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Large-eddy simulations of a heated and combusting Rijke tube configuration WEI XIAN LIM, WAI LEE CHAN, Nanyang Technological University, Singapore — Due to its potential to cause catastrophic damages to combustion engines, thermoacoustic instability is an active area of research that demands further understanding. The process to experimentally identify or eliminate thermoacoustic instability effects can be costly, so the ability to employ numerical simulation techniques will be advantageous. In this work, a canonical thermoacoustic configuration, known as the Rijke tube, was chosen to study the coupling effects between the heat-addition and acoustic pressure fluctuations. To this end, two large-eddy simulation cases were studied, one with heating wire and the other with combustion represented by the flamelet/progress-variable model. In all simulations, proper boundary conditions and buoyancy force were accounted for to represent the actual conditions of Rijke tube in a laboratory space. Good results were obtained for the heating-wire case when comparing the theoretical and numerical resonant frequency. Meanwhile, additional flame-acoustics interactions were also observed in the flamelet/progress-variable case.

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