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A Re-processed SHADOZ (Southern Hemisphere ADditional OZonesondes) Dataset: Improvements in Station Bias and Agreement with Satellites

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Strategic ozonesonde networks coordinate and schedule launches in a fixed region to answer specific questions and support satellite validation, model evaluation and studies of atmospheric pollution and dynamics. SHADOZ (Southern Hemisphere ADditional OZonesondes) is the premier archive of tropical balloon-borne ozonesonde data at NASA/Goddard Space Flight Center with data from 14 tropical and subtropical stations provided by collaborators in Europe, Asia, Latin America and Africa <http://croc.gsfc.nasa.gov/shadoz>. The SHADOZ time series began in 1998, using electrochemical concentration cell (ECC) ozonesondes that measure profiles of ozone and are interfaced with a meteorological radiosonde to provide P-T-U information. Like many long-term sounding stations, SHADOZ has been characterized by variations in operating procedures, instrumentation, sensing solution, and data processing. Thus, there are variations in agreement with satellite ozone and biases among stations and within the data record of an individual station. These contribute to measurement uncertainty and may limit the reliability of ozone profile trends. We have recently completed the first major re-processing of the SHADOZ record based on recommendations published in the WMO GAW Report #201 [2014]. We illustrate the re-processing steps using selected SHADOZ stations from Asia, South America and Africa. The re-processing approach is site-specific to account for differences in the completeness of the original data, software options, and availability of metadata information in the historic records of each station. We quantify uncertainties in various parts of the sonde processing and compare original and re-processed SHADOZ data to co-located ground and satellite measurements of ozone. The satellite instruments include Aura's OMI (Ozone Monitoring Instrument) and MLS (Microwave Limb Sounder). The impact of re-processing on the stratospheric and tropospheric ozone columns are compared and biases are re-evaluated. In general, time series due to re-processing are improved and biases among stations reduced. Differences between re-processed and original time series can be as high as $\pm$4 DU and are most evident in the stratospheric portion of the atmosphere. The overall agreement between ground-based column ozone from Dobsons, OMI, and sondes is improved significantly in several stations largely due to corrections in the background current of the ozonesonde and its pump efficiency correction factors (PCF) in the stratosphere. All stations show better agreement with MLS in the mid-stratosphere due to corrections in the PCF.