2021 Mineralogy, Geochemistry, Volcanology, and Petrology (MGPV) Early Career Award to Xiao-Ming Liu: Citation

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October 11, 2021

I'm delighted to be here today to introduce to you this year's winner of the MGPV early career award: Xiaoming Liu. The award was endowed by the late Jim Thompson, who valued multidisciplinary investigations grounded in solid fieldwork. Xiaoming is a particularly appropriate person to receive this award, as this nicely describes her approach to research.

Xiaoming did her Master's and PhD at the University of Maryland, where I had the privilege of co-supervising her for both degrees. The UMD mascot is a turtle – a Terrapin, to be precise, and the associated logos are "Fear the Turtle" and "Fearless Ideas". This fits Xiaoming perfectly, as she is fearless in pursuing her research, as I will shortly describe.

For her Master's degree, which was co-supervised by Sash Hier-Majumder, Xiaoming studied the behavior of Li and its isotopes in country rocks adjacent to narrow (<3 m) Li-rich pegmatites. This involved field work (with Mona Sirbescu), Li analyses, 1-D diffusion and 2-D diffusion-advection modeling. She dove into this project without any background in Li isotopes or numerical modeling and produced a nice paper in *G-cubed* demonstrating that Li infiltrated more than 50 m into the country rocks from the pegmatites via diffusion, assisted by fluid advection.

In her PhD, co-advised with Bill McDonough, Xiaoming changed course and focused on quantifying the impact of chemical weathering on the composition of the continental crust. Again, she used geochemistry (major, trace elements, Li, Mg and Nd isotopes), field work and fluid transport modeling, but in this case, she was concerned with understanding the influence of basalt weathering on stream waters that drained only basalt and whether weathering of an initial basaltic crust could generate the evolved continental crust we see today. The Columbia River Basalts (right out our door here) proved a wonderful natural laboratory for this work, given their within-flow homogeneity and huge lateral extent. Studying drill cores through bauxites developed on the CRB on the west side of the Cascades (provided by Michael Cummings at Portland State University), she documented the chemical effects of extreme weathering and its influence on Li and Mg isotopes in the regolith. The latter was carried out in the lab of Fang-zhen Teng at University of Washington, thereby starting a long-term collaboration. Analyzing the streams, rivers and groundwaters that drained only CRB, she was the first to document seasonal variation in riverine Li isotopes and showed, through reactive transport modeling that Li isotopes continue to fractionate between river waters and suspended mineral loads as the material is carried downstream. This has important implications for understanding the changing δ^7Li of seawater over the Cenozoic, which has been used as a proxy for chemical weathering. Here was another example of Xiaoming's fearlessness – she reached out to Christoph Wanner, a post-doc at Lawrence Berkeley National Lab to learn how to apply

reactive transport modeling to the problem and dove right in. She also contributed a modeling paper, following the lead of Cin-Ty Lee, that appeared in PNAS where she demonstrated that chemical weathering has had a huge influence on the composition of the continental crust over Earth history.

Following her PhD, Xiaoming spent a fruitful two years as a post-doc at the Carnegie Institution of Science where she changed course yet again to study mineral evolution with Bob Hazen, and developed the Zn/Fe ratio in marine carbonates as a proxy for atmospheric oxygen, confirming earlier suggestions that oxygen levels were exceedingly low for much of the Proterozoic, and providing a useful new proxy to the community.

Joining the faculty in the Department of Geosciences at University of North Carolina, Chapel Hill in 2015, Xiaoming has built an ICP-MS laboratory and continued multidisciplinary studies of chemical weathering and the rise of atmospheric oxygen. She has explored additional proxies of atmospheric oxygen, such as cerium anomalies in carbonates and, with Fangzhen Teng, the use of potassium isotopes to trace chemical weathering. She has emerged as a strong female role model and established herself as a terrific mentor of younger scientists both at UNC and at professional meetings.

On behalf of the nominating team of Jérôme Gaillardet, Tim Lyons, Fangzhen Teng, and Anat Shahar, I am proud to introduce the MGPV early geological career awardee: Xiaoming Liu. Congratulations Xiaoming!