Rarefied gas mixture flow between plates of arbitrary length due to small pressure difference

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Abstract
The linearized flow of a binary gas mixture between two parallel plates of any length driven by a small pressure difference is numerically solved based on the McCormack kinetic model. In this case the flow is not fully developed and the simulated flow field includes, in addition to the channel, efficiently large upstream and downstream regions significantly increasing the required computational effort. In the present work results are provided for one gas mixture, namely He-Ne with a specific concentration of 0.5 in a wide range of gas rarefaction. The ratio of the length over the height of the channel is taken to be equal to 0, 1 and 5 corresponding to flow through channels of very short (slit), short and moderate lengths respectively. Results are provided for the two kinetic coefficients related to Poiseuille and barodiffusion flow rates and the velocity profiles of each species. The effect of the length to height ratio and of the gas rarefaction on the flow quantities is investigated deducing that as the ratio in increased the separation phenomenon becomes more dominant, while a Knudsen minimum is observed at the ratio equal to 5.