

## Class Exercise (Toy Example)

### Introduction to Data Assimilation

#### Toy Example:

We want to measure the temperature in this room, and we have two thermometers that measure temperature with errors:

$$T_1 = T_t + e_1$$

$$T_2 = T_t + e_2$$

where  $T_t$  is the true value (which, like the errors, we never exactly know in reality).

We assume that the errors are random and unbiased and normally distributed: i.e.

$$E(e_1) = E(e_2) = 0$$

where  $E(\ )$  is the “expectation”. We also know the variances of these errors: i.e.

$$E(e_1^2) = \sigma_1^2 \quad \text{and} \quad E(e_2^2) = \sigma_2^2$$

Assume that the errors of the two measurements are uncorrelated:

$$E(e_1, e_2) = 0$$

Question: How can we estimate the true temperature in an objective (feasible) way?

Note: The importance of these toy examples is that the equations are identical to those obtained with big models and many obs.