

## **Phosphorus Transformation during Ecosystems Development under Different Climates and Effects of Dust Inputs**

THAN T. N. DAM<sup>1</sup>, LEO M. CONDRON<sup>2</sup>, STEPHEN C. HART<sup>3</sup>, and MENGQIANG ZHU<sup>1</sup>

<sup>1</sup>Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY 82071

<sup>2</sup>Faculty of Agriculture and Life Sciences, P.O. Box 85084, Lincoln University, Christchurch 7647 New Zealand

<sup>3</sup>Department of Life & Environmental Sciences and Sierra Nevada Research Institute, University of California, Merced, CA 95343, United States

Aeolian dust inputs play a crucial role in biogeochemical P cycle of many ecosystems. However, effects of dust inputs on P transformation in soils under different climates remains poorly understood. Herein, we combined the modified Hedley sequential chemical extractions (SCEs) and P K-edge XANES spectroscopy to characterize soil P speciation changes throughout the soil profiles across semi-arid substrate age gradient of Arizona (SAGA, USA; 1 ky – 3000 ky) and humid Franz Josef chronosequence (FJ, NZ; 0.002 ky – 120 ky). Both extraction and XANES results show that the P transformations of FJ follow the Walker and Syers model. For SAGA, the extraction results are consistent with the Walker and Syers model, but not for the XANES results showing that the Ca-P and Fe/Al-P stocks fluctuate with increasing substrate age. The difference between the two chronosequences can be ascribed to substantial dust inputs and slow dust weathering in semi-arid environment compared to that in humid environment. In addition, P transformation patterns strongly depend on the depth used for the P stock calculations. Moreover, we were able to quantify Al/Fe-bound and free organic P in soils, and found that organic P increasingly binds to Al/Fe with increasing substrate age of FJ. This work provides important insights into the impacts of aeolian dust inputs on P biogeochemical transformation in soils during ecosystem development under different climates.