Handheld sunphotometers, such as the Microtops II (manufactured by Solar Light, Inc.), provide a simple and inexpensive means to measure in situ aerosol optical thickness (AOT). Sunphotometers require that the user manually points the instrument at the sun. Unstable platforms, such as a ship at sea, can make this difficult, causing pointing errors. A poorly pointed instrument mistakenly records less than the full direct solar radiance, so the computed AOT is much higher than reality, and can be mistaken as cloud or dust. To remove pointing errors when used at sea (Porter et al. 2001), this bias was attributed to the failure of the Microtops II measurement protocol, intended for land oceanic studies (SIM BIOS) Projects have been collecting maritime AOT data since 1997. As the normalized variance is reduced below the threshold or the number of points becomes too small, the normalized variance of a group is above a threshold, the highest AOT measurement is kept the maximum (rather than average) value of a sequence of measurements. Several sets of these sequences are made for each intended data point. Once on shore, a second screening algorithm calculates a normalized standard deviation (N SD ) value for each set of measurements in each band. If the N SD is above a threshold of 0.05, the lowest voltage (highest AOT) value is averaged. On the other hand, if the threshold of the NSD is below 0.05, the highest voltage (lowest AOT) value is averaged. The passed points are those that passed this screening and reductions the effectiveness of data merger.

The Microtops II instrument has a default screening protocol intended to solve the pointing error problem. Figure 2, above, and Porter et al. 2001, illustrate that the default protocol is not sufficient for unstable platforms such as a boat. A new protocol is to be used as part of the SIM BIOS Project, a method to correct for pointing errors must be found.

To reduce the possibility of recording data with pointing error contamination, two steps were taken. First, the measurement protocol was changed. Unlike the default protocol, which saves the average of the 4 largest (out of 32) voltage values, the new protocol logs the largest single value of each band. If the NSD is above a threshold of 0.05, the lowest voltage (highest AOT) value is removed, and the NSD recalculated. If it is less than 0.05 or there are not enough points left to calculate the standard deviation, the passed points are those that passed this iterative process in all bands. Figure 4 shows this screening method.

Several versions of this protocol were tested on a recent California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruise, and a post-processing algorithm was developed to remove pointing errors. These results were compared to concurrent measurements using the old protocol. Finally, a separate post-processing algorithm was created for data already gathered with the old protocol, based on statistical calculations by the instrument at the time of capture.

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The new protocol and processing algorithm will reduce pointing errors in new data, while the old protocol will correct for past pointing errors. The Berkeley Environmental Archive and Storage System (SeaBASS), contains Microtops II AOT data from 1997 to 2001. To remove data with pointing errors, an iterative screening algorithm. This algorithm removes points whose standard deviation, in terms of AOT, exceed the instrument error of 0.015. Figures 6 and 7 show examples of old data which have been reprocessed to remove pointing errors.

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