Many remote sensing observations of vertical profiles of atmospheric variables are obtained by instruments operating on spaceborne, airborne platforms, as well as from ground-based stations. Recently, the Complete Data Fusion (CDF) method (Ceccherini et al., 2015) was proposed for use in the combination of independent measurements of the same profile in order to exploit all the available information and obtain a comprehensive and concise description of the atmospheric state. This is a posteriori method that uses standard retrieval products. The CDF products are equivalent to those obtained with a simultaneous retrieval, considered to be the most comprehensive way of exploiting different observations of the same quantity, and offer a simpler implementation. However, so far, the CDF method was mainly applied to measurements performed by the same instrument while sounding the same asample.

Here, we consider the general problem posed by the application of the CDF method to measurements performed by different instruments that are retrieved on different vertical grids and refer to different true profiles (which correspond to the case of fusing profiles measured in different geolocations). The analysis of this problem suggests a modification of the CDF method, taking into account interval interpolation and coincidence errors. We determine the expressions of these errors and show how they enter in the CDF formula. The study is performed using simulated measurements of ozone profiles obtained in the ultraviolet and in the thermal infrared in the framework of the Sentinel 4 (S4) mission of the Copernicus programme (http://www.copernicus.eu/main/missions).

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