

# On the sharp time decay of the 2D quasi-geostrophic equation

**Fazel Hadadifard**

University of Kansas

*f.hadadi@ku.edu*

## Abstract

We compute the sharp time decay rates of the solutions of the IVP for two models arising in fluid mechanics: the quasi-geostrophic equation and the Boussinesq model, both subject to fractional dissipation. Our approach is based on the method of scaled variables of Gallay–Wayne. It allows us to not only compute the rates, but also explicitly identify the asymptotic profiles. Our work, joint with Prof. A. Stefanov, generalizes the classical works on the Navier–Stokes system. Since the Green’s functions in the fractional dissipation context are not sufficiently decaying at infinity, the center-stable manifold construction of Gallay–Wayne appears to be out of reach. Instead, we rely on appropriate a priori estimates for the solutions (both in weighted and unweighted settings) to derive the asymptotic profiles.