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Accelerating reactive transport simulations with on-demand learning algorithms

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Reactive transport simulations help us better understand how geochemical reactions affect complex geothermal systems. However, geochemical reaction calculations can be extremely costly, sometimes accounting for over 99% of all computing costs in the simulation. As a result, the common practice is to simplify chemical details of fluids and rocks in the computer model to make it more computationally feasible. To tackle this computing issue, we resort to an on-demand learning algorithm that can speed up geochemical calculations by orders of magnitude, and thus substantially accelerate reactive transport simulations. In this presentation, we show how these algorithms work and highlight the speed up obtained in some reactive transport problems. We also comment about the next steps we will undertake to make these smart algorithms more commonly used for numerical investigations of geothermal energy systems.

Authors: Dr LEAL, Allan M. M. (ETH Zurich); Dr KYAS, Svetlana (ETH Zurich); Prof. SAAR, Martin O. (ETH Zurich)

Presenter: Dr LEAL, Allan M. M. (ETH Zurich)

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