The WMO calibration scheme is based on the Primary Standard Dobson instrument (GMD’s D083). All the other WMO instruments are optically aligned to be similar to D083.

The calibration for the Primary Standard is determined by the “Langley Plot Method” at GMD’s Mauna Loa Observatory. This calibration is transferred to the world network through regional calibration centers (Fig. 4) by direct comparison with the Primary Standard.

These centers conduct intercomparison campaigns to apply the various station instruments in their region by direct comparison with the regional standards (Fig. 5).

The centers also supply assistance (repairs, and training) to the stations in their region.

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A representative Langley plot. Measurements are made on the rising or setting sun, and then plotted against the thickness of the atmosphere (Airmass). The trend line is then extrapolated to zero – outside the atmosphere. The method was developed by Samuel P. Langley, the founder of the Smithsonian Astrophysical Observatory, in determining the solar constant.

Dobson Langley Calibrations are transformed so the slope of the data becomes the correction to the calibration. The clear, stable summer skies at the Mauna Loa observatory in 2012 allowed 21 days of measurement, summarized above. The correction implied is −0.3%

This is a display of the stability of the World Standard D083, based on results of the Langley plot campaigns at Mauna Loa Observatory. The results are expressed as a percentage difference from the “real” value when total ozone is calculated.

The record of initial calibrations of field Dobson Instruments versus the network standards. The improvement through time includes optical component replacement to more stable types.