

NASA/AURA/Microwave Limb Sounder Water Vapor Validation by MLO Raman Lidar

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The NASA/AURA/Microwave Limb Sounder (MLS) instrument has been compared to the ESRL Mauna Loa Observatory Raman water vapor lidar. The lidar has been calibrated using Vaisala RS-80 radiosondes launched from the observatory. The average standard deviation between the sondes and the lidar, in the range 6 km to 11.5 km, is 12%. The sondes indicate no overlap correction for the lidar at low altitudes is necessary. The lidar total column water has been compared to the ESRL GSD GPS total column water measurement as a check on the calibration. The correlation slope is 1.019 and $R^2 = 0.82$. The MLS measurements are significantly better in the stratosphere where the lidar has poor sensitivity. The MLS measurement in the troposphere has much lower altitude resolution than the lidar so the validation overlap altitudes are limited. The comparison with version 1.5 MLS data is shown below for 31 overpasses at the three MLS altitudes in the troposphere. Two points greater than 100% at 316 hPa are not shown. At 147 hPa the water mixing ratio is usually below 10 ppm and the lidar is unreliable. At 215 hPa the MLS measurement shows a dry bias of 18.2% +/- 37% and is consistent with the Colorado Frost-Point Hygrometer (CFH) dry bias of 23% +/- 37% for measurements at many latitudes. At 316 hPa there is also a dry bias of 20.9% +/- 66% which is consistent with the CFH's 4% +/- 62% measured at many latitudes, but the large spread in the result limits the usefulness for validating MLS. Version 2.2 MLS data have additional tropospheric altitudes but only 4 of the 31 overpass days are available at this time.

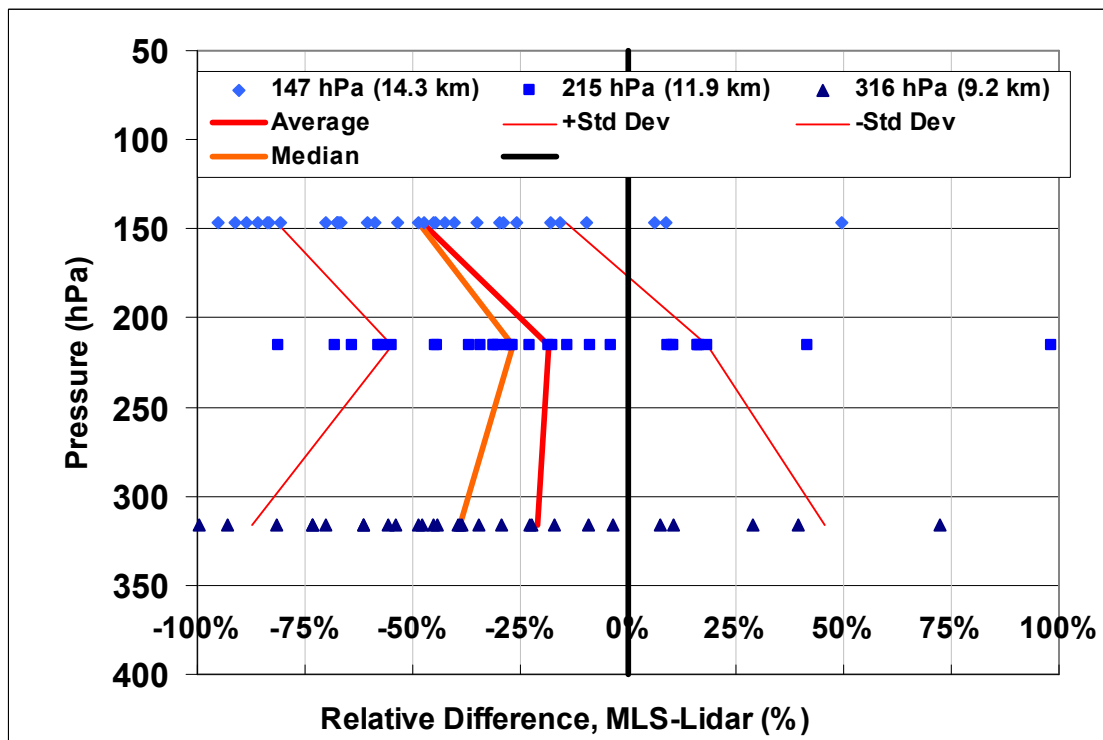


Figure 1. Relative difference between tropospheric water vapor concentrations measured by the NASA/AURA Microwave Sounder and the NOAA MLO Raman lidar at three altitudes.