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Measuring air temperature without shading by using virtual sensors of zero surface area

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Ideally, temperature sensors would have zero surface area so they would not heat up due to radiation and would always immediately take on the temperature of their surroundings. Such ideal sensors could be placed in direct sunlight and still measure air temperature. Following an idea by Dr. Gaylon Campbell, a method was tested to emulate these sensors by measuring the temperature of small spheres of different known diameter. Extrapolating the diameter - temperature relation of the measured sensors to zero diameter allowed for estimation of the temperature of a sensor with no diameter. The associated extrapolate temperature would be equal to the air temperature.

Lab tests in a wind tunnel showed good results for this method under steady state conditions. Field tests in Zambia and South Africa showed that, under variable conditions, the estimation of air temperature is noisy due to the different time constants of the different spheres due to their differences in volume. By filtering the individual signals, one can correct for the differences in volume as well. The result is that air temperature can be estimated accurately but high frequency information is lost.