3.1.4. LONG-TERM TRENDS

Long-term trends in CN concentration, σ_{sp}, σ_{ap}, ω_o, and å are plotted in Figures 3.3 and 3.4 for the baseline observatories. The monthly means are plotted along with a linear trend line fitted to the data. The aerosol properties at BRW exhibit an annual decrease in σ_{sp} of about 2% per year since 1980. This reduction in aerosol scattering has been attributed to decreased anthropogenic emissions from Europe and Russia [*Bodhaine*, 1989] and is most apparent during March when the Arctic haze effect is largest. The corresponding decrease in the Ångström exponent over the same time period points to a shift in the aerosol size distribution to a larger fraction of coarse mode seasalt aerosol. *Stone* [1997] noted a long-term increase in surface temperatures and cloud coverage at BRW from 1965-1995 that derives from changing circulation patterns and may account for the reduction in σ_{sp} by enhanced scavenging of accumulation mode aerosols.

Long-term trends in CN concentrations are difficult to determine at this time since the data record contains measurements from two different instruments, a GE water-based CN counter and a TSI butanol-based CN counter. New TSI butanol-based CN counters were installed in January 1989 at SPO, January 1993 at SMO, January 1991 at MLO, and January 1991 at BRW. The TSI butanol-based CN counter concentrations are 1.5-2 times higher than the old GE water-based CN counter. The reason for this difference is not known. Before any long-term trend analysis can be conducted, this difference needs to be resolved, and the data sets need to be put on the same scale.

Previous reports describing the aerosol data sets include: BRW: *Bodhaine* [1989, 1995]; *Quakenbush and Bodhaine* [1986]; *Bodhaine and Dutton* [1993]; *Barrie* [1996]; MLO: *Bodhaine* [1995]; SMO: *Bodhaine and DeLuisi* [1985]; SPO: *Bodhaine et al*. [1986, 1987, 1992]; *Bergin et al*. [1998]; WSA: *McInnes et al.* [1998].

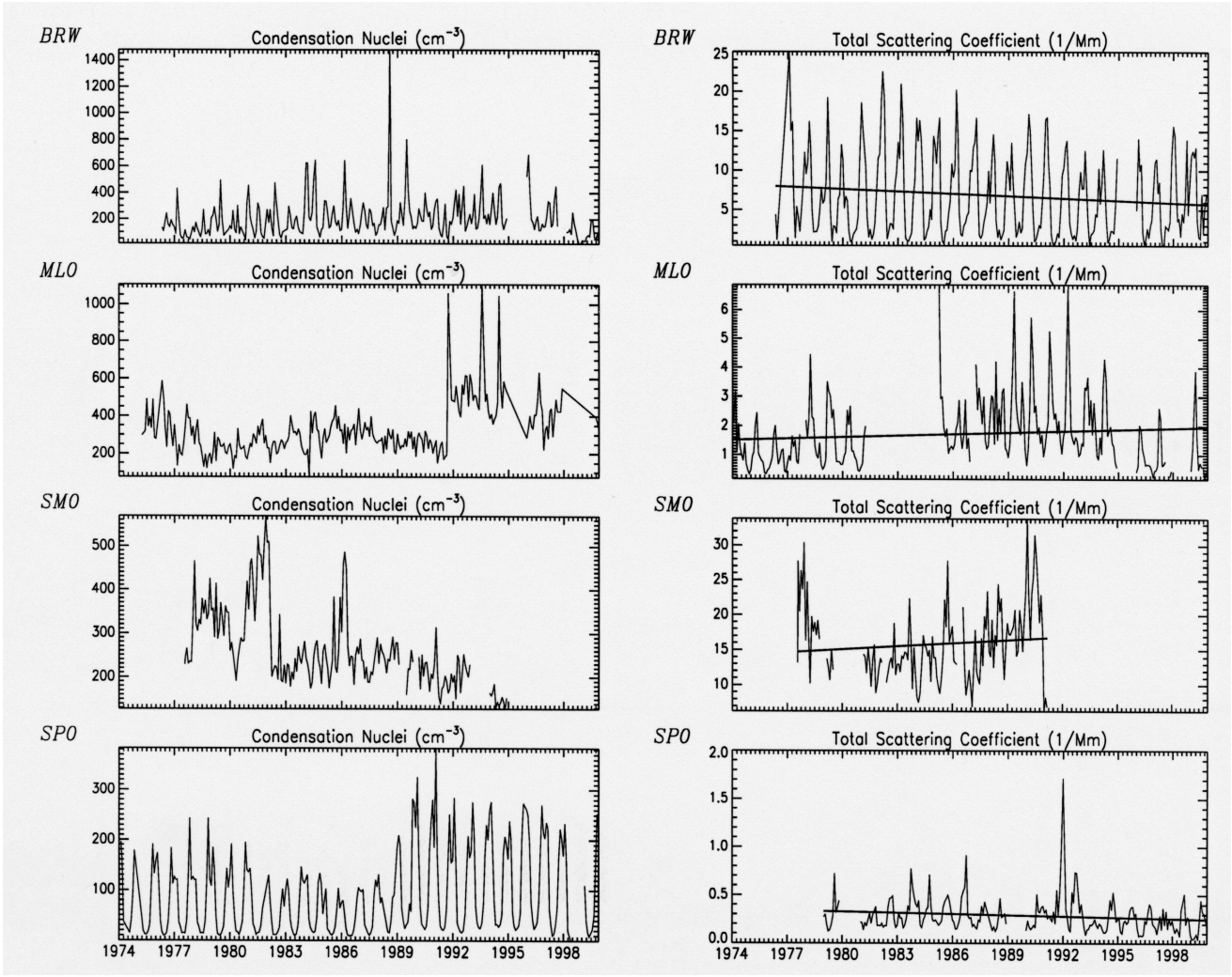

Fig. 3.3. Long-term trends for baseline stations of monthly averaged condensation nuclei concentration and total scattering coefficient at 550 nm. A simple linear fit is given for the scattering coefficient but is omitted for the condensation nuclei concentration since instrument changes make a trend line inappropriate.

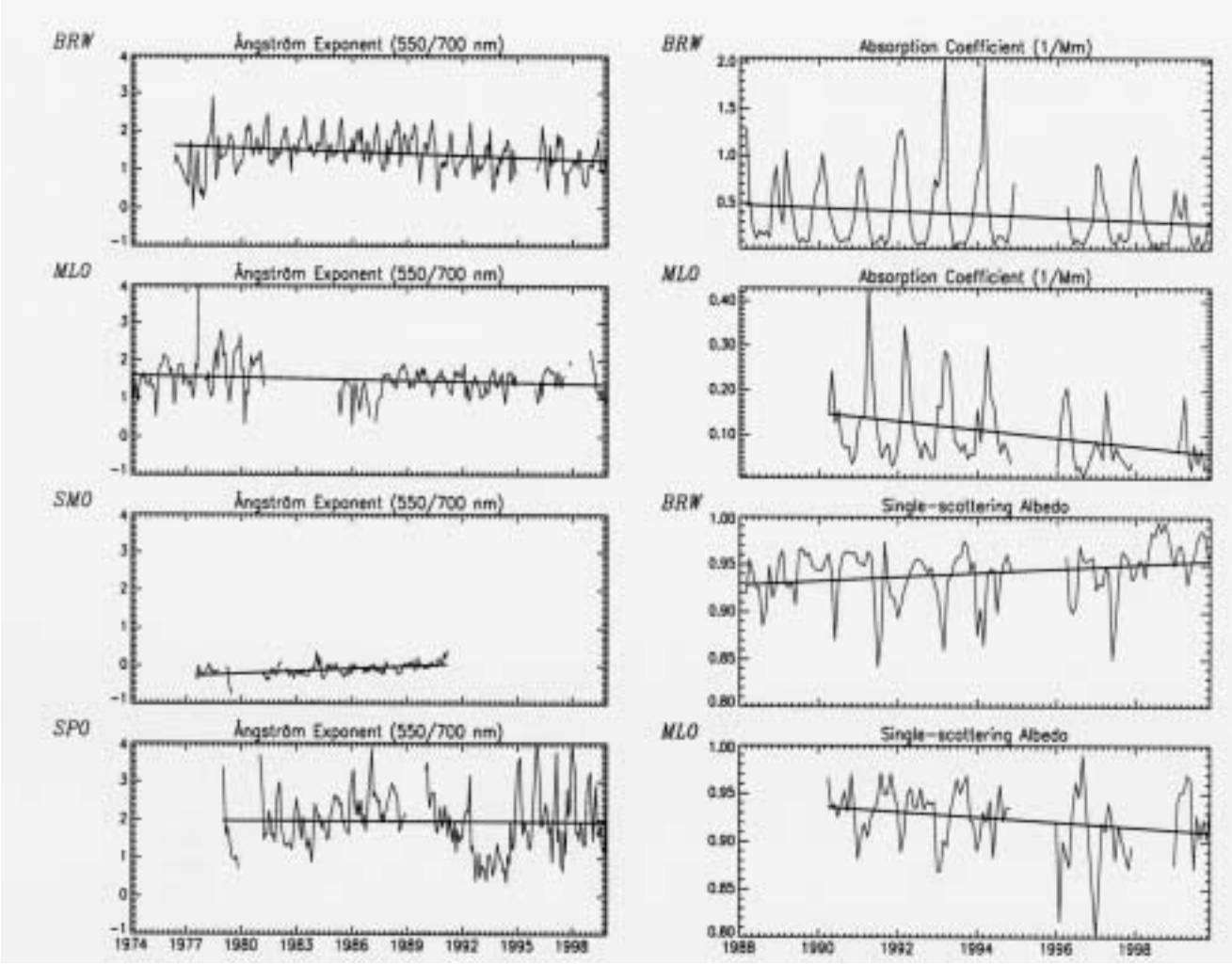

Fig. 3.4. Long-term trends for baseline stations of monthly averaged Ångström exponent (550/700 nm), absorption coefficient, and single-scattering albedo. A simple linear fit to the data is shown.