtcvqt { ."Nwtgn'0'F ."WUC0

Introduction: "Vj g" nwpct" etevgtkpi "ej tqpqm { "ku" wugf "vq" fgtkxg" cduqmwg" o qf gn'ci gu" *CO Cu+" qh"i gq/ o qtr j qm { le" cpf " utwewtcrn' wplku" hqt" y j lej "pq" f kgev uco r rgu" ctg" cxckrdng"]g0 0"3_0'Vq" ecikdtevg" y j g" ej tq/ pqm { . "U34hrgt" cpf "T { fgt "4223+"]4_ "cpf "U34hrgt" gv'cr0' *4228+"]5_ "uqwi j v'vq" fvgto lpg" y j lej "uco r rgi" ci gu" ctg" dguv' tgrvgtf "vq" egtvclp" nwpct" dculpu. "etevgtu. "cpf" o ctg" wplku0' Ukeg" y j ku" ghhtv. "cf xcpegu" j cxg" dggp" o cf g" kp" dqj " uco r rgi" f cvkpi " vzej pks wgu" cpf " etevgt" uk/ g/ hgs wpe { "f kwtkdwkqp" *EUFH "+" gcuwtgo gpvu. "o qvxc/ kpi "tggpy gf "cvwplvq" vq" dqj " y j g" uco r rgi" eqmgevq" cpf " tgo qvg" ugpukpi " f cv. "kp" cf f kkp" vq" o kuukqp" eqpegr u" cpf "r tqr qucu" hqt" y j g" eqmgevq" cpf kq "kp" ukw" cpcn { uku" qh'ng { "nwpct" rki qm { kgu" *g0 0' Uqwj "Rqng/ Cknrg" dculp"]6.7_ " { qvpi "dcucnu"]8_ " cpf "Etkukwo IP gevtku" ko r cev' o gnu"]9_ 0' Gcej "uco r rgi" v'cev' dg" r cktgf "y kj " eqttg/ ur qpf kpi "EUFH" o gcuwtgo gpvu' ecp' dg' wugf "vq" ko r tqxg" y j g" nwpct" etevgtkpi "ej tqpqm { ." cu" y gm' cu' ku" cr r rkec/ vq" vq" f cvkpi "qj gt" Uqnt "U { ugo "dqf kgu0'

Crisium Basin: "Hci o gpvu" qh' Etkukwo "ko r cev' o gnu" o c { "j cxg" dggp" eqmgevgtf "d { " y j g" Nwpc "42" uco r rgi" tgwtp" o kuukqp. " y j lej " { lgrf gf " c" hgrf ur cvj le. " MF GGR/ r qqt" uco r rgi" y kj "c" tcf kqo gvte" ci g" qh' 50 ; 702039 "I c"]: _0' Gctnrgt "tcf kqo gvte" cpcn { ugu' uwi i guvgf "cp" ci g" qh' 50 6" I c" hqt "Etkukwo "]: /33_0' J qy gxgt. "dcugf" qp" eqo r quk' vqpcn' eqpukf gtevkpu. "Uy kpf rg" gv'cr0']: _cti vg" v'v' y j g" Nwpc "42" uco r rgi" y j g" cpcn { gf "ku" o qtg" rknrg" vq" tgr t/ ugpv' Etkukwo " y j cp" y j g" qj gt u0' Tgegpv { "wr f cvgtf "Cr qm { 39" uco r rgi" ci gu. " lpgvtrtvgf " d { "]34_ " vq" tgr tguvpv' Etkukwo . "tci g' hqo " 50 : "vq" 50 5 "I c"]34_0'

Dcugf "qp" utevki ter j le "tgrvqpuj kr u. "Y kj gm u"]: _ r tqr qugf " y j cv' Ugtgpkevku" ku" { qvpi gt " y j cp" Etkukwo . " y j lej " y qwr "ugv' y j g" o loko wo "ci g' hqt "Etkukwo " vq" i tgcvt gt " y j cp" y j g" r tqr qugf "ci g' qh' Ugtgpkevku" <50 902034 "I c"]35_ "qt" 50 470206: "I c"]34_0' J qy gxgt. "o qtg" tgegpv' y qtni' dcugf "qp" utevki ter j le "tgrvqpuj kr u" cpf " j ki j gt" qdugtxgf " etevgt " f gpukkgu" cv' Ugtgpkevku"]36/38_ " lpf k' ecvgu" y j cv' Ugtgpkevku" ku" qrf gt " y j cp" Etkukwo . "eqpukv' y kj " Dcrf y lpa" etevgt " eqwv' cpf " tko " j gli j v' qdugtxc/ vqpu"]39.3: _0' Vj ku" eqwrf "ko r n { " y j cv' y j g" Ugtgpkevku" ci g" ku" c" o czko wo " hqt " y j g" ci g' qh' Etkukwo " j y gxgt. "Ur wf ku" gv'cr0']36_ "cti vg" y j cv' y j g" uco r rgi" ci gu" cuuqekvgtf " y kj " Ugtgpkevku" eqwrf " tgr tguvpv' c" f hhtgtpv' ko r cev' dculp0' kpf ggf. "Qti gn' gv'cr0']38_ " tgr qtv' cp' CO C " hqt " Ugtgpkevku" qh' 6044- 20249/20255 "I c. " y j lej "ku" o wej "qrf gt" y j cp" y j g" r tqr qugf " Ugtgpkevku" uco r rgu0' Cu" uvej. " eqo r ct kuqpu" y kj " Ugtgpkevku" uco r rgi" ci gu" f q" pqv' ckl "lp" eqpuctkplpi " y j g" ci g' qh' Etkukwo 0'

EUFH u"o gcuwtgf "cv' Etkukwo "i kxg" c" tci g' qh' ci gu0' P gvwmo "]3; _ " tgr qtvgtf " etevgt " f gpukkgu" y j cv' { lgrf " cp" CO C " qh' 50 ; "I c" wukpi " j ku" 3; : 5 " ej tqpqm { " hwpvqrp. " y j kg" Qti gn' gv'cr0']38_ " tgr qtv' cp" ci g' qh' 6029- 20238/ 2023: "I c" hqo " y j g" etevgt " tko " cpf " glgevc. " wukpi " c" o qf / gtp" dwhtgtf " pqp/ ur ctugppuu" eqttgevqrp" hqt " EUFH " o gcuwtgo gpvu' cpf " y j g' 4223 " ej tqpqm { " hwpvqrp" qh']3_0' Dqj " ci gu" ctg" uqo gy j cv' qrf gt " y j cp" y j g" uco r rgi" ci gu" cuuqekvgtf " y kj " Etkukwo 0'

Tgegpv' i gqmi kcn'o cr r kpi "kf gpv' hgtf " r quukrg" tgo / pcpw' qh' y j g' Etkukwo " dculp" ko r cev' o gnu' u' j ggv' dcugf " qp"

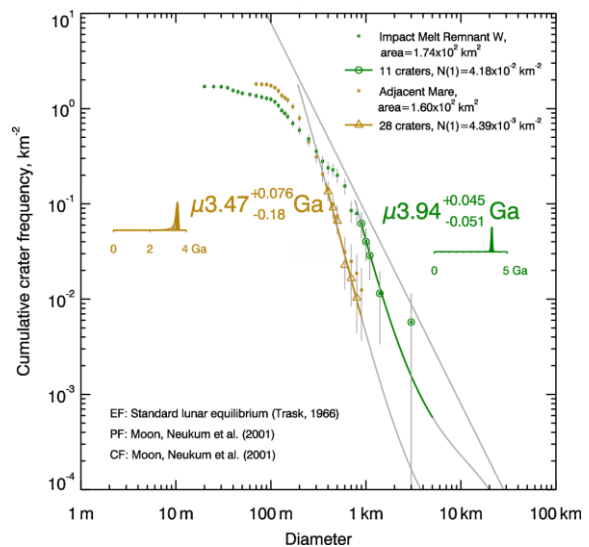
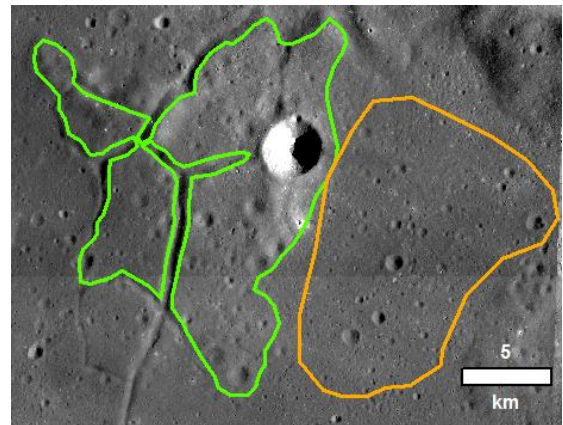


Figure 1. Count areas and corresponding fitted CSFDs for the most prominent proposed melt exposure of Spudis and Sliz [20] (green, 3.94 Ga) and adjacent mare basalt (orange, 3.47 Ga) in western Crisium basin (SELENE TC mosaic)."

vj gk"o qtr j qmji { "cpf "eqo r qukkqp"]42_0'Uqo g"qh"vj g" r tqr qugf "o gm'gZR quwtgu"gzj kdk'etcengf"cpf "hkuwtgf" o qtr j qmji kgu. "eqpukvgpv"y kj "vj qug"cv'dqj "ht guj "etc/ vgtu" *g0 0"V{ej q"cpf "Mkpi "etcvgtu"]43_+ "cpf "qrf gt"ko / r cev' o gnu" *g0 0"Qtlgpvcrg"]; .44_+ "cpf "uj qy "go dc{/ o gpv' d{ "uwdugs wgpv' o ctg' dcucn' hqy u"]42.45_0' Vj gk" eqo r qukkqp. "f gvgto kpgf "htqo "Ergo gpvkg" f cv. "kpf k' ecvg"vj cv'vj g{ "j cxg"rgu" HgQ " *c: 05'y v0 " + "vj cp"vj g' uwt/ tqwpf kpi "dcucn" *@7"y v0 " + "cpf "j k j rpf u'r { tqzgpq" eqo r qukkqp. "cvgukpi "vq"vj gk" chhpkv{ "vq" npxct "j k j / rpf u'o cvgtkcn"]45_0'

Our Study: "Y g" gZCO kpgf "vj g" r tqr qugf "ko r cev' o gm'gZR quwtgu. "cu'y gm'cu'cf lcegpv' o ctg' dcucn. "wukpi " EUHF "o gcuwtgo gpw"vq" gZR cpf "qwt" wpf gtucvcpf kpi "qh" vj g"ci g"qh"vj g" Etkukwo "dcukp"cpf "ku'r qukkqp"kp"vj g"dc/ ukp"ej tqppmji { 0'Y g" wugf "Mci w{c "Vgttckp" Eco gtc " *VE+]46_ "cpf "Npxct" Tgeppckupeg" Qtdkgt "Y kf g" Cpi rg" *Y CE+ "cpf "Pcttqy "Cpi rg" Eco gtc " *PCE+ "]47_ "f cvc" hqt "qwt" o gcuwtgo gpw"cpf "hk'vj g" EUHF u'y kj "vj g" r tq/ f wevkp"cpf "ej tqppmji { "hmpvku"qh"]3_ "wukpi "Rqkuuq" v0 kpi "cpn{uku"]48_ " *Fig. 1-0'

Results and Discussion: "Y j gp" gZCO kpgf "cv' UGNPG "VE"cpf "NTQE" PCE "tguqmwkpu. "uqo g"qh"vj g" r qukkrg" o gm' tgo pcpw' cr r gct "vq" dg" ugeqpf ct { "etcvgt" hgrf u' dcugf "qp"vj g" r tgupeg" qh' etcvgt "ej ckpu"cpf "j gt/ tkpi dqpg" r cvgtpu' Vj gug" ugeqpf ctkgu" r tguwo cdn{ "f g/ r quksf" o qtg' hgnle" o cvgtkcn" qp "O ctg" Etkukwo { "lgrf kpi " c" mpy gt "qxgtcm" HgQ " eqpvgp' Uqo g" qj gt "gZR quwtgu" j cxg" r qukkxg" tgrgh" dw' f q' pqv' gZj kdk' ko r cev' o gm' o qtr j qmji kgu' Qpg" ctgc" kp" uqwj gtp" Etkukwo "o c{ "dg" r ctv'qh'ep" go dc{ gf "etcvgt" tko. "dw'qj gt" ctgcu'eqwf "dg" o gi cdmem' qh' Etkukwo "dcugo gpv' o cvgtkcn. "uko krt"vq" vj g" tqvcvqf "eqwpt { / tqemlo gi cdmem' qdugt xgf "dgy ggp" vj g" kppgt" cpf "qwtg" tkpi u' qh' vj g" vgt gwtkcn' Tkgu" etcvgt"]49_0' Vj gug" o gi cdmem' gZR quwtgu" eqwf "pXgt vj grguu" gZj kdk' c" tguv' etcvgt" r qr wv'vqp" eqpukvgpv" y kj "vj g" v0 kpi "qh"vj g" Etkukwo "ko r cev' J qy gxgt. "vj gk" twi i gf" vqr qi tcr j { "o cngu" kv' f hkwv"vq" ko r qukkrg" vq" f ghkg" tqdww' eqwv' ctgcu' Wukpi "dqj " tcf kkpvcn" cpf "dwhgtgf" etcvgt "eqwv" *DEE+ "vgej plk wgu. "y g" y gtg" qpn{ "cdrg"vq" f gtxg" r qqtqf "eqpuctkpgf" ci gu. "y j lej" ctg' uko krt "vq"vj g" 609' I c" ci g" f gvgto kpgf "d{ "Qti gn'gv'cn0"]38_0' Wphqt w' pcvgn{. "qwt" gttqt "dctu" ctg" o vej "rti gt" vj cp' kp"]38_ "f vq" vq"vj g' uo cmgt" pwo dgtu' qh' etcvgtu' kp" qwt' f cvugv'0'

Vj g" rti guv' cpf "o quv" r tqo kpgpv' qh' vj g" r tqr qugf " o gm' f gr quku' kf gpv' hkgf "d{ "Ur wf ku" cpf "Urk"]42_ " { lgrf u' cp" CO C "qh" 5Q 60207' I c" *Fig. 1-0' Vj ku' ci g" ku' qrf gt" vj cp" vj g" qrf guv' o gcuwtgf "o ctg" vpk' cuuqekcvqf "y kj" Etkukwo " *509' I c" + "cu' f cvqf "d{ "J kguipi gt" gv'cn0"]4_ " qp" vj g" Y CE "o quck0' Y g" cmq' f gvgto kpgf "cp" CO C "qh" 5069' I c" hqt "vj g" o ctg' vpk' cf lcegpv' vq" vj g" r tqr qugf "o gm' f g/ r quku' y j lej "hcmu" kpq' vj g' tci g" qh' ci gu' f gvgto kpgf "hqt" qj gt" o ctg' dcucn' kp' Etkukwo "]4_ " 0Cp' ci g" qh' 5Q 6' I c" ku' qp" vj g" qrf "ukf g" qh' vj g" w' f cvqf "tcf kqo gvtle" ci gu' f g/

tkxgf "htqo "uco r ngu"vj qwi j v'vq" qtki kpcvq' htqo " Etkukwo 0' J qy gxgt. "vj gug" uco r ng" ci gu' cpf "qwt" tguwn' ctg" { "qwi gt" vj cp" vj qug' f gtxgf "d{ "qj gt" y qtngtu' xlc" etcvgt "ucv'kueu"]38.3; 01 kxgp' vj g" gZR quwtgu' o qtr j qmji lecn' chhpkv{ "vq" hqqt/ htcewgtf "etcvgtu" cpf "qxgtr tkpvkpi "d{ "glgevc" htqo " vj g" etcvgt "Rtqenwu"]4; _ "eqo dlpgf "y kj "ku" { "qwi gt" ci g" eqo r ctgf "y kj "vj g" CO Cu" f gvgto kpgf "qp" vj g" glgevc" drp'ngv' "k'ku" r qukkrg" vj cv'vj ku' gZR quwtg' tgr tguv' vj g" hku' xqrecpkuo "kp" Etkukwo "dcukp. "tcj gt" vj cp' cp' ko r cev' o gm' vpk'0' Cngt pcvgn{. "vj gt" o c{ "dg" c" o gej cpkuo. "uwej " cu" vti gv' r tqr gtv{ "qt" ugrh' ugeqpf ct { "etcvgtkpi " ghgevu. " vj cv' ecwugu' vj g" glgevc/ dcugf "ci gu' vq' dg" qrf gt' vj cp' o gm' dcugf "ci gu"]52.53_ "

Conclusions and Implications: I kxgp' vj g" wpegt/ vckpv{ "kp" qwt "o gcuwtgo gpw" qp" vj g" o gi cdmem' rknq" gZ/ r quwtgu. "cpf "vj g" r qukkrg" vj cv'vj g' y gvgtpo quv' gZR q/ uwtg' o ki j v' tgr tguv' r quv' dcukp' xqrecpkuo. "y g' ecp' eqp/ utckp" vj g" ci g" qh' vj g" Etkukwo "dcukp" vq" >5Q 6' I c"]y ku' y qtm' cpf "0609' I c"]38_ "wukpi " EUHF "o gcuwtgo gpw'0'

Qwt "y qtn' kmwv' cvgu" cp' guugv' kcn' ergo gpv' qh' uco r ng" uksg" ugrge'vqp" hqt "npxct" ej tqppmji { "o kuukpu'0' P qv' qpn{ "uj qwf "vj g" rpf kpi "uksg" j cxg" vj g" i tgcvgv' r qukkrg" { "qh" r tqxkf kpi "vj g" f guktgf "uco r ng. "dw' kv' cmq" uj qwf "gp/ eqo r cuu' cp" ctgc" vj cv' o ggw' EUHF "o gcuwtgo gpv' tg/ svktgo gpw" vq" r tqxkf g" c" o gcpkpi hwi' eckd' cvkq" r qkpv' hqt "vj g" npxct" etcvgtkpi "ej tqppmji { 0' Y j gp" gxcn' cvkpi " r qv' gv' kcn' rpf kpi "uksg. " EUHF "o gcuwtgo gpw' ecp" r tq/ xkf g" xcn' cdng" kphqto cvkq" cdqw" uksg" xlc' dkrk' 0' I kxgp" vj g' wpegt' vckpv' vj cv' tgo clp' hqt "f gvgto kpkpi "vj g" ci g" qh' vj g" Etkukwo "dcukp" xlc' vj g' ewt' gpv' uco r ng' eqmge'vqp" cpf " EUHF "o gcuwtgo gpw. "dqj "tgwtpgf" qt "kp" ukw' uco r ng" cpen{uku' htqo "c" y gm' f ghkgf "rpf kpi "uksg" y qwf "dg" xcn' vcdng" hqt "dgwgt" eqpuctkpkpi "Etkukwo ai' ci g" cpf "tghkpkpi " ku' r qukkqp" kp" vj g' npxct "dcukp" ugs wpeg'0'

References: "]3_ " P gwmo " gv' cn0" *4223+ "Space Sci Rev"; 8. "770"]4_ " U0' hnt" cpf "T { f gt" *4223+ "Space Sci Rev"; 8. "0"]5_ " U0' hnt" gv' cn0" *4228+ "New Views of the Moon, Rev Min Geochem 82. "73; 0"]6_ " lqmh" gv' cn0" *4232+ "LEAG Meeting. "52940"]7_ " lqmh" gv' cn0" *4239+ "LPSC 48. "35220"]8_ " Ncy tpep" gv' cn0" *4235+ "LEAG Meeting. "926; 0"]9_ " Eqj gp" gv' cn0" *423; + "LPSC 490"; _ " Uy kpf rg" gv' cn0" *3; ; 3+ "PLPSC 43. "3890"; _ " Y kj gm u" *3; ; 9+ "USGS Prof Pap 3268/C. "93" rr 0"]32_ " Ectf qi cp" cpf "Vwtpgt" *3; 99+ "Phil Trans R Soc London" C4; 6. "3890"]33_ " F gwuej " cpf "U0' hnt" *3; ; 9+ "GCA 73. "3; 730"]34_ " Uej o kv' gv' cn0" *4239+ "Icarus 298. "40"]35_ " Rqf qum' gv' cn0" *3; 95+ I EC" 59. " : 90"]36_ " Ur wf ku' gv' cn0" *4233+ "I T" 338. "320824; 4233IG225; 250"]37_ " Hcuugw" gv' cn0" *4234+ "JGR" 339. "320824; 4233IG225; 730"]38_ " Qti gn' gv' cn0" *423; + "JGR. "revised"]39_ " Dcrf y kp" *3; ; 9+ " kctwu" 93. "30"]3; _ " Dcrf / y kp" *3; ; 9+ " kctwu" 93. "3; /4; 0"]3; _ " P gwmo " *3; ; 5+ "NASA TM-77558. " 375" rr 0"]42_ " Ur wf ku' cpf "Urk" *4239+ "GRL. "32082242381 N29364; 0"]43_ " J qy ctf "cpf "Y knj kg" *3; 97+ "J Res USGS" 5. "4590"]44_ " Ueqw' gv' cn0" *3; 9; + "USGS Map" K32560"]45_ " Urk" cpf "Ur wf ku" *4238+ "LPSC" 69. "389; 0"]46_ " J ctw{co c' gv' cn0" *422; + "Earth Planet Space 60. "465"]47_ " Tqdkpuq" gv' cn0" *4232+ "Space Sci Rev" 150. " : 30"]48_ " O lej cgn' gv' cn0" *4238+ "Icarus" 499. "49; 0"]49_ " Uwto " gv' cn0" *4236+ "MAPS 50. "3630"]4; _ " J kguipi gt" gv' cn0" *4233+ "LPSC 42. "439; 0"]4; _ " Tvp {qp" gv' cn0" *423; + "LPSC 49. "37580"]52_ " xcp' f gt" Dqi gt' gv' cn0" *4239+ "Icarus 298. "6; 0"]53_ " cpgw' gv' cn0" *4239+ "Icarus 298. "860'