Supplementary material
H-theorem and boundary conditions for the linear R26 equations: application to flow past an evaporating droplet

Anirudh S. Rana[1] , Vinay Kumar Gupta[2], James E. Sprittles[3], and Manuel Torrilhon[4]

[1]Department of Mathematics, BITS Pilani, Pilani Campus, 333031 Rajasthan, India
[2]Department of Mathematics, Indian Institute of Technology Indore, Indore 453552, India
[3]Mathematics Institute, University of Warwick, Coventry CV4 7AL, UK
[4]Department of Mathematics, RWTH Aachen University, D-52062 Aachen, Germany

The purpose of this supplementary material is to illustrate that the solutions of the LR26 equations for the problems, namely (i) a steady gas flow past a rigid sphere and (ii) a steady vapour flow past an evaporating spherical droplet, obtained with the PBC and the MBC differ only negligibly.

Figures 1 and 2 exhibit the (a) radial velocity, (b) polar velocity, (c) pressure and (d)

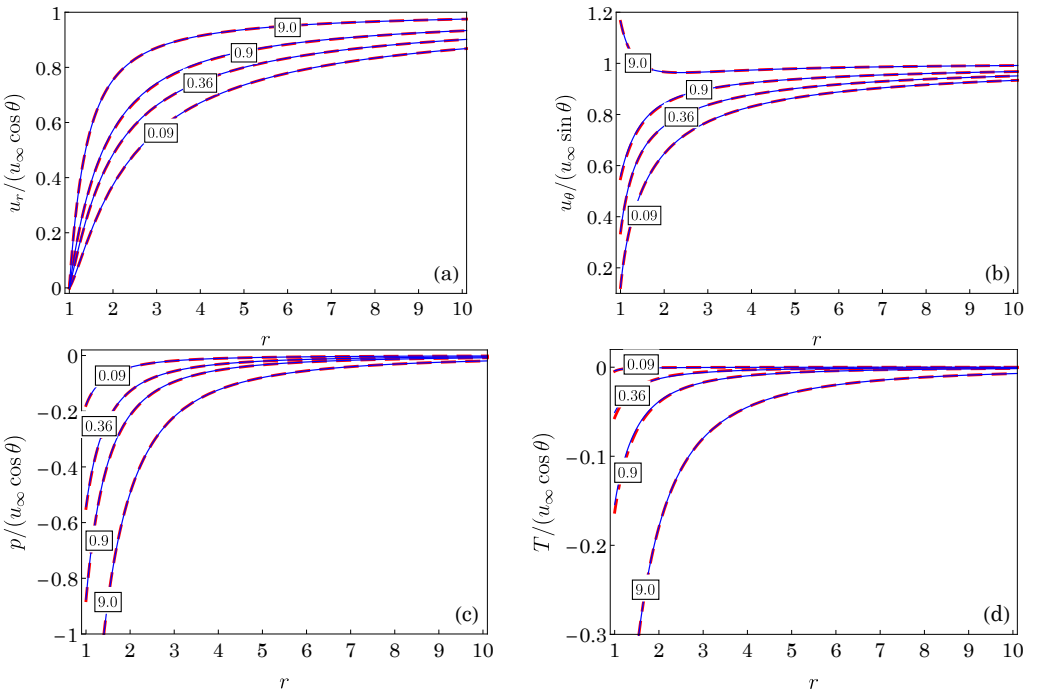

FIGURE 1. Profiles of the (a) radial velocity, (b) polar velocity, (c) pressure and (d) temperature of the gas in a steady gas flow past a rigid sphere as functions of the radial distance from the surface of the sphere for various Knudsen numbers (depicted in the boxes above the curves). Results are obtained from the LR26 theory with the PBC (solid blue lines) and with the MBC (dashed red lines).

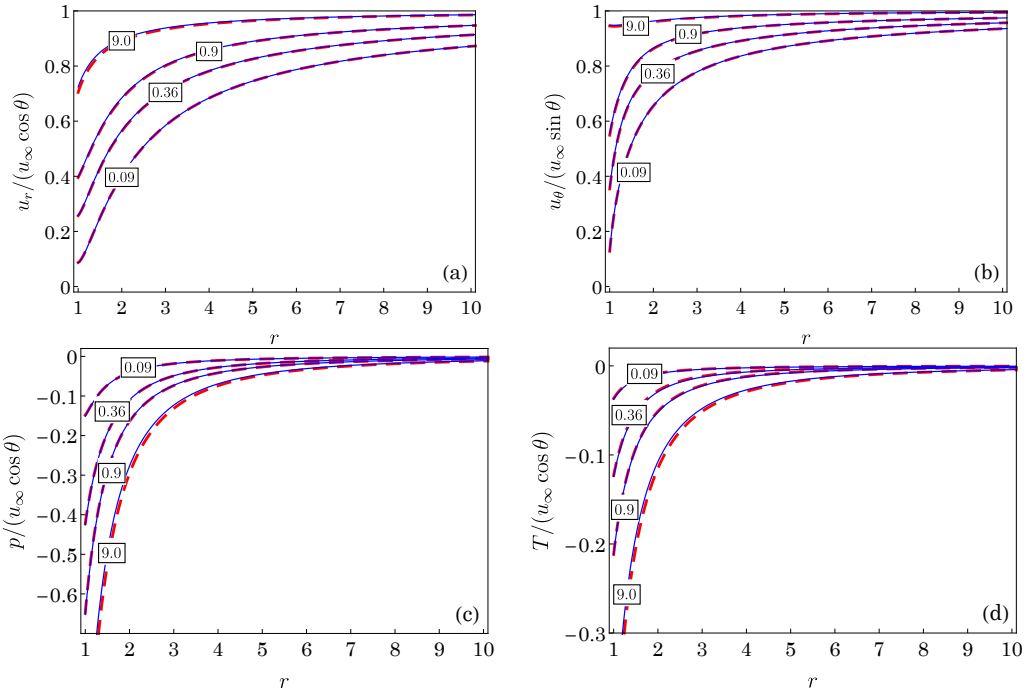

FIGURE 2. Same as figure 1 but in a steady vapour flow past an evaporating spherical droplet.

temperature profiles obtained with the PBC (solid blue lines) and with the MBC (dashed red line) for different values of the Knudsen number (depicted in the boxes above the curves) for the aforementioned problems (respectively). Clearly, for both problems, the difference between the results with the PBC and MBC is negligibly small.

Figure 3 displays the normalized (with the Stokes drag $F_{\text{Stokes}} = 6\pi \text{Kn} u_\infty$) drag force obtained from the LR26 theory with the PBC (solid blue line) and MBC (dashed red lines) as a function of the Knudsen number for the aforementioned problems. Also, the drag force obtained from the LR26 equations with the PBC and MBC are virtually indistinguishable for both problems.

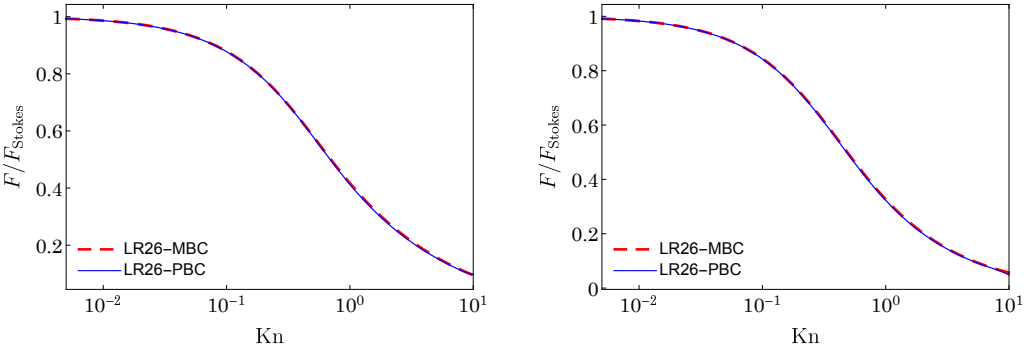

FIGURE 3. Normalized drag force from the LR26 theory with the PBC (solid blue line) and MBC (dashed red lines) as a function of the Knudsen number in the case of (left) a gas flow past a rigid sphere and (right) a vapour flow past an evaporating droplet. The results are normalized with the Stokes drag $F_{\text{Stokes}} = 6\pi \text{Kn} u_\infty$.