Retrospective Forecast Stability of Hockey-Stick Analysis on NOAA Cohesive SBUV(/2) Total Ozone Trend

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Since the implementation of Montreal Protocol, and in particular the associated Multilateral Fund in 1991, the ozone community has been examining the plausible alleviation of the ozone depletion. Both statistical analyses and model simulations have been conducted to assess the change of ozone trends in anticipation of a possible recovery.

Meanwhile, in terms of observations, many new sciences and technologies have been developed; hence, the algorithms have been constantly revised for improvements. Measurements, such as the 37 year SBUV(/2) from NOAA operational polar satellites, have been continuously reprocessed. Due to the intrinsic variability of ozone, the revision of the measurement data may have impacted the periodic analyses over the past years, when the trend signals were weak and sensitive.

It is currently believed that the length of the time series is sufficient to more likely in detecting the increase of ozone induced by the implementation of the Protocol. Also the data now is suitable for a retrospective re-evaluation of algorithms for assessing the past capability in determining the trends.

In this study, we evaluate the widely used Hockey-Stick statistical model of Reinsel et al (2002). We successively reprocess the trend analysis of the Hockey-Stick statistical model at 2-year increments from 1999 through 2015 with a single Cohesive SBUV(/2) total ozone data set of 1979-2015. The objective is to examine how and if the standard error, SE, of the trend narrows through the years and the trends reach a stable value.

The analysis takes into the consideration of the ozone modulation by solar cycle, Arctic and Antarctic Oscillations, QBO, as well as the quality of the observational data affected by the eruption of Mt. Pinatubo volcano.

The analysis was applied to 45N, 45S, and a domain average of 50N to 50S. The results indicate that the SE of trend for 50N to 50S levels off near the year 2009; 45N also exhibits similar pattern, while 45S is less definitive. The coefficients of a number of predictors, such as solar, also show similar patterns. The SEs from the Hockey-Stick statistical model suggest that with the given conditions, the reversal of ozone trend has been more statistically stables, thus that the trend forecast could not be conclusive prior to 2009. Other details will be presented.