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On the Use of Satellite Observations to Fill Gaps in the Halley Station Total Ozone Record

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Measurements by the Dobson ozone spectrophotometer at the British Antarctic Survey's (BAS) Halley research station form a record of Antarctic total column ozone that dates back to 1956. Due to its location, length, and completeness, the record has been, and continues to be, uniquely important for studies of long-term changes in Antarctic ozone. However, a crack in the ice shelf on which it resides forced the station to abruptly close for eight months and [SC-UB1] led to a gap in its historic record. We develop and test a method for filling in the record of Halley total ozone by combining and bias-correcting overpass data from a range of different satellite instruments. Tests suggest that our method reproduces the monthly ground-based Dobson total ozone values to within 20 Dobson units. We show that our approach improves on the overall performance as compared to simply using the raw satellite average or an individual instrument. The method also provides a check on the consistency of the automated Dobson used at Halley after 2018 compared to earlier manual Dobson data, and suggests a significant difference between the two. The filled Halley dataset provides further support that the Antarctic ozone hole is healing not only during September, but also in January.