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Peridynamics for Desiccation Curling and Cracking Simulation

Time: June 26th, 2023, 10:30 a.m. ~12:00 a.m.

Place: **University of Natural Resources and Life Sciences (BOKU),
Seminar room 02, GUTH-SR 02 (GUTH-EG/14), Feistmantelstraße 4, 1180 Vienna**

Abstract: The soil desiccation cracking attributed to moisture loss will significantly weaken the mechanical properties of soil and cause various potential natural disasters. The numerical simulation of soil desiccation cracking remains challenging within the framework of classical continuum mechanics. To avoid the limitation of classical continuum mechanics and corresponding numerical methods, peridynamics has been proposed and developed for dealing with damage accumulation and crack evolution problems. Moreover, the soil curling usually occurs in thin layers of desiccation cracked soil but has been seldom discussed. It plays a significant role in soil desiccation cracking from different aspects; for example, 1) the evaporation surface newly formed by the curling further accelerates the moisture dissipation, 2) the curling increases the surface roughness, making soil susceptible to weathering and easier to be damaged, 3) the curling expands the crack gap, thus affecting the surface runoff direction and the infiltration path of rainwater, etc.

Therefore, the reporter and colleagues develop hygro-mechanical peridynamic models (bond-based, ordinary state-based) and corresponding numerical methods (staggered and monolithic schemes) for this typical hygro-mechanical coupled problem. Summarily, the coupled hygro-mechanical peridynamics provides a potential strategy in soil curling and desiccation cracking investigation for real-scale simulation and fine mechanism exploration.

