next up previous contents

Next: 2.2 Classification of error **Up:** 2. Measurement Uncertainty **Previous:** 2. Measurement Uncertainty

2.1 General comments

The error in an experimental result, or the difference between the measurement and the correct value, usually must be estimated in some way from knowledge of the performance of the instrument or from calibrations, intercomparisons, or repeated measurements of the same quantity. A measurement is of little use unless there is some way of estimating the associated uncertainty, so an experimental result should always be accompanied by such an estimate.[2.1]

The ***measurement uncertainty*** is an estimate of likely limits to the experimental error. It is sometimes referred to as the measurement "accuracy," but this usage is incorrect because ***accuracy*** is a measure of error, not uncertainty. ***Accuracy*** refers to the difference between a result and the true value; a measurement can, by chance, be accurate while having a large associated uncertainty.

Many different measures are used to characterize measurement error, often making it difficult to determine which interpretation should be associated with a quoted uncertainty. However, there is a growing consensus among engineering societies and among instrumentation engineers favoring one particular set of conventions. The methodology described here is consistent with recommendations from those societies, although it is not in common use in atmospheric science. Acceptance of this methodology (summarized further in section 2.4 and described fully in Abernethy and Ringheiser 1985, Abernethy and Benedict 1984, and NBS Special Publication 644) followed more than twenty years of debate within engineering societies, notably ASME, to reach agreement on standardization. Some of the key features (e.g., use of the Welch-Satterthwaite formula) were evaluated via Monte-Carlo simulations that demonstrated their utility. The history of this evolution was described by Abernethy and Ringheiser (1985). General acceptance of these approaches by engineering societies is an important factor favoring their adoption by experimental scientists also, because an evolution is occurring toward more availability of basic instrument characteristics in these terms.

next up previous contents

Next: 2.2 Classification of error **Up:** 2. Measurement Uncertainty **Previous:** 2. Measurement Uncertainty

NCAR Advanced Study Program
http://www.asp.ucar.edu