Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

Altered regulation of arsenic by iron plaque on rice roots under a changing climate

E. MARIE MUEHE[1], SAMUAL M. WEBB[2], NICHOLAS P. EDWARDS[2,] AND SCOTT FENDORF[1]

[1]Stanford University, Stanford, CA-94305, USA
[2]Stanford Synchrotron Radiation Lightsource, Menlo Park, CA-94025, USA

With rice feeding more than 50% of the global population daily, understanding the constraints to the production of this main staple today and in the future is absolutely critical. A shift in climate to increasing temperature and atmospheric CO_2 concentrations is expected to affect the production of rice adversely, which directly translates to impeding food security. Our recent work has shown that when the effect of soil arsenic (As) is considered with a shift in climate, rice productivity is decreased drammatically in comparison to climate alone. Temporally resolved As dynamics in the rhizosphere indicated that the amount of phytoavailable As in the first 8 weeks of the vegetative growth cycle is crucial for rice productivity and grain As content. Therefore, we investigated the underlying mechanisms of As exposure to rice in the early growth stage of the plant under varying climatic conditions.

Using custom-designed rhizoboxes, we show that tiller diameter is reduced with increasing temperatures leading to differences in total and spatial radial oxygen loss from roots into the rhizosphere. The resulting steeper redox gradient away from roots reduces iron (Fe) plaque formation and As retention. Synchrotron-based elemental mapping of Fe and As visualized the extent and variety by which roots form Fe plaque that sequesters As. Subtle differences in Fe speciation as a function of soil As concentration and climatic condition are quantified with localized Fe-K-edge XANES analysis. Correspondingly, a prominent shift to reduced As species was observed in Fe-plaque associated As exposed to climatic change and elevated soil As levels.

Our findings indicate that elevated temperatures and CO_2 will cause As to bind and associate with Fe plaque differently in rice's rhizosphere compared to today. Consequently, the role of Fe plaque in potentially regulating uptake of As by rice may have to be re-assessed under future climatic conditions.