Title: Numerical modeling of unstable fluid flow past heated bodies

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Abstract: Presented work brings new results to numerical computations of flow influenced by temperature changes. Constructed numerical algorithm takes into account variable coefficients of the differential operators in the system of incompressible Navier-Stokes equations coupled with thermal heat equation. The spatial discretisation of the problem targets to application of high order method, the spectral element method. Phenomenons connected with high order approximations are discussed on a number of examples and comparisons with methods of lower order, which are more common. Results were achieved for two fluids with opposite response to heating, air and water. The observed quantity is particularly a frequency of vortex shedding, the Strouhal number, as dependent on temperature and Reynolds number. The calculated values were compared with experimental results and exhibit a good coincidence. Numerical analysis of separation angle in flow around heated circular cylinder may give a new impulse to verification of accuracy and reliability of the developed method.

Keywords: Navier-Stokes-Fourier, spectral element methods, heated flow, separation angle