

Well posedness in Sobolev spaces of the Prandtl equation

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We develop a new approach to study the well-posedness theory of the Prandtl equation in Sobolev spaces by using a direct energy method under a monotonicity condition on the tangential velocity field instead of using the Crocco transformation. Precisely, we firstly investigate the linearized Prandtl equation in some weighted Sobolev spaces when the tangential velocity of the background state is monotonic in the normal variable. Then to cope with the loss of regularity of the perturbation with respect to the background state due to the degeneracy of the equation, we apply the Nash-Moser-Hörmander iteration to obtain a well-posedness theory of classical solutions to the nonlinear Prandtl equation when the initial data is a small perturbation of a monotonic shear flow.

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