Contribution ID: **1** Type: **not specified**

Discretizing the Fokker-Planck equation with second-order accuracy: a dissipation driven approach

Wednesday, April 16, 2025 10:30 AM (50 minutes)

We propose a fully discrete finite volume scheme for the standard Fokker-Planck equation. The space discretization relies on the well-known square-root approximation, which falls into the framework of two-point flux approximations. Our time discretization is novel and relies on a tailored nonlinear mid-point rule, designed to accurately capture the dissipative structure of the model. We establish well-posedness for the scheme, positivity of the solutions, as well as a fully discrete energy-dissipation inequality mimicking the continuous one. We then prove the rigorous convergence of the scheme under mildly restrictive conditions on the unstructured grids, which can be easily satisfied in practice. Numerical simulations show that our scheme is second order accurate both in time and space, and that one can solve the discrete nonlinear systems arising at each time step using Newton's method with low computational cost.

Presenter: CANCÈS, Clément (Inria)