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How certain are we of the uncertainties in recent ozone profile trend assessments of merged limb/occultation records? Challenges and possible ways forward.

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Abstract Text:

Most recent assessments of long-term changes in the vertical distribution of ozone (by e.g. WMO and SI2N) rely on data sets that integrate observations by multiple instruments. Several merged satellite ozone profile records have been developed over the past few years; each considers a particular set of instruments and adopts a particular merging strategy. Their intercomparison by Tummon *et al.* revealed that the current merging schemes are not sufficiently refined to correct for all major differences between the limb/occultation records. This shortcoming introduces uncertainties that need to be known to obtain a sound interpretation of the different satellite-based trend studies. In practice however, producing realistic uncertainty estimates is an intricate task which depends on a sufficiently detailed understanding of the characteristics of each contributing data record and on the subsequent interplay and propagation of these through the merging scheme. Our presentation discusses these challenges in the context of limb/occultation ozone profile records, but they are equally relevant for other instruments and atmospheric measurements. We start by showing how the NDACC and GAW-affiliated ground-based networks of ozonesonde and lidar instruments allowed us to characterize fourteen limb/occultation ozone profile records, together providing a global view over the last three decades. Our prime focus will be on techniques to estimate long-term drift since our results suggest this is the main driver of the major trend differences between the merged data sets. The single-instrument drift estimates are then used for a tentative estimate of the systematic uncertainty in the profile trends from merged data records. We conclude by reflecting on possible further steps needed to improve the merging algorithms and to obtain a better characterization of the uncertainties involved.