

MENG-HUA ZHU

Curriculum Vitae

Professor | Vice Director | Space Science Institute/State Key Laboratory of Lunar and Planetary Sciences | Macau University of Science and Technology | Avenue Wai Long, Macau

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Education

Ph.D. Information Science

2010 - Macau University of Science and Technology, Macau

M.S. Artificial Intelligence and Pattern Recognition

2006 - Wuyi University, China

B.S. Computer Science

2003 - National University of Defense Technology, China

Employment

Space Science Institute/State Key Laboratory of Lunar and Planetary Sciences, Macau University of Science and Technology

2022.07 – Present Full Professor, Vice Director

2019.07 – 2022.06 Associate Professor

2012.07 – 2019.06 Assistant Professor

2010.10 – 2012.06 Postdoctoral Fellow

2010.03 – 2010.09 Research Assistant

Center for Excellence in Comparative Planetology, Chinese Academy of Sciences

2019.01 – 2020.12 Professor

Museum für Naturkunde, Berlin

2012 – 2019 Visiting Scientist (summer)

Purple Mountain Observatory, China

2011.01 – 2012.06 Visiting Postdoctoral Fellow

Waseda University, Japan

2010.01 – 2010.03 Visiting Student

Teaching

- MSEZ05 *Numerical Methods* (Autumn, 2016-2021, *Masters level*)
- MSEE04 *Methods of Mathematical Physics* (Autumn, 2018-2020, *Masters level*)
- GLA001 *Linear Algebra* (Autumn, 2017, *Undergraduate level*)

- *General Physics Experiment (Autumn, 2015, Undergraduate level)*

Research Interests

- Moon's formation and evolutionary history
- Impact cratering process on planetary surface (*observations and numerical simulations*)
- Late accretion history of terrestrial planets (*numerical simulations with constraints by highly siderophile elements and other tracers*)
- Lunar and planetary remote sensing observation (*in particular on X-ray/gamma-ray, neutron, hyper-spectroscopy*)

Research Experiences

- *Scientist*, Geochemical analysis of Chang'E-5 lunar sample (100 mg), 2021 – 2023.
- *Participating scientist*, Substructure analysis of China's Tianwen-1 mission, 2019- .
- *Participating scientist*, Mineral analysis of China's Chang'E-4 mission, 2018- .
- *Participating scientist*, TRR170 Late accretion onto terrestrial planets (LATP), 2016.07-2016.12
- *Participating scientist*, Multidisciplinary experimental and modeling impact research network (MEMIN), 2015.07-2015.12.
- *Participating scientist*, Mineral and element analysis of China's Chang'E-3 observation, 2013-2015.
- *Participating scientist*, Data processing and analysis of China's Chang'E-2 observation, 2010-2012.
- *Co-investigator*, Gamma-ray spectrometer for China's Chang'E-2 lunar mission, 2008-2010.
- *Team member*, Data processing and analysis for Chang'E-1 gamma-ray observation, 2008-2011.
- *Team member*, Gamma-ray spectrometer for China's Chang'E-1 lunar mission, 2006-2007.

Research Gants

(a) Principle Investigator

- (1). Late accretion of terrestrial planets. *Science and Technology Development Fund of Macau*, 2023-2026, MOP 2,846,000.
- (2). The hyper-velocity impact facilities, *Science and Technology Development Fund of Macau*, 2020-2021, MOP 12,000,000 (*direct support of MOP 5,000,000 from FDCT and direct support of MOP 7,000,000 from laboratory operating expenses).
- (3). High-speed observation aids (camera, flash, lasers etc.) for hyper-velocity impact facilities, *Science and Technology Development Fund of Macau* (laboratory operating expenses), 2021-2023, MOP 3,700,000.
- (4). Effects of early impacts in the solar system on the solidification of lunar magma ocean and the difference of highly siderophile elements between the Earth and the Moon, *Science and Technology Development Fund of Macau*, 2019-2022, MOP 2,189,000.
- (5). The bombardment history of the Moon (RMB 500,000) – *the sub-project of Lunar Magma Ocean and the Giant Impact Hypothesis* (RMB 5,000,000 in total), *Chinese National Space Administration*, (PI: Liping Qin, University of Science and Technology of China), 2020-2023.

- (6). A compositional study of the landing sites of Chang'E-4 and Chang'E-5, *State Key Laboratory in Lunar and Planetary Science, Macau University of Science and Technology*, (Co-I: Hao Zhang, China University of Geosciences (Wuhan)), 2022-2023, MOP 100,000.
- (7). Geochemistry and mineralogy of meteor impact on the Earth, Moon, and Mars, *State Key Laboratory in Lunar and Planetary Science, Macau University of Science and Technology*, (Co-I: Joseph Michalski, University of Hong Kong), 2019-2020, MOP 160,000.
- (8). Research on the gamma ray spectrometer and spectrum analysis methods for the detection of asteroid composition, *National Natural Science Foundation of China*, 2018-2021, RMB 670,000.
- (9). Hydrocode numerical modeling of the impact cratering on the Moon and its application, *Science and Technology Development Fund of Macau*, 2015-2017, MOP 2,666,000.

(b) Co-Investigator

- (1). Mars Shallow subsurface properties of the Moon from multisource radar datasets, *Science and Technology Development Fund of Macau* (PI: Min Ding, MUST), 2021-2024, MOP 1,856,200.
- (2). Shallow subsurface properties of the Moon from multisource radar datasets, *Science and Technology Development Fund of Macau* (PI: Wenzhe Fa, PKU/MUST), 2017-2019, MOP 2,136,200.
- (3). Study of the in-situ reduction of nanophase iron particles by meteorite impacts, *Lunar and Planetary Science Laboratory, Macau University of Science and Technology*, (PI: Yang Li, Institute of geochemistry, CAS), 2017-2018, MOP 50,000.
- (4). Physical properties of cometary nuclei assessed from the development of 67P CG's Activity, *International Space Science Institute*, (PI: Yuri Skorov, Max-Planck Institute for Solar System Research, Germany), 2015-2017.
- (5). Planetary evolution: Moon as a case study of thermal evolution, *German Science Foundation*, (PI: Vera Fernandes, Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung, Germany), 2014-2017, EUR 195,000.
- (6). Origins and physical properties of solar system small bodies, *Science and Technology Development Fund of Macau* (PI: Wing-Huen Ip, National Central University, Taiwan), 2015-2016, MOP 3,046,000.
- (7). Scientific analysis of Chang'E-2 exploration data, *Science and Technology Development Fund of Macau* (PI: Zesheng Tang, Macau University of Science and Technology, Macau), 2014-2017, MOP 2,491,000.
- (8). Investigation of the Moon by using multi-bands data, *Science and Technology Development Fund of Macau* (PI: Aoao Xu, Macau University of Science and Technology, Macau), 2013-2015, MOP 4,895,000.

Publications

(a) Journal papers (peer-reviewed, *corresponding author)

- (1). Chen J. Y., Wang, Y., Zhang, A., Liao, S., Li, S., Sky, B., and **M.-H. Zhu*** (2023), Olivine alteration and merrillite Pb-Pb age in Dong Ujimqin Qi: implications for reheating events on the mesosiderite parent body, *Journal of Geophysical Research: Planets*, 128, e2023JE007954.
- (2). Sun Q. H., W. Fa, **M.-H. Zhu**, and J. Du (2023), Evolution of physical properties of sub-kilometer scale impact craters on the lunar maria, *Research in Astronomy and Astrophysics*, 23, 125001.
- (3). Sun Q. H., W. Fa, **M.-H. Zhu**, and J. Du (2023), Morphological characteristics of impact craters with diameters of 5-20 km on the Moon, *Icarus*, doi:10.1016/j.icarus.2023.115688.
- (4). Hu X. Y., T. Jiang, P. Ma, H. Zhang, P. Lucey, and **M. -H. Zhu** (2023), A spectral library study of mixtures of common lunar minerals and glass. *Remote Sensing*, 15, 2195.
- (5). Ma P., H. Zhang, Y. Yang, T. Jiang, D. Britt, and **M. -H. Zhu** (2023), A laboratory study of the phase ratio imagery method, *Icarus*, 401, 115608.
- (6). Sun, Y., T. Jiang, Y. Zhuang, H. Zhang, D. T. Britt, and **M. -H. Zhu** (2023), A laboratory study of the photometric properties of Mars Global Soil Simulant MGS-1 and its variants, *Planetary and Space Science*, 227, 105639, doi: 10.1016/j.pss.2023.105639.
- (7). Luo, X. Z., **M. -H. Zhu***, and M. Ding (2022), Ejecta patterns from oblique impacts on the Moon – Insights from the numerical simulation, *Journal of Geophysical Research: Planets*, e2022JE007333, doi: 10.1029/2022JE007333. (*corresponding author)
- (8). Xi X. Y., M. Ding, and **M. -H. Zhu** (2022), Groove formation on Phobos from re-impacting orbital ejecta of the Stickney crater, *Earth and Planetary Physics*, doi: 10.26464/epp2022027.
- (9). Gao Y. J. and **M. -H. Zhu*** (2022), Application of the reflectionless discrete perfectly matched layer for acoustic wave simulation. *Frontiers in Earth Science*, doi: 10.3389/feart.2022.883160.
- (10). Gao Y. J., **M. -H. Zhu**, and H. Zhang (2022), Releasing the time step upper bound of CFL stability condition for the acoustic wave equation with model-order reduction. *Frontiers in Earth Science*, doi:10.3389/feart.2022.855015.
- (11). Ding, M. and **M. -H. Zhu*** (2022), Effects of Regional Thermal State on the Crustal Annulus Relaxation of Lunar Large Impact Basins, *Journal of Geophysical Research: Planets*, e2021JE007132, doi: 10.1029/2021JE007132. (*corresponding author)
- (12). Lin X., Z. Zhu, X. Yu, X. Ji, T. Luo, X. Xi, **M. -H. Zhu**, and Y. Y. Liang (2022), Lunar crater detection on digital elevation model: a complete workflow using deep learning, *Remote Sensing*, 14, 621, doi:10.3390/rs14030621.
- (13). Zhang N., M. Ding, **M. -H. Zhu**, H. C. Li, H. Y. Li, and Z. Yue (2022), Lunar compositional asymmetry explained by mantle overturn following the South Pole-Aitken impact, *Nature Geosciences*, 15, 37-41, doi: 10.1038/s41561-021-00872-4. (**Highlighted by Nature**)
- (14). Yang Y. Z., S. Li, **M. -H. Zhu**, Y. Liu, J. Du, W. Fa, R. Xu, Z. He, J. Yang, B. Xue, and Y. Zou (2021), Impact remnants rich in carbonaceous chondrites detected on the Moon by the Chang'e-4 rover, *Nature Astronomy*, doi:10.1038/s41550-021-01530-w.
- (15). **Zhu M. -H.***, A. Morbidelli, W. Neumann, Q. -Z. Yin, J. M. D. Day, D. C. Rubie, G. J. Archer, N. Artemieva, H. Becker, and K. Wünnemann (2021), Vesta reveals common feedstocks of late accretion for the terrestrial planets, *Nature Astronomy*, doi:10.1038/s41550-021-01475-0. (with '**News and Views**' by Simone Marchi) (*corresponding author)
- (16). Liu T., G. Michael, **M. -H. Zhu**, K. Wünnemann (2021), Predicted sources of samples returned from Chang'e-5 landing region, *Geophysical Research Letters*, doi: 10.1029/2021GL092434.

- (17). Gou S., Z. Yue, K. Di, R. Bugiolacchi, **M. -H. Zhu**, P. C. Pinet, and Z. Cai (2021), Mare basalt flooding events surrounding Chang'E-4 landing site as revealed by Zhinyu crater ejecta, *Icarus*, 360, 114370, doi:10.1016/j.icarus.2021.114370.
- (18). Jiang T., X. Y. Hu, H. Zhang, P. Ma, C. Li, X. Ren, B. Liu, D. Liu, J. Yang, B. Xue, W. Jin, **M. -H. Zhu**, C. Huang, and H. Lin (2021), *In-situ* lunar phase curves measured by Chang'E-4 in Von Karman crater, South Pole-Aitken Basin, *Astronomy&Astrophysics*, 646, A2, doi:10.1051/0004-6361/202039252.
- (19). Zhang J[‡], B. Zhou[‡], Y. Lin, **M. -H. Zhu[‡]**, H. Song, Z. Dong, Y. Gao, K. Di, W. Yang, H. Lin, J. Yang, E. Liu, L. Wang, Y. Lin, C. Li, Z. Yue, Z. Yao, and Z. Ouyang (2020), The regolith thickness and subsurface structure of Von Karman crater in South Pole-Aitken basin probed by the lunar rover Yutu-2, *Nature Astronomy*, doi:10.1038/s41550-020-1197-x. ([‡] **Equal contribution to this work**)
- (20). Ma P., Y. Sun, **M. -H. Zhu**, Y. Z. Yang, X. Hu, T. Jiang, H. Zhang, P. G. Lucey, C. Li, R. Xu, Z. He, C. Huang, and H. Lin (2020), A plagioclase-rich rock measured by Yutu-2 rover in Von Karman crater on the farside of the Moon, *Icarus*, 350, 113901, doi:10.1016/j.icarus.2020.113901.
- (21). Lin H. L., Z. P. He, W. Yang, Y. T. Lin, R. Xu, C. Zhang, **M. -H. Zhu**, R. Chang, J. H. Zhang, C. Li, H. Lin, Y. Liu, S. Gou, Y. Wei, S. Hu, C. Xue, J. Yang, J. Zhong, X. Fu, W. Wan, and Y. Zou (2020), Olivine-norite rock detected by the lunar rover Yutu-2 likely crystallized from the SPA impact melt pool, *National Science Review*, 7, 913-920, doi:10.1093/nsr/nwz183.
- (22). Di K., **M. -H. Zhu**, Z. Yue, Y. Lin, W. Wan, Z. Liu, S. Gou, B. Liu, M. Peng, Y. Wang, S. Niu, J. Zhang, J. Li, J. Xie, L. Xi, J. Yang, and B. Xue (2019), Topographic evolution of Von Karman crater revealed by the lunar rover Yutu-2, 2019, *Geophysical Research Letters*, 46, 12,764-12,770, doi:10.1029/2019GL085252 (**Paper on Front Cover of Journal**)
- (23). Du J. W. Z. Fa, M. Wicczorek, M. G. Xie, Y. Z. Cai, and **M. -H. Zhu** (2019), Thickness of lunar mare basalts: new results based on modeling the degradation of partially buried craters, *Journal of Geophysical Research: Planets*, 124, 2,430-2,459, doi:10.1029/2018JE005872.
- (24). Hu X. Y., P. Ma, Y. Z. Yang, **M. -H. Zhu**, T. Jiang, L. Z. Sun, H. Zhang, P. G. Lucey, C. L. Li, R. Xu, Z. P. He, H. Y. Lin, and C. N. Huang (2019), Mineral abundances inferred from reflectance measurements of Chang'E-4 landing site in South Pole-Aitken basin, *Geophysical Research Letters*, 46,9,439-9,447, doi: 10.1029/2019GL084531 (**Featured Article of Journal**)
- (25). **Zhu M. -H.***, N. Artemieva, A. Morbidelli, Q. -Z. Yin, K. Wünnemann, and H. Becker (2019), Reconstructing the late accretion history of the Moon, *Nature*, 571, 226-229, doi:10.1038/s41586-019-1359-0 (with '**News and Views**' by James Day). (*corresponding author)
- (26). Zhang X. Y. and **M. -H. Zhu**, R. Bugiolacchi (2019), Mafic minerals of the South Pole-Aitken basin, *Journal of Geophysical Research: Planets*, 124, 1,581-1,591, doi:10.1029/2018JE005870.
- (27). Zhong Z., G. Yan, S. G. Jin, **M. -H. Zhu**, J. Alexis, P. Rodriguez, H. Q. Zhu, and Y. Li (2019), Selenophysical parameter inversion in the lunar southern hemisphere highlands based on mutant particle swarm optimization, *Physics of the Earth and Planetary Interior*, 292, 55-66, doi: 10.1016/j.pepi.2019.05.001.
- (28). **Zhu M. -H.***, K. Wünnemann, R. W. K. Potter, T. Kleine, and A. Morbidelli (2019), Forming the Moon's nearside-farside dichotomies via giant impact, *Journal of Geophysical Research: Planets*, 124, 2,117-2,140, doi: 10.1029/2018JE005826 (**Featured Article and Paper on Front Cover of Journal**). (*corresponding author)

- (29). **Zhu M. -H.***, J. Chang, T. Ma (2019), Thorium distribution on the Moon: new insights from Chang'E-2 Gamma-ray Spectrometer, *Research in Astronomy and Astrophysics*, 19 (6), 76, doi:10.1088/1674-4527/19/6/76. (*corresponding author)
- (30). Zhang F. and **M. -H. Zhu**, et al. (2018), Diversity of basaltic lunar volcanism associated with buried impact structures: Implications for intrusive and extrusive events, *Icarus*, 307, 216-234, doi:10.1016/j.icarus.2017.10.039.
- (31). Luther R., **M. -H. Zhu**, G. Collions, and K. Wünnemann (2018), The effect of target properties on ejection dynamics and ejecta deposition, *Meteoritics and Planetary Science*, 53, 1,705-1,732, doi:10.1111/maps.13143.
- (32). **Zhu M. -H.***, K. Wünnemann, and N. Artemieva (2017), Target's thermal effect on the ejecta thickness distribution of large-scale impact basins on the Moon, *Geophysical Research Letters*, 44, 11,292-11,300, doi: 10.1002/2017GL075405. (*corresponding author)
- (33). Xie M. G. and **M. -H. Zhu***, et al. (2017), Effect of topography degradation on crater size-frequency distributions: Implications for populations of small craters and age dating, *Geophysical Research Letters*, 44, 10,171-10,179, doi:10.1002/2017GL075298. (*corresponding author)
- (34). Zhang F., J. Head, A. Bazilevskiy, R. Bugiolacchi, G. Komatsu, L. Wilson, W. Fa, and **M. -H. Zhu** (2017), Ring-moat dome structures: a newly discovered stratigraphically young features in the lunar maria, *Geophysical Research Letters*, 44, 9,216-9,224, doi: 10.1002/2017GL074416.
- (35). Xu X. M., T. Kenkmann, Z. Xiao, S. Sturm, N. Metzger, Y. Yang, D. Weimer, H. Krietsch, and **M. -H. Zhu** (2017), Reconnaissance survey of the Duolun ring structure in Inner Mongolia: Not an impact structure, *Meteoritics and Planetary Science*, doi:10.1111/maps.12890.
- (36). Rolf T., **M. -H. Zhu**, Wünnemann, and S. W. Werner (2017), The role of impact bombardment history in lunar evolution, *Icarus*, 286, 138-152, doi: 10.1016/j.icarus. 2016.10.007.
- (37). **Zhu M. -H.*** (2016), On estimating the background of the remote sensing gamma ray spectroscopic data, *Nuclear Instruments and Methods in Physics Research A*, 832, 259-263, doi: 10.1016/j.nima.2016.06.134. (*corresponding author)
- (38). Wünnemann K., **M. -H. Zhu**, and D. Stöffler (2016), Crater formation, shock metamorphism, and ejecta distribution in laboratory experiments and modeling, *Meteoritics and Planetary Science*, 51, 1,762-1,794, doi:10.1111/maps.12710.
- (39). Zhang F. and **M. -H. Zhu**, and Y. L. Zou (2016), Late stage Imbrium volcanism on the Moon: Evidence for two source regions and implications for the thermal history of Mare Imbrium, *Earth and Planetary Science Letters*, 445, 13-27, doi: 10.1016/j.epsl.2016.04. 003.
- (40). Xie M. G. and **M. -H. Zhu*** (2016), Estimates of primary ejecta and local material for the Orientale basin: Implications for the formation and ballistic sedimentation of multi-ring basins, *Earth and Planetary Science Letters*, 440, 71-80, doi: 10.1016/j.epsl.2016.02.012. (*corresponding author)
- (41). Dong W., X. P. Zhang, **M. -H. Zhu**, A. Xu, and Z. Tang (2016), Global Mg/Si and Al/Si distribution on lunar surface derived from Chang'E-2 X-ray spectrometer, *Research in Astronomy and Astrophysics*, 16, 004, doi:10.1088/1647-4527/16/1/004.
- (42). **Zhu M. -H.***, K. Wünnemann, R. Potter (2015), Numerical modeling of the ejecta distribution and formation of the Orientale basin on the Moon, *Journal of Geophysical Research: Planets*, 120, 2,118-2,134, doi:10.1002/2015JE004827. (*corresponding author)

- (43). Fa W., **M. -H. Zhu**, T. T. Liu, J. Plescia (2015), Regolith stratigraphy at the Chang'E-3 landing site as seen by Lunar Penetrating Radar, *Geophysical Research Letters*, 42, 10,179-10,187, doi:10.1002/2015GL066537.
- (44). Jin W. D., H. Zhang, Y Yuan, Y. Z. Yang, Y. G. Shkuratov, P. G. Lucey, V. G. Kaydash, **M. -H. Zhu**, B. Xue, K. C. Di, B. Xu, W. H. Wan, L. Xiao, and Z. W. Wang (2015), In situ optical measurements of Chang'E-3 landing site in Mare Imbrium: 2. Photometric properties of the regolith, *Geophysical Research Letters*, 42, 8,312–8,319, doi:10.1002/2015GL065789.
- (45). Zhang H., Y. Z. Yang, Y. Yuan, W. D. Jin, P. G. Lucey, **M. -H. Zhu**, V. Kaydash, Y. Shkuratov, K. C. Di, W. H. Wan, B. Xu, L. Xiao, Z. W. Wang, B. Xue (2015), In-site optical measurements of Chang'E-3 landing site in Mare Imbrium: 1. Mineral abundances inferred from spectral reflectance, *Geophysical Research Letters*, 42, 6,945–6,950, doi:10.1002/2015 GL065273. **(Paper on Front Cover of Journal)**
- (46). **Zhu M. -H.***, J. Chang, M. G. Xie, J. Fritz, V. Fernandes, W. H. Ip, T. Ma, A. A. Xu (2015), The unique source of re-surfaced deposits in Mare Orientale: Radioactive elemental evidences derived from Chang'E-2 gamma-ray spectrometer, *Earth and Planetary Science Letters*, 418, 172-180, doi:10.1016/j.epsl.2014.11.009. (*corresponding author)
- (47). Fa W., T. T. Liu, **M. -H. Zhu**, J. Haruyama (2014), Regolith thickness over Sinus Iridum: Results from morphology and size-frequency distribution of small impact craters, *Journal of Geophysical Research: Planets*, 119, 1,914-1,935, doi:10.1002/2013JE 004604 **(Featured Article)**.
- (48). K. Wünnemann and **M. -H. Zhu** (2014), Impact Cratering on the Moon and Planets, *Proceedings of International Symposium on Lunar Science* (Macau), 32-45.
- (49). **Zhu M. -H.***, W. Fa, W. H. Ip, J. Huang, J. Yan, T. T. Liu, A. A. Xu, Z. Tang, L. Z. Meng, X. L. Wang, Y. Li, D. Qian (2014), Morphology of asteroid (4179) Toutatis as observed by Chang'E-2 spacecraft, *Geophysical Research Letters*, 41, 328-333, doi:10.1002/201058914. (*corresponding author)
- (50). Huang J., J. H. Ji, P. Ye, X. L. Wang, L. Z. Meng, S. Wang, J. Yan, Y. Li, D. Qiao, Y. Zhao, T. Zhang, W. Zhao, Y. Jiang, W. Rao, S. Li, C. Huang, W. H. Ip, S. Hu, **M. -H. Zhu**, L. Yu, J. Li, H. B. Zhao, The Ginger-shaped asteroid 4179 Toutatis: New observations from a successful flyby of Chang'E-2 (2013), *Scientific Reports*, 3, 3411, doi:10.1038/srep 03411.
- (51). Ma T., J. Chang, N. Zhang, J. Wu, M. Cai, Y. Gong, H. Tang, R. Zhang, N. S. Wang, M. Yu, J. P. Mao, Y. M. Hu, A. A. Xu, **M. -H. Zhu** (2013), Gamma-ray spectrometer onboard Chang'E-2, *Nuclear Instruments and Methods in Physics Research A*, 726, 113-115, doi: 10.1016/j.nima. 2013.05.162.
- (52). **Zhu M. -H.***, J. Chang, T. Ma, W. H. Ip, W. Z. Fa, J. Wu, M. S. Cai, Y. Z. Gong, Y. M. Hu, A. A. Xu, Z. S. Tang (2013), Potassium map from Chang'E-2 constraints the impact of Crisium and Orientale basin on the Moon, *Scientific Reports*, 3, 1611, doi:10.1038/srep01611. (*corresponding author)
- (53). **Zhu M. -H.***, J. Chang, T. Ma, and A. Xu (2010), Potassium detection of lunar surface from Chang'E-1 gamma-ray spectrometer, *Proceedings of International Symposium on Lunar Science* (Macau), 92-105. (*corresponding author)
- (54). **Zhu M. -H.***, T. Ma, J. Chang, Z. Tang, W. -H. Ip, and A. Xu (2011), Lunar potassium distribution: results from Chang'E-1 gamma ray spectrometer, *Science China Physics, Mechanics and Astronomy*, 54, 2,083-2,090, doi: 10.1007/s11433-011-4491-x. (*corresponding author)

- (55). **Zhu M. -H.***, T. Ma, J. Chang (2010), Chang'E-1 gamma ray spectrometer and preliminary radioactive results on the lunar surface, *Planetary and Space Science*, 58, 1547-1554, doi: 10.1016/j.pss.2010.07.022. (*corresponding author)
- (56). **Zhu M. -H.***, L. G. Liu, Y. S. Cheng, T. K. Dong, Z. You, A. A. Xu (2009), Iterative estimation of the background in noisy spectroscopic data, *Nuclear Instruments and Methods in Physics Research A*, 602, 597 – 599, doi: 10.1016/j.nima.2009.01.174. (*corresponding author)
- (57). **Zhu M. -H.***, L. G. Liu, D. X. Qi, Z. You, A. A. Xu (2009), Least square fitting of low-resolution gamma-ray spectra with Cubic B-Spline basis functions, *Chinese Physics C*, 33, 24 – 30, doi: 10.1088/1674-1137/33/1/006. (*corresponding author)
- (58). **Zhu M. -H.***, L. G. Liu, Z. You, A. A. Xu (2009), Heuristic approach for peak regions estimation in gamma-ray spectra measured by NaI detector, *Chinese Physics C*, 33, 205 – 205, doi: 10.1088/1674-1137/33/3/009. (*corresponding author)
- (59). **Zhu M. -H.***, L. G. Liu, M. Zheng, D. X. Qi, C. M. Zheng (2009), Automatic smoothing the spectroscopic data by Cubic B-Spline basis functions, *Spectroscopy and Spectral Analysis*, 29, 2,721 -2,724, doi: 10.3964/j.issn.1000-0593(2009)10-2721-04. (*corresponding author)
- (60). **Zhu M. -H.***, L. G. Liu, D. X. Qi, Z. You, A. A. Xu (2008), Smoothing noisy spectroscopic data with many-knot spline method, *Nuclear Instruments and Methods in Physics Research A*, 589, 484 – 486, doi: 10.1016/j.nima.2008.03.008. (*corresponding author)
- (61). **Zhu M. -H.***, L. G. Liu, A. A. Xu (2008), An impact model of the Imbrium basin for the distribution of the Thorium on the lunar surface, *Chinese Physics Letter*, 25, 4,490 – 4,492, doi: 10.1088/0256-307X/25/12/086. (*corresponding author)
- (62). **Zhu M. -H.***, L. G. Liu, Z. You, A. A. Xu (2008), Least-squares fitting of gamma-ray spectra with B-Spline basis functions, *IEEE Image and Signal Processing*, 691-695. (*corresponding author)
- (63). **Zhu M. -H.***, L. G. Liu, A. A. Xu, T. Ma (2008), Automatic estimation of peak regions in gamma-ray spectra measured by NaI detector, *Chinese Physics Letter*, 25, 3,942 – 3,945, doi: 10.1088/0256-307X/25/11/029. (*corresponding author)

(b) Symposium/Proceeding (peer-reviewed)

- (1). W. D. Dong, X. P. Zhang, **M. -H. Zhu**, A. A. Xu, Z. Tang (2014), Distributions of Mg/Si and Al/Si on the Lunar Surface derived from Chang'E-2 X-ray Spectrometer, *Proceedings of International Symposium on Lunar Science*, Macau.
- (2). Zhang, X. P., M. G. Xie, **M. -H. Zhu**, W. D. Dong, Z. Tang, A. A. Xu, L. Xiao et al. (2014), Major Elements Abundances in Chang'E-3 Landing Site from Active Particle-induced X-ray Spectrometer, *Proceedings of International Symposium on Lunar Science*, Macau.
- (3). **Zhu M. -H.**, W. -H. Ip, M. G. Xie, A. A. Xu, Z. S. Tang, J. Chang, T. Ma, W. Fa (2014), Thorium on the Lunar Highlands: Insights from Chang'E-2 Gamma-ray Spectrometer, *Proceedings of International Symposium on Lunar Science*, Macau.
- (4). **Zhu M. -H.**, T. Ma, J. Chang, Z. S. Tang, A. A. Xu, Y. Cheng, W. D. Dong (2012), Potassium measurement from Chang'E-1 gamma ray spectrometer, *International Symposium of the Science and Utilization of the Moon: Based on Scientific Achievements from Kaguya and Other Missions and Future Planning of Lunar Resources*, Tokyo, Japan.
- (5). **Zhu M. -H.**, T. Ma, J. Chang, W. -H. Ip, Z. S. Tang, A. A. Xu (2012), The first observations of Chang'E-2 gamma-ray spectrometer, *Mineralogical Magazine*, Abstract no. 2278.

(c) Papers Presented at Conference (peer-reviewed)

- (1). Ding, M., **M. -H. Zhu**, M. Wieczorek, A. -C. Plesa, and K. Wünnemann (2024), Formation and Evolution of the Isidis Basin on Mars Based on Numerical Simulations. 55th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. #1811.
- (2). Moreau, J. G., A. Jöeleht, A. Losiak, **M.-H. Zhu**, L. Ferrière, and J. Plado (2024), Occurrence of Shatter Cones at Kaali Crater, Estonia: A Modeling Approach. 55th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. #1429.
- (3). Su, Y. Z, L. Y. Xu, and **M. -H. Zhu** (2024), Numerical Simulation of Impact Gardening at Chang'E-5 Landing Site to Explain Its Composition Origination. 55th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. #1467.
- (4). Xu, G. -H., **M. -H. Zhu**, X. -Z. Luo, M. Ding, and K. Wünnemann (2024), Original depth of pure plagioclase at peak ring basins on the Moon-Insights from Impact simulations and observations. 55th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. #1444.
- (5). Morbidelli, A., Nesvorny, D. and **M. -H. Zhu** (2023), Late veneer on the terrestrial planets: dynamics perspective. *GeoBerlin*, #229, 3-8, September, 2023, Berlin.
- (6). Luo, X., **M. -H. Zhu**, M. Ding, L. Manske, K. Wünnemann, and R. Luther (2023), Numerical simulations of shock melting in oblique impacts. 54th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. ###.
- (7). Jia, W., X., Luo, M. Ding, and **M. -H. Zhu** (2023), Effects of megaregolith porosity structure on the gravity signature of lunar craters: Insights from numerical simulations. 54th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. ###.
- (8). Liu T., L. Allibert, R. Luther, K. Wünnemann, **M. -H. Zhu**, and T. M. Davison (2023), The synergetic effect the potential Procellarum and the South Pole-Aitken impact on the formation of the lunar nearside/farside asymmetries. 54th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. ###.
- (9). Gao Y., **M.-H. Zhu**, R. Luther, and K. Wünnemann (2023), Numerical simulation of impact-induced seismic wave generation and propagation using a coupled approach. 54th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. ###.
- (10). Meng Y., M. Ding, **M. -H. Zhu**, and L. Y. Xu (2023), Stratigraphical sequences of Schrodinger basin on the Moon. 54th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. ###.
- (11). Cui X., M. Ding, Q. Deng, S. Yan, and **M. -H. Zhu** (2023), Globally automated lunar mare and melt detection using deep learning. 54th *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. ###.
- (12). Luo X., **M. -H. Zhu** and M. Ding (2022), Ejecta pattern of oblique impacts on the Moon from numerical simulation. 53rd *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1133. (Poster).
- (13). Xi X., M. Ding, and **M. -H. Zhu** (2022), Groove formation on Phobos from orbital ejecta of Stickney crater. 53rd *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1062. (Poster).

- (14). Yang, Y., S. Li, **M. -H. Zhu**, Y. Liu, B. Wu., J. Du., W. Fa, and Y. Zou (2021), Impact remnants detected by the Chang'E-4 rover on the Moon, 52nd *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 2548. (*Poster*).
- (15). Liu, T. T., G. Michel, **M. -H. Zhu**, and K. Wunnemann (2021), Predicted sources of samples returned from Chang'E-5 landing region, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1255. (*Poster*).
- (16). Ding, M. and **M.-H. Zhu** (2021), Crustal annulus of impact basins controlled by regional thermal state of the Moon, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1099. (*Talk*).
- (17). **Zhu M. -H.**, N. Artemieva, K. Wunnemann, A. Morbidelli, Q. -Z. Yin, and H. Becker (2019), Retention of impactor material on the Moon during late accretion. *Large Meteorite Impact Conference (LMI VI)*, Brasilia, Brazil. (*Talk*).
- (18). Morbidelli A., D. Nesvorny, V. Laurenz, S. Marchi, D. C. Rubie, L. Elkins-Tanton, M. Wieczorek, S. Jacobson, **M. -H. Zhu** (2019), Sequestration of highly siderophile elements into the lunar core during a late magma ocean crystallization and mantle overturn, *European Lunar Symposium*, Manchester, UK. (*Talk*).
- (19). Schwinger S. and **M. -H. Zhu** (2018), Explaining the lunar dichotomy by a giant impact on the lunar nearside, *AGU Fall meeting*, Abstract no. 404623. (*Poster*).
- (20). **Zhu M. -H.**, N. Artemieva, A. Morbidelli, K. Wunnemann, H. Becker (2018), The Moon's impact history: Reconstruction based on highly siderophile elements, *81st Annual Meeting of the Meteoritical Society*, Moscow, Russia, Abstract no. 6102. (*Talk*).
- (21). Schwinger S. and **M. -H. Zhu** (2018), Forming a lunar dichotomy by giant impact melting, *European Planetary Science Congress*, Berlin, Germany, Abstract no. EPSC2018-1000. (*Poster*).
- (22). Lompa T., K. Wunnemann, and **M. -H. Zhu** (2018), Formation of impact basins on the Moon-insights from numerical modeling, gravity and remote sensing data, *European Planetary Science Congress*, Berlin, Germany, Abstract no. EPSC2018-224. (*Talk*).
- (23). **Zhu M. -H.**, K. Wunnemann, A. Morbidelli, N. Artemieva (2018), South Pole-Aitken basin may contribute insignificantly to the late accretion of the Moon, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1955. (*Poster*).
- (24). **Schwinger S.** and **M. -H. Zhu** (2018), Redistribution of titanium in the lunar mantle by giant impact-induced melting, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 2343. (*Poster*).
- (25). Du J., W. Fa, M. A. Wieczorek, M. Xie, and **M. -H. Zhu** (2018), New estimation of lunar mare basalt thickness based on partially buried craters, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1865. (*Poster*).
- (26). Wunnemann, K., M. Lukas, **M. -H. Zhu**, M. Makajima, D. Breuer, S. Schwinger, A. -C. Plesa (2017), Impact-induced melting and heating of planetary interiors-Implications for the thermo-chemical evolution of planets and crystallization of magma ocean, *AGU*, Abstract No. 228653, New Orleans, USA. (*Talk*).
- (27). Engelmann J., K. Wunnemann, R. Luther, and **M. -H. Zhu** (2017), Quantification of shock-induced melting and its distribution in the ejecta, *European Planetary Science Congress 2017*, EPSC2017-251. (*Poster*).

- (28). Breuer D., Schwinger S., **M. -H. Zhu**, K. Wunnemann, and A. -C. Plesa (2017), The influence of impacts on the lunar magma ocean crystallization, *Accretion and Early Differentiation of the Earth and Terrestrial Planets*, Nice, France. (Talk).
- (29). **Zhu M. -H.**, K. Wunnemann, R. W. Potter, T. Kleine, and A. Morbidelli (2017), Forming the Moon's nearside-farside dichotomies via giant impact, *Accretion and Early Differentiation of the Earth and Terrestrial Planets*, Nice, France. (Talk).
- (30). Fernandes V. A., R. Bugess, L. Cooper, P. Czaja, A. Khan, C. Liebske, C. Neal, J. Sliwinski, and **M. -H. Zhu** (2017), Type, chemistry, Ar-isotopes and magma generation of new Apollo 17 basaltic regolith fragments, *New Views of the Moon 2-Europe*, Münster, Abstract no. 6011. (Talk).
- (31). Frochtenicht T., K. Wunnemann, and **M. -H. Zhu** (2017), Formation of impact basins on the Moon-Insights from numerical modelling, gravity and remote sensing data, *European Lunar Symposium 2017*, Münster, Germany. (Talk).
- (32). **Zhu M. -H.**, K. Wunnemann, R. W. Potter, T. Kleine, and A. Morbidelli (2017), Forming the Moon's nearside-farside dichotomies via giant impact, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1851. (Talk).
- (33). Fernandes V. A., R. Bugess, P. Czaja, C. Liebske, C. Neal, J. Sliwinski, and **M. -H. Zhu** (2017), Type, chemistry, ^{40}Ar - ^{39}Ar and cosmic ray exposure age of new Apollo 17 basaltic regolith fragments, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1282. (Poster).
- (34). Zhang F. and **M. -H. Zhu** (2017), Resurfacing of Procellarum-Imbrium region by tectonism and volcanism: the role of the basin-radial fracture zones around the Imbrium basin, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1710. (Poster).
- (35). Wunnemann K., J. Engelmann, R. Luther, C. Hamann, and **M. -H. Zhu** (2017), Impact-induced shock melting and ejection of material in an asteroidal environment - implications for the deficit in melt agglutinates in Itokawa, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 2023. (Poster).
- (36). Wilk J., M. Zanett, A. Losiak, A. Joeleh, R. Valja, T. Wisniowski, K. Pavel, A. Kukko, H. Kaartinen, J. Plado, **M. -H. Zhu**, and W. D. Geppert (2016), Kaali impact crater: A structural investigation of a small crater based on 3D laser scanning, strike and Dip measurements, ground penetrating radar, electro-resistivity tomography nad iSALE-2D numerical modeling, *79th Annual Meeting of the Meteoritical Society*, Berlin, Abstract no. 6556. (Talk).
- (37). Losiak A., C. Belcher, V. Hudspith, M. Bronikowska, **M. -H. Zhu**, A. Joeleht, J. Plado, and J. Wilk (2016) Kaali impact crater: Impact-produced Charcoal sheds light on the processes associated with the formation o small craters, *79th Annual Meeting of the Meteoritical Society*, Berlin, Abstract no. 6219. (Talk).
- (38). Hamann C. **M. -H. Zhu**, K. Wunnemann, L. Hecht, and D. Stoffler (2016), Tracing shock wave attenuation in porous, particulate targets: Insights from Impact experiments and numerical modeling, *79th Annual Meeting of the Meteoritical Society*, Berlin, Abstract no. 6335. (Talk).
- (39). **Zhu M. -H.**, M. Bronikowska, and A. Losiak (2016), The formation of Kaali crater, Estonia: Insights from numerical modeling, *79th Annual Meeting of the Meteoritical Society*, Berlin, Abstract no. 6325. (Poster).
- (40). **Zhu M. -H.**, K. Wunnemann, and N. Artemieva (2016), Ejecta distribution and crater

- formation of large impact basins on the Moon: Insights from numerical modeling, *79th Annual Meeting of the Meteoritical Society*, Berlin, Abstract no. 6331. (*Talk*).
- (41). Xi X. Y. and **M. -H. Zhu** (2016), The crater formation and ejecta trajectory for the Stickney crater of Phobos, *Asia Oceania Geosciences Society*, Beijing, China. (*Talk*).
 - (42). Zhang F. and **M. -H. Zhu** (2016), Intrusion bellow volcanically buried craters in Mare Fecunditatis indicated by extrusive features associated with Mare ridge ring structures, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1798. (*Poster*).
 - (43). Xie M. G. and **M. -H. Zhu** (2016), Estimates of primary ejecta and local material for the Orientale basin on the Moon, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1747. (*Poster*).
 - (44). Fernandes V. M. Storey, and **M. -H. Zhu** (2016), Report on initial characterization of new Apollo 17 basaltic soil fragments, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1020. (*Poster*).
 - (45). Rolf T., **M. -H. Zhu**, K. Wunnemann, and S. C. Werner (2016), The role of basin-forming impacts in the global lunar evolution, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1423. (*Poster*).
 - (46). Luther R., **M. -H. Zhu**, K. Wunnemann, and N. A. Artemieva (2016), Impact ejecta mechanics: atmospheric interaction and fragment-size distribution from numerical modeling, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1950. (*Poster*).
 - (47). Losiak A., C. Belcher, V. Hudspith, **M. -H. Zhu**, M. Bronikowska, A. Joeleht, and J. Plado (2016), How to form charcoal in a small impact crater? A Kaali crater case, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1467. (*Poster*).
 - (48). Werner S. C., **M. -H. Zhu**, K. Wunnemann and T. Rolf (2016), Mass delivery onto terrestrial planets - insight from scaling laws and basin records, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1884. (*Poster*).
 - (49). **Zhu M. -H.** and K. Wunnemann (2016), Giant impact forming the crustal thickness dichotomy of the Moon, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1771. (*Poster*).
 - (50). Losiak A., C. Belcher, V. Hudspith, **M. -H. Zhu**, M. Bronikowska, A. Joeleht, and J. Plado (2016), How to form charcoal in a small impact crater? A Kaali crater case, *EGU General Assembly*, Vol. 18, Abstract no. EGU2016-10317. (*Talk*).
 - (51). Werner S. C., **M. -H. Zhu**, T. Rolf, and K. Wunnemann (2016), Moon: basin-forming impacts in scale, time and as thermal and mass input, *EGU General Assembly*, Vol. 18, Abstract no. EGU2016-11517. (*Talk*).
 - (52). **Zhu M. -H.** and K. Wunnemann (2015), Numerical modeling of Ejecta distribution of large impact basins on the Moon, *Bridging the Gap III*, Freiburg, Germany, Abstract no. 1062. (*Talk*).
 - (53). Wunnemann K. **M. -H. Zhu**, and D. Stoffler (2015), Insight into crater formation, shock metamorphism and ejecta distribution from laboratory experiments and modeling, *Bridging the Gap III*, Freiburg, Germany, Abstract no. 1067. (*Talk*).
 - (54). Zanetti M. J. Wilk, A. Kukko, H. Kaartinen, M. Kohv, A. Joeleht, R. Valja, K. Paavel, A. Kriiska, J. Plado, A. Losiak, T. Wisniowski, M. Huber, and **M. -H. Zhu** (2015), The structure of the Kaali impact crater (Estonia) based on 3D laser scanning, electro-resistivity tomography,

- and iSALE hydrocode modeling, *Bridging the Gap III*, Freiburg, Germany, Abstract no. 1103. (Talk).
- (55). Rolf T. M. Schott, R. Luther, **M. -H. Zhu**, K. Wunnemann, and S. C. Werner (2015), Thermal and volcanic evolution of small planetary bodies: role of impact processes through shock heating and insulating ejecta deposits, *Bridging the Gap III*, Freiburg, Germany, Abstract no. 1050. (Talk).
- (56). Wunnemann K. and **M. -H. Zhu** (2015), Numerical modeling of ejecta distribution and crater formation of large impact basins on the Moon, *78th Annual Meeting of the Meteoritical Society*, San Francisco, Abstract no. 5108. (Talk).
- (57). Zhang X. P., M. G. Xie, **M. -H. Zhu**, W. D. Dong, Z. S. Tang, and A. A. Xu (2015) Major elements abundances in Chang'E-3 landing site from Active Particle-induced X-ray Spectrometer, *EGU General Assembly*, Vol. 17, Abstract no. EGU2015-726. (Talk).
- (58). **Zhu M. -H.**, K. Wunnemann, R. W. K. Potter (2015), New estimates of the Orientale basin impactor size from modeling of the ejecta thickness distribution, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1770. (Poster).
- (59). **Zhu M. -H.**, J. Chang, M. G. Xie, J. Fritz, V. Fernandes, W. -H. Ip, T. Ma, and A. A. Xu (2015), The uniform K distribution of the Mare deposits in the Orientale basin: insights from Chang'E-2 gamma ray spectrometer, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1207. (Poster).
- (60). Liu T. T., W. Z. Fa, **M. -H. Zhu** (2015) Rules for regolith thickness estimation using crater morphology and its application to oceanus Procellarum, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1253. (Poster).
- (61). Fa W. Z., **M. -H. Zhu**, T. T. Liu, and J. B. Plescia (2015), Shallow subsurface structure of the Moon at the Chang'E-3 landing site as revealed by lunar penetrating radar, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1136. (Poster).
- (62). T. Kenkmann, R. Maier, S. Sturn, and **M. -H. Zhu** (2014), New tektite discoveries in the Guangdong Province, China, and the search for the source crater of the Australasian tektite strewn field, *Annual Meeting of the Meteoritical Society*, Casablanca, Morocco, Abstract no. 5142. (Talk).
- (63). K. Wunnemann, **M. -H. Zhu**, D. Stöffler (2014), Crater formation, shock metamorphism, and ejecta distribution in laboratory experiments and modeling, *Annual Meeting of the Meteoritical Society*, Casablanca, Morocco, Abstract no. 5142. (Talk).
- (64). T. Kenkmann, R. Maier, S. Sturn, and **M. -H. Zhu** (2014), New tektite discoveries in the Guangdong Province, China, and the search for the source crater of the Australasian tektite strewn field, *GEO??*, Frankfurt, Germany, Abstract no. xxx. (Talk).
- (65). K. Wunnemann, **M. -H. Zhu** (2014), Impact cratering on the Moon and Planets, *International Symposium on Lunar and Planetary Science*, Macau. (Talk).
- (66). **Zhu M. -H.**, J. Chang, W. Fa, W. H. Ip, T. Ma, M. G. Xie, A. A. Xu, and Z. S. Tang (2014), Thorium on the lunar highlands surface: Insights from Chang'E-2 gamma-ray spectrometer, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1237. (Talk).
- (67). T. Liu, W. Fa, **M. -H. Zhu**, and J. Haruyama (2014), Regolith thickness estimation over Sinus Iridum using morphology and size-frequency distribution of small craters from LROC images, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1347. (Poster).

- (68). **Zhu M. -H.**, K. Wünnemann (2013), Modeling of meteorite impact-induced secondary mass wasting - Case study by means of the Bunte breccia ejecta blanket at Ries crater, Germany, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1921. (Poster).
- (69). **Zhu M. -H.**, J. Chang, W. H. Ip, T. Ma, Z. S. Tang, A. A. Xu (2013), Lunar gamma-ray observations from China's Chang'E-2 spacecraft, *Asia Oceania Geosciences Society*, Brisbane, Australia. (Talk).
- (70). W.D. Dong, **M. -H. Zhu**, X. P. Zhang, W. H. Ip, A. A. Xu, Z.S. Tang (2013), Lunar X-ray fluorescence observations from Chang'E-2 X-ray spectrometer, *Asia Oceania Geosciences Society*, Brisbane, Australia. (Poster).
- (71). N. Hasebe, H. Nagaoka, Y. Fujibayashi, Y. Ideguchi, M. Hareyama, Y. Karouji, T. Okada, S. Kobayashi, E. Shibamura, M. Kobayashi, K. J. Kim, C. d'Uston, O. Gasnault, O. Forni, R. C. Reedy, N. Yamashita, **M. H. Zhu** (2012), Global maps of elements on the Moon: The Kaguya gamma-ray spectrometer, *Asia Oceania Geosciences Society*, Singapore. (Talk).
- (72). **Zhu M. -H.**, J. Chang, T. Ma, M. S. Cai, Y. Z. Gong, J. Wu, Y. M. Hu, W. -H. Ip, Z. S. Tang, A. A. Xu (2012), The measurements of Gamma-ray spectrometer from China's Chang'E-1/2 spacecraft, *39th COSPAR Scientific Assembly*, India. (Talk).
- (73). **Zhu M. -H.**, J. Chang, T. Ma, M. S. Cai, Y. Z. Gong, J. Wu, Y. M. Hu, W. -H. Ip, Z. S. Tang, A. A. Xu (2012), The measurements of Chang'E-2 gamma-ray spectrometer, *Proceedings of International Symposium on Lunar and Planetary Science*, Macau. (Talk).
- (74). N. Hasebe, Y. Karouji, N. Yamashita, C. d'Uston, O. Gasnault, O. Forni, S. Kobayashi, M. Hareyama, T. Okada, R. C. Reedy, M. Kobayashi, E. Shibamura, K. J. Kim, **M. H. Zhu** (2011), Elemental composition of the Moon observed by Kaguya gamma-ray spectrometer, *Asia Oceania Geosciences Society*, Taipei, Taiwan. (Talk).
- (75). **Zhu M. -H.**, T. Ma, J. Chang, W. -H. Ip, Z. S. Tang, A. A. Xu (2011), First look of Chang'E-2 gamma-ray spectrometer observations, *Asia Oceania Geosciences Society*, Taipei, Taiwan. (Talk).
- (76). L. C. Huang, W. -H. Ip, **M. -H. Zhu** (2011), W. J. Cheng, Physical characteristics of the river valleys of the Hellas basin on Mars, *Asia Oceania Geosciences Society*, Taipei, Taiwan. (Poster).
- (77). L. C. Huang, **M. -H. Zhu**, W. -H. Ip (2011), The thorium distributions of Hellas basin, the large impact crater of Mars, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 2018. (Poster).
- (78). **Zhu M. -H.**, T. Ma, J. Chang, Z. S. Tang, W. -H. Ip, A. A. Xu, and GRS team members (2011), Chang'E-2 gamma-ray spectrometer and its first measurements, *the 5th Kaguya science working team meeting*, Tokyo, Japan. (Poster).
- (79). L. C. Huang, **M. -H. Zhu**, W. -H. Ip (2011), A comparison of the South Pole-Aitken basin on the Moon and the Hellas basin on Mars, *2011 Annual Meeting of the Physical Society of ROC in Taipei*, Taipei, Taiwan. (Poster).
- (80). **Zhu M. -H.**, T. Ma, J. Chang, The radioactive results from Chang'E-1 gamma ray spectrometer (2010), *International Symposium of the Science and Utilization of the Moon*, Tokyo, Japan. (Talk).
- (81). T. Ma, **M. -H. Zhu** (2010), J. Chang, The gamma ray spectrometer onboard Chang'E-1 and Chang'E-2, *International Symposium of the Science and Utilization of the Moon*, Tokyo, Japan.

(Talk).

- (82). **Zhu M. -H.**, J. Chang, T. Ma, A. A. Xu (2010), Chang'E-1 gamma-ray spectrometer and its preliminary radioactive results, *Lunar and Planetary Science Conference*, Houston, TX, Abstract no. 1046. (Talk).
- (83). **Zhu M. -H.** (2010), Preliminary results of Chang'E-1 gamma-ray spectrometer, *AGU 2010 Western pacific geophysics*, Taipei, Taiwan. (Talk).
- (84). **Zhu M. -H.** (2009), New constraints for KREEP-enrich province, *China Planetary and Lunar Science Conference*, Chengdu, China. (Talk).
- (85). **Zhu M. -H.** (2009), The preliminary results of CE-1 gamma ray spectrometer, *Beijing Lunar Science Workshop*, Beijing, China. (Talk).
- (86). **Zhu M. -H.** (2009), Preliminary results of CE-1 gamma ray spectrometer, *The 3rd meeting of China lunar expert committer*, Beijing, China. (Talk).

Invited Talks

- How to effectively make kinetic impactor test, *The 2nd China Planetary Defense Conference*, YiNing, China, 2023.
- Reconstructing the early impact flux of inner Solar System, *ISSI workshop-planetesimal formation of Solar System*, Bern, Switzerland, 2023.
- Impacts in our Solar System, *2022 International workshop on Intensive loading and its effects*, Beijing Institute of Technology, China.
- Bombardments in the Solar System, *The 1st China Planetary Defense Conference*, Guilin, China, 2021.
- Giant impacts on the Moon, *Chengdu University of Technology*, Chengdu, China, 2020.
- Moon's late accretional history, *Chinese Astronomical Society*, Chengdu, China, 2019.
- Are the Moon's nearside-farside asymmetries resulted from a giant impact? *University of Science and Technology of China*, China, 2019.
- Procellarum impact forming the nearside-farside dichotomies of the Moon, *Munster University*, Munster, Germany, 2017.
- Procellarum impact forming the nearside-farside dichotomies of the Moon, *DLR*, Berlin, Germany, 2017.
- Thermal effects of large-scale impact basins on the evolution of the Moon, *DLR*, Berlin, Germany, 2016.
- Formation of large-scale impact basins on the Moon and roles in lunar evolution, *Free University*, Berlin, Germany, 2016.
- Large impact events on the Moon, *Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science*, Germany, 2015.
- Thorium on the lunar highlands: Insight from Chang'E-2 gamma-ray spectrometer, *International Symposium on Lunar and Planetary Science*, Macau, 2014.
- Advanced crater size scaling laws through hydrocode simulations, *Peking University*, Beijing,

China, 2014.

- New views of the Moon: insights from China's Chang'E-2 gamma-ray spectrometer, *Leibniz Institute for Research on Evolution and Biodiversity*, 2012, Berlin, Germany.
- Gamma-ray measurements from China's Chang'E-2 spacecraft, *Laboratory Astrophysics Workshop*, Nanjing, China, 2012.
- The measurements of gamma-ray spectrometer from China's Chang'E-1/2 spacecraft, *39th COSPAR Scientific Assembly*, India, 2012.
- First look of China's Chang'E-2 gamma-ray spectrometer, *Asia Oceania Geosciences Society*, Taipei, Taiwan, 2011.
- The measurements of China's Chang'E-1 gamma-ray spectrometer, *Waseda University*, Tokyo, Japan, 2011.

Professional Services

(a) Conference Session Convener and Committee

- Planetary session convener, *Asia Oceania Geosciences Society*, 2019
- Local organizer committee, *Macau International Symposium on Lunar and Planetary Science*, 2018
- Convener and committee, *Macau International Symposium on Lunar and Planetary Science*, 2014
- Planetary session convener, *39th COSPAR Scientific Assembly*, 2012
- Planetary session convener, *Asia Oceania Geosciences Society*, 2011

(b) Reviewer of International Journals

2014. Planetary and Space Science (1); Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment (1)
2015. Science China Physics, Mechanics & Astronomy (1); Journal of Earth Science (1); American Mineralogist (1); IEEE Transactions on Geoscience and Remote Sensing (1); Nature Communication (1)
2016. Astrophysics and Space Science (1); Science (4)
2017. Meteorites and Planetary Science (1), Journal of Geophysical Research-Planets (2)
2018. Icarus (1); Nature Astronomy (2); Earth and Space Science (1); Earth and Planetary Science Letters (1)
2019. Icarus (2);
2020. Icarus (2);
2021. Journal of Geophysical Research-Planets (1); Oxford Research Encyclopedia (1)
2022. Science China Physics, Mechanics & Astronomy (1); Planetary Science Journal (2); JGR (1); Icarus(1); Nature Communication (1)
2023. Icarus(2)

(c) External Proposal Review/Panel Member

- National Natural Science Foundation of China (NSFC), 2018-present
- Research Grants Council (RGC) of Hong Kong (normal and areas of excellence scheme), 2017-present
- NASA Postdoctoral Program fellowship, 2016-present
- Macau First Satellite for Popular Science (2021)

(d) Student Award Judge

- AGU Fall Meeting Outstanding Student Paper Award (2018)
- Best Poster Awards, *International Symposium on Lunar and Planetary Science, 2018*
- Dwornik Award, Lunar and Planetary Science Conference, Houston, TX, USA (2015; 2017)

(e) Societies and Members

- Chinese Astronomical Society, Meteoritical Society Member, AGU Member

Honors and Awards

- Best Reviewer Awards 2022 - Icarus
- Macao SAR Science and Technology Research Award (Natural Science Award, First Class), 2020
- Chinese Scholarset Science and Technology Persons of the Year Outstanding Achievement Award, 2019
- Macao SAR Science and Technology Research Award (Natural Science Award, First Class), 2016
- MUST BOC Excellent Research Award, 2016
- 2013 China Top 10 Astronomical Advancements, 2014
- MUST BOC Excellent Research Award, 2013
- 2012 China Top 10 Astronomical Advancements, 2013
- Macao SAR Science and Technology Research Award (Natural Science Award, Third Class), 2012