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On instrumental errors and related correction strategies of ozonesondes: possible effect on calculated ozone trends for the nearby sites Uccle and De Bilt

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The ozonesonde stations at Uccle (Belgium) and De Bilt (Netherlands) are separated by only 175 km, but use different ozonesonde types, different operating procedures, and different correction strategies. As such, these stations form a unique test bed for the Ozonesonde Data Quality Assessment (O3S-DQA) activity, which aims at providing a revised, homogeneous, consistent dataset with an altitude-dependent estimated uncertainty for each revised profile. To study the impact of the corrections on the ozone profiles and trends, we compared the Uccle and De Bilt average ozone profiles and vertical ozone trends, calculated from the operational corrections at both stations and the O3S-DQA corrected profiles. In the common ECC 1997-2014 period, the O3S-DQA corrections effectively reduce the differences between the Uccle and De Bilt ozone partial pressure values with respect to the operational corrections only for the stratospheric layers below the ozone maximum. The upper stratospheric ozone measurements at both sites are substantially different, regardless the used correction methodology, the origin of which is not clear. The Uccle operational correction method, applicable to both ozonesonde types used, diminishes the relative stratospheric ozone differences of the Brewer-Mast sondes in the 1993-1996 period with De Bilt from about 20-30% compared to the standard pump corrections to less than 5%. The O3S-DQA corrections bring the Uccle and De Bilt ozone trend estimates for 1997-2014 closer to each other in the lower stratosphere and lower troposphere. Throughout whole the vertical profile, these trend estimates are however not significantly different from each other, and only in the troposphere significantly positive. For the entire Uccle observation period (1969-2014), the operational

corrections lead to height-independent and consistent ozone trends for both the troposphere and the stratosphere, with rates respectively +2 to +3%/dec, and -1 to -2%/dec.