

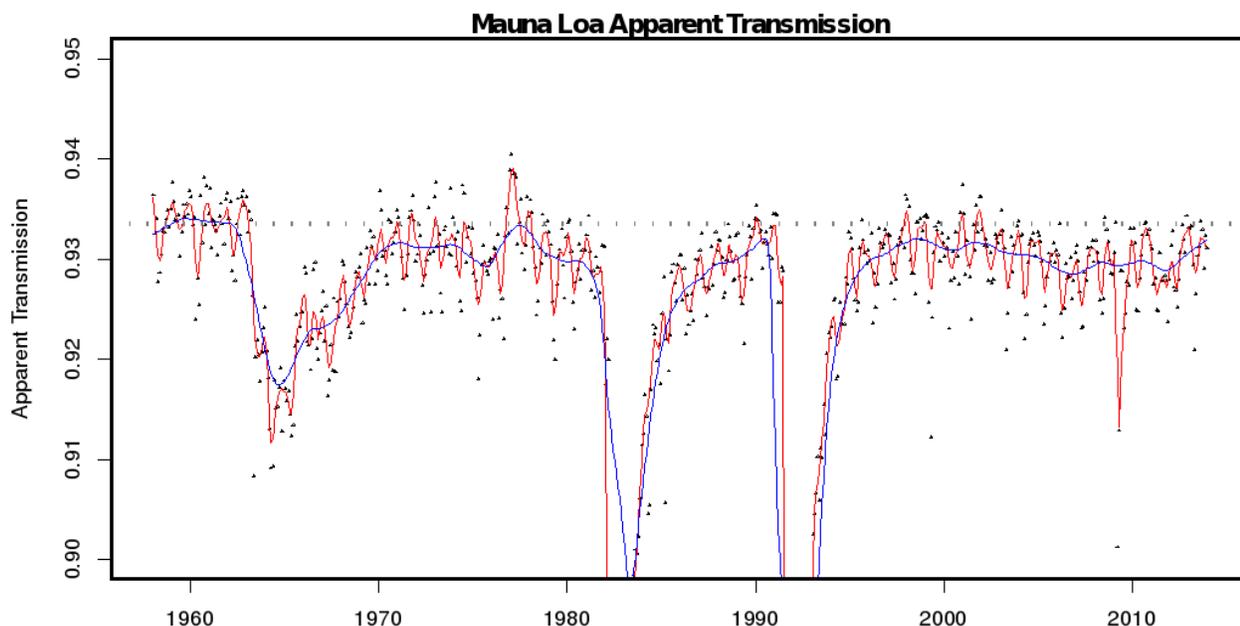
## Update of the Mauna Loa Clear-sky Atmospheric Solar Transmission 1958 – 2013

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Atmospheric apparent solar transmission has been measured for five and a half decades by the NOAA Global Monitoring Division at the Mauna Loa Observatory (MLO). MLO's remote location and high altitude makes it well suited for studying atmospheric changes in the free troposphere with limited local influences. A clear-sky "Apparent" solar Transmission (AT) is calculated using the ratio of direct-beam broadband pyrheliometer measurements at fixed atmospheric paths (airmass) [Ellis and Pueschel, 1971]. The MLO AT is particularly sensitive to changes in background stratospheric aerosols and the influence of volcanic eruptions. The updated clear-sky AT from 1958 to 2013 monthly record is computed from daily morning values to remove boundary layer influences due to upslope winds (Figure 1). The aerosol signal from the eruptions of Agung, El Chichon, and Mt Pinatubo in 1964, 1982, and 1991, respectively are clearly visible in the record. The 6-month running smoothed fit to the monthly values highlights the seasonal trends in the data that have been attributed primarily to Asian aerosol transport in the spring [Bodhaine et al., 1981]. This seasonal variability of the clear-sky AT has an amplitude of  $\sim 0.007$ . A 24-month running smoothed fit highlights the longer term changes. The gray dashed line reflects the cleanest background observed from 1958 – 1962 in the record except for a brief period in 1978. After the eruption of Mount Pinatubo in 1991, the clear-sky AT reached a maximum in 1998 with a subsequent slow decrease through 2010 that was attributed to smaller volcanic eruptions [Vernier et al., 2011; Solomon et al., 2011]. The last few years show the AT has begun to show a slight increase. The AT results are compared with aerosol optical measurements at the site. Changes in the background aerosol have implications for climate change and surface temperature and their prediction from climate models.



**Figure 1.** Monthly mean of the clear-sky AT at MLO. Means are determined from the morning values. The red line is the 6-month running smoothed fit, and the blue line is the 24-month smoothed fit using only monthly means that include at least 10 days. The dashed line is the background level from 1958 – 1972.