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Migrating FLOTRAN Reaction Network From NGEE-Arctic into ACME Through a Generic Biogeochemistry Interface

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The Accelerated Climate Modeling for Energy (ACME) program is an ongoing multi-laboratory and multi-institutional collaboration project aiming to build a next-generation Earth system model. “*How do biogeochemical cycles interact with global climate change*” is one of the three high-level science drivers for ACME. Explicit representation of microbial communities and functions in soil biogeochemistry (BGC) processes is a major task in the ACME Land Model (ALM) development. The microbe-enabled BGC module will be implemented in the PFLOTRAN-BGC framework, which has been developed under the NGEE-Arctic project. PFLOTRAN can solve a system of nonlinear partial differential equations describing multi-phase, multi-component and multi-scale 3-D flow and reactive-transport in porous media. We have developed a generic BGC-Interface in ACME to facilitate the migration of NGEE-PLFOTRAN to ACME. The ultimate objective of this interface is to enable flexible and fast development and evaluation of soil BGC modules and their coupling to various thermohydrology and aboveground vegetation modules. The BGC-Interface includes a generic data-structure to pass data between submodels (i.e., vegetation, vegetation and BGC) and allows a selection of multiple instances (e.g., ALM-BGC and PFLOTRAN-BGC for BGC-submodel) for each submodel. We test ALM-PFLOTRAN and compare it to the original ALM and NGEE-PLOTRAN at the Barrow site, AK. Global-scale test of the ALM-PFLOTRAN will also be conducted through this collaboration between ACME and NGEE-Arctic projects.