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Examination of easily soluble organic matter over a growing season in a rice paddy ecosystem under elevated CO_2: searching for labile organic nitrogen in soil.

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Soil nitrogen (N) plays a crucial role for plant productivity and rice paddy field ecosystems are characterised by a low N use efficiency. While the nature of plant-available N in soil remains as a fundamental question, low molecular weight organic N compounds are reasonable candidates because N-containing macromolecules (e.g., proteinaceous materials) need to be depolymerized and solubilized for mineralization and/or direct uptake by biota. We hypothesized that easily-soluble organic matter (i.e. extractable by weak phosphate at pH 7) represents or contains plant available N pool in soil and tested if the soluble organic N changes over a growing season in a rice paddy ecosystem. A broader objective of current study was to examine the effects of elevated CO_2 (eCO_2) on soil N and C cycling in a paddy soil under field condition as a part of Tsukuba FACE project in Japan. The experiment was set up to examine the effects of eCO_2, types of cultivar and rice growth stage (7 time points between May to September).
The soluble organic matter in the rice rooting zone was characterized by total organic C, total dissolved N, and inorganic N. We found rather minor effect of eCO_2 and cultivar but clear effect of time (growth stage) on the inorganic N concentrations. A noticeable result is the increase of the C:N ratio in the labile OM pool during rice development. We further characterize the nature of the soluble organic N using molecular-size separation (SEC-HPLC) coupled with three types of detector (UV absorbance, fluorescence and chemiluminescence). The acquisition of HPLC spectra coupled with chemiluminescence nitrogen detection allowed to quantify the relative proportion of N-containing organic compounds based largely on their molecular weight. We will present our initial results on the HPLC-based organic N.