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Technical Comments

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Comment on "Computational Modeling and Experiments of Natural Convection for a Titan Montgolfiere"

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Despite reporting useful computational modeling and experiments, Samanta et al. [1] incorrectly apply the empirical Nusselt–Rayleigh correlation of Scanlan et al. [2] for free (natural) convective heat transfer between concentric spheres. They attribute the correlation used in their Eq. (19) to a private communication with J. Jones (2009). However, Jones† took this correlation from Holman's well-known text [3] (also see earlier editions), which incorrectly quotes the scale length used by Scanlan et al. [2]. Perpetuation of this error will lead to significant differences in predicted heat transfer rates and deserves to be highlighted to prevent similar recurrence.

It is also worth noting that for internal free convection inside a sphere, Hutchins and Marschall [4] probably offer a better correlation than the one of Carlson and Horn [5] quoted by Samanta et al. [1]. Furthermore, Churchill [6] offers a corrected correlation for high-Rayleigh-number free convective flows around a sphere of uniform temperature, which would be more suitable than the one quoted by Samanta et al. [1]. Again, this may lead to significant differences in heat transfer rates at Rayleigh numbers approaching the range of applicability for possible Titan Montgolfières [7] and other planetary balloons [8].

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