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Navier-Stokes-Fourier fluids interacting with elastic shells

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Abstract. We study the motion of a compressible heat-conducting fluid in three dimensions interacting with a nonlinear flexible shell. The fluid is described by the full Navier-Stokes-Fourier system. The shell constitutes an unknown part of the boundary of the physical domain of the fluid and is changing in time. The solid is described as an elastic non-linear shell of Koiter type; in particular it possesses a non-convex elastic energy. We show the existence of a weak solution to the corresponding system of PDEs which exists until the moving boundary approaches a self-intersection or the non-linear elastic energy of the shell degenerates. This is achieved by compactness results (in highest order spaces) for the solid-deformation and fluid-density. Our solutions comply with the first and second law of thermodynamics: the total energy is preserved and the entropy balance is understood as a variational inequality.

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