

Analysis of Sweat Evaporation and Heat Transfer on Skin Surface: A Pointwise Numerical Study

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Abstract : This study aims to investigate the thermoregulatory role of sweating by comprehensively analyzing the evaporation process and its thermal cooling impact on local skin temperature at various time intervals. Traditional experimental methods struggle to fully capture these intricate phenomena. Therefore, numerical simulations play a crucial role in assessing sweat production rates and associated thermal cooling. This research utilizes transient computational fluid dynamics (CFD) to enhance our understanding of the evaporative cooling process on human skin. We conducted a simulation employing the k-w SST turbulence model. This simulation includes a scenario where sweat evaporation occurs over the skin surface, and at particular time intervals, temperatures at different locations have been observed and its effect explained. During this study, sweat evaporation was monitored on the skin surface following the commencement of the simulation. Subsequent to the simulation, various observations were made regarding temperature fluctuations at specific points over time intervals. It was noted that points situated closer to the periphery of the droplets exhibited higher levels of heat transfer and lower temperatures, whereas points within the droplets displayed contrasting trends.

Keywords : CFD, sweat, evaporation, multiphase flow, local heat loss

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