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"Effect of temperature changes on micro-environment inside a Beehive – a modeling study"

Honey bees have been in the news grabbing head-lines (e.g, "EU Plan Bee for bee recovery", BBC news) world over due the sudden collapse in honey bee colony size also called as Colony Collapse Disorder(CCD). In parallel with efforts to find the source of this collapse, this event has initiated studies aimed at understanding conditions inside a beehive, which are difficult to monitor. Honeybees work hard to maintain temperature and humidity levels inside their beehive within narrow limits to ensure optimal growth conditions for their off-springs as well as to optimize their finite energy resources. Understanding and ensuring good ventilation of a beehive has been long recognized by beekeepers as a way to help honeybees maintain a healthy colony.

Despite the long history of beekeeping and its extensive use in honey bee farming practice, little information is available about the conditions inside a honey beehive. In this study, using field data and observations, we constructed for the first time a realistic physical model of a beehive, and modeled the relevant heat and mass transfer processes describing the interaction of the honeybees with the air and simulated the 3-D flow inside the beehive. In our talk, we will discuss the challenges involved in modeling this problem as well as our findings regarding conditions inside the beehive at different ambient temperatures and its implication for the honeybees.