

DISCONTINUOUS GALERKIN METHOD FOR SOLVING A THIN-FILM EQUATION

ABSTRACT. Aircraft icing is a critical operational, safety, and certification concern for the aircraft industry. Aircraft icing occurs in regimes that involve residual surface water that is transported along the surface, also known as runback. The water mass transport or runback can be modeled using thin-film equations. The thin-film equation results from an asymptotic limit of the Navier-Stokes equations. The thin-film equation contains both a nonlinear hyperbolic transport and nonlinear parabolic diffusion terms. Generally these terms are handled separately using operator splitting. We describe how to use an explicit Runge-Kutta DG method for solving the nonlinear hyperbolic equation and an implicit DG method for solving the nonlinear parabolic diffusion equation. To ensure fast convergence of the implicit method a multi-grid approach is used.