# Personal Bio-Meteorological Station based on Cylindrical Radiation Thermometers and Turbulence Accounting Anemometers

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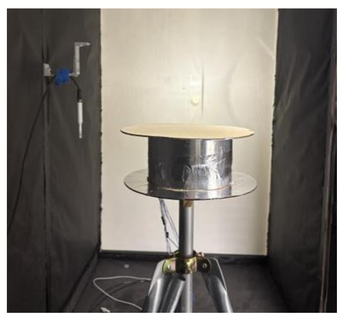
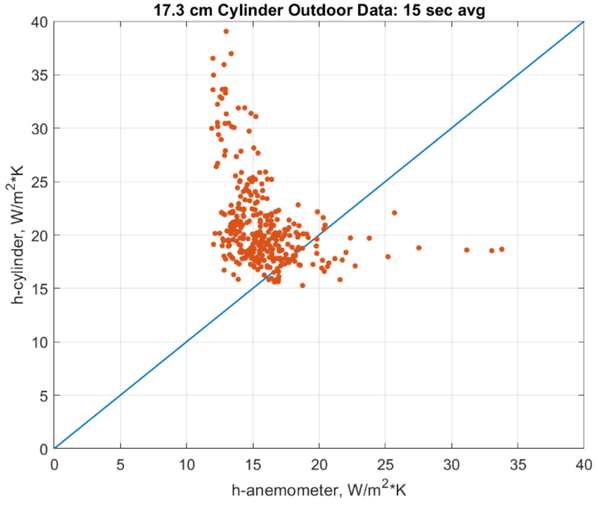
**Research Motivation:** This project seeks to address how to affordably and accurately measure the convection heat transfer coefficient of the human body in turbulent outdoor flow. For almost 150 years, the Earth has been experiencing the effects of global warming: heat waves, long lasting droughts, and increasing temperatures. These climate changes pose serious risks to human health including heat exhaustion, nausea, fainting, and even death.

**Possible Solutions:**

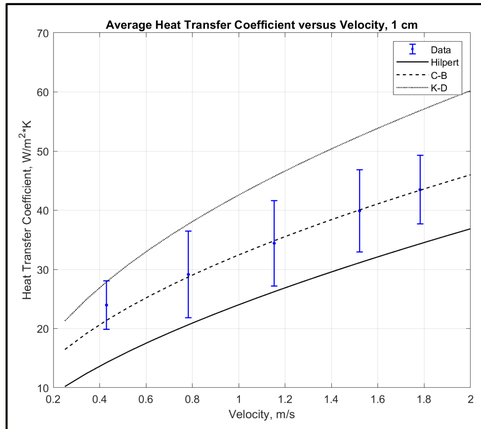
1. Cylinder with equivalent diameter to human body (17.3 cm), which directly quantitates the convective heat transfer coefficient of the human body
2. Three cylinders of varying diameter, which quantitate turbulence intensity, turbulence length scale, and mean wind speed. These values then allow for calculation of the convective heat transfer coefficient in outdoor turbulent flow.

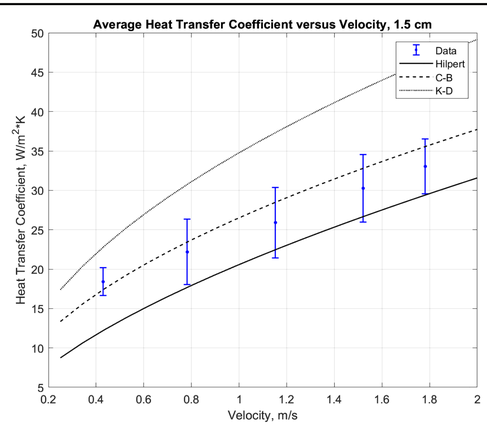


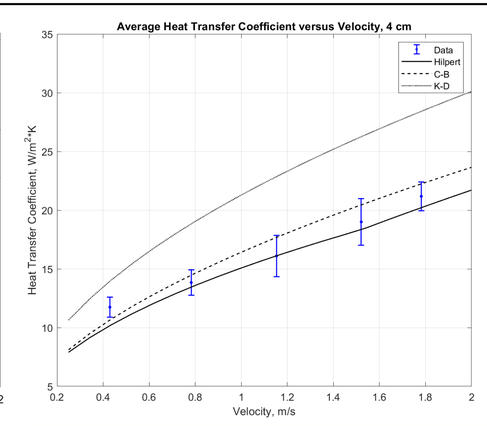
## Results/Conclusions:




Outdoor testing of Solution #1 reveals mostly overprediction of the theoretical heat transfer coefficient. However, with refinement (such as wall thickness and power input), this device has the potential for accurate measurements.




Testing of the 3-cylinder setup in a wind enclosure revealed promising results. All cylinders aligned well with the Hilpert and Churchill-Burnstein correlations. Next step is to perform testing outdoors and assess the accuracy of turbulence characteristics measurements.

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