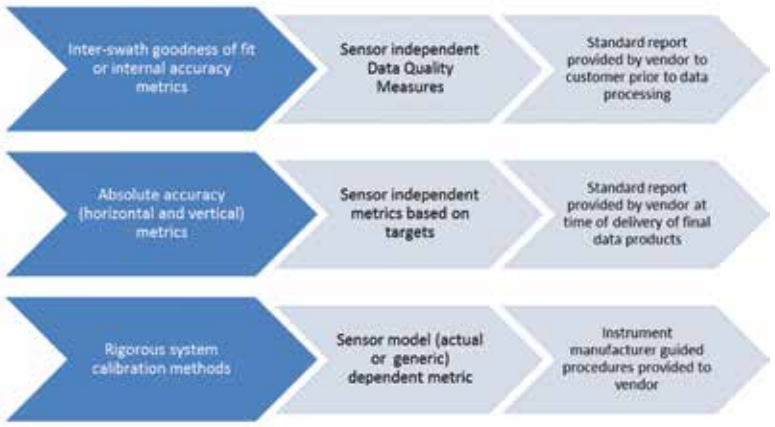

Figure 1. Framework for draft Guidelines on Geometric Accuracy and Quality of Lidar Data.

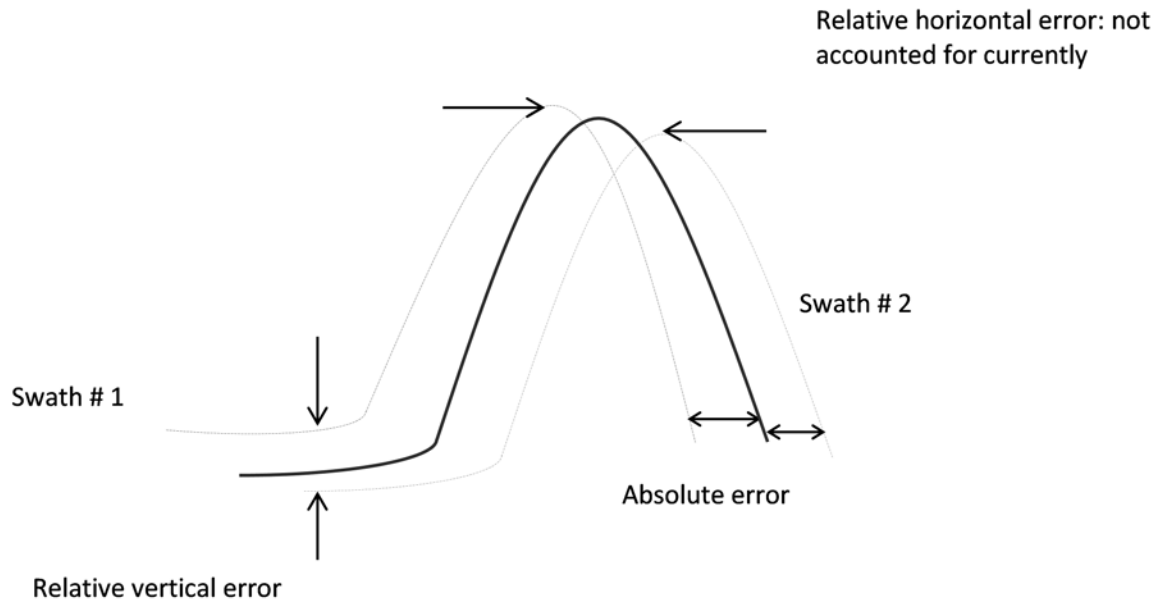

Figure 2. Surface uncertainties in hypothetical adjacent swaths. Profile of actual surface is shown as solid line while the surface defined by swath # 1 and swath # 2 are shown as dotted lines.

Internal Accuracy of Lidar Data Through DQMs

The importance of correct calibration of a lidar system to the data acquisition process and to the geometric quality of data cannot be overstated. A good calibration involves precise measurements between the various subsystems of a lidar system, including the lidar instrument, GPS receiver and IMU (Habib et. al., 2010).

Figure 2 shows a profile of a surface that falls in the overlapping region of two adjacent swaths. The surface as defined by the swaths is shown in dotted lines while the solid profile represents the actual surface. A poorly calibrated system leads to at least two kinds of errors in lidar data. The first error is that the same surface is defined in two (slightly) different ways (relative or internal error) by different swaths, and the second error is the deviation from the actual surface (absolute error). For most users of lidar data, the calibration procedures are of less concern than the data themselves. However, users would like to have a process to test the quality of calibration of the instrument, because a well-calibrated instrument is a necessary condition for high quality data. While data providers make every effort to reduce the kind of errors shown in Figure 2, there are no standard methodologies in current QC processes to measure the internal goodness of fit between adjacent swaths (i.e. internal or relative accuracy).

Current specifications documents (e.g. Heidemann 2012) do not provide guidance on measuring the inter-swath (internal accuracy) goodness of fit of lidar data. The ASPRS Cal/Val Working Group is investigating three quantities (Table 1) that measure the inter-swath goodness of fit. These measures describe the discrepancy between two overlapping point clouds and are often used to obtain optimal values of the transformation parameters.