

Some Info for the CAESAR Discussion

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September 17, 2020

THE PROBLEM RE SENSIBLE-HEAT FLUX

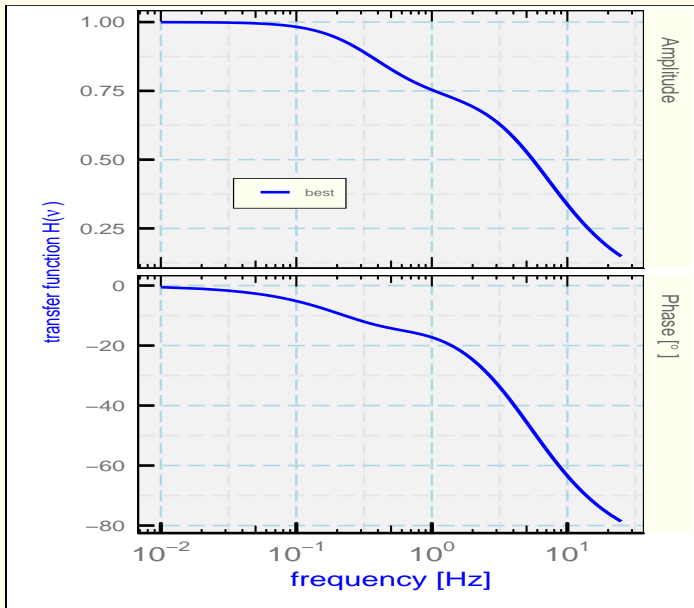
The Response Time of a Thermometer Can Affect the Measurement

- Desirable: measure at frequencies above 1 Hz (10 Hz?).
- The standard sensor, the Rosemount 102E4A2, doesn't respond fast enough and so misses part of the flux.
- The response also introduces a phase shift, potentially giving a wrong-sign contribution for some frequencies.

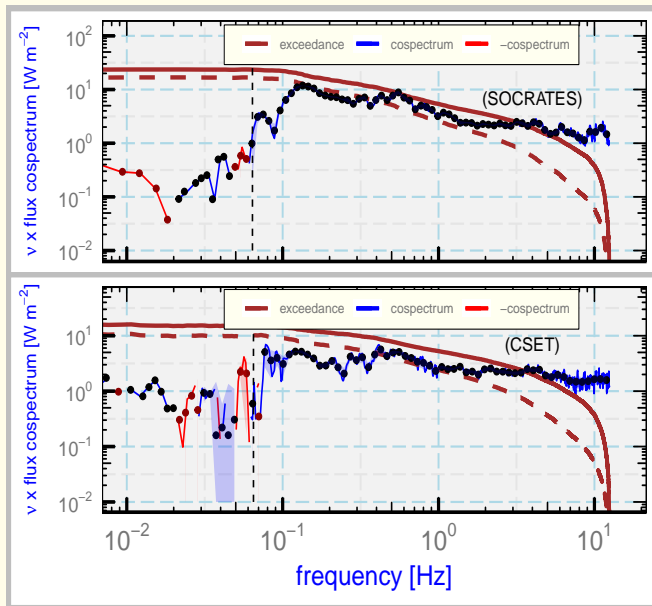
Recent Work

- The frequency-domain transfer function was determined for the sensor.
$$H(\nu) = (\text{sensor output}) / (\text{measurand input})$$
$$H(\nu) \text{ has both amplitude (gain) and phase.}$$
- The transfer function was found by using the known input provided by dynamic heating.

THE TRANSFER FUNCTION



CORRECTIONS ARE POSSIBLE, often 30-35%. Examples:



SUGGESTED ASSESSMENT:

For the NSF/NCAR C-130:

- Defensible measurements of sensible-heat flux are possible.
- Uncertainty arising from sensor response: 5% or less.
- The usual restrictions re leg lengths apply and often require long legs in relatively homogeneous conditions.

The situation is less studied for latent-heat flux:

- There are several candidate sensors for water vapor:
 - ▶ VCSEL – the standard sensor on RAF aircraft, but a recent change to improve instrument resolution needs study.
 - ▶ UV Hygrometer – has provided good measurements, but it has not been studied as much as other sensors.
 - ▶ Picarro – needs study for flux applications. Uses sample tubing.