RE-EVALUATION OF THE LIFETIMES OF THE MAJOR CFCS AND CH_3CCL_3 USING ATMOSPHERIC TRENDS

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MEASUREMENT INTER-COMPARISON

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AGAGE and NOAA observations were averaged by month and semi-hemisphere. Figure 1 shows the percentage difference in semi-hemispheric average as measured by the two networks. Also shown is the global average of these differences. Systematic global differences point to calibration differences between the two networks, although some difference could be due to the different sampling locations of the networks.

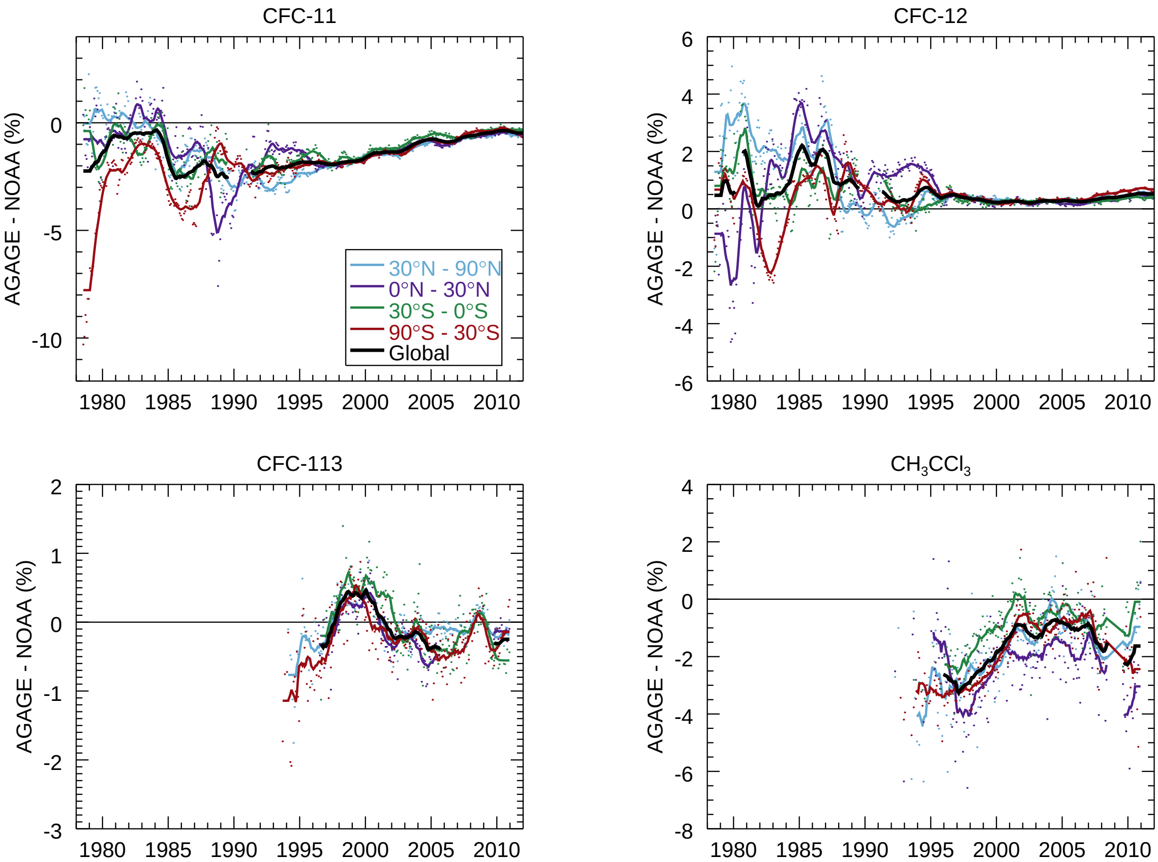

FIGURE 1. Inter-comparison of AGAGE and NOAA observations. The dots show the percentage difference in monthly-mean mole fraction between the networks in each semi-hemisphere for the four gases investigated. Solid lines show the annual running mean percentage differences.

The comparison at 0S - 30S is for a single station at which both networks make independent measurements (Cape Matatula, American Samoa). This inter-comparison should provide the best estimate of the difference in calibration between the two networks, since other factors (e.g.

sampling location) do not apply. The overall trends in fractional difference at this site are similar to the global average suggesting that the global average is also a good measure of the calibration differences, and that the deviation from this number in individual semi-hemispheres could be due to measurement uncertainties and sampling location differences between the two networks.

In order to estimate the overall measurement uncertainty for the semi-hemisphere averaged observations that are compared to the model, we used this inter-comparison of the two networks. The aim was to obtain an overall measurement uncertainty that contained contributions from the temporal and spatial sub-sampling of the monthly mean in each semi-hemisphere by the two networks, and inherent measurement uncertainties (e.g. repeatability and calibration scale propagation). For each decade, we determined the standard deviation of all the monthly semi-hemispheric inter-network differences (shown in Figure 1) about the global mean difference. These values are shown in Figure 2 as blue crosses. We then estimated the overall measurement uncertainty in each decade as the mean of these standard deviations (solid black line in Figure 2).

The mean standard deviation about the global difference can be seen to improve from the 1990s until the latest measurements, indicating improvements in the measurement repeatabilities and scale propagation. The reduction in the scatter may also be partly due to the decrease in emissions which would reduce the semi-hemispheric spatial and temporal sub-sampling error by each network, as the atmospheric mole fraction becomes more spatially uniform.

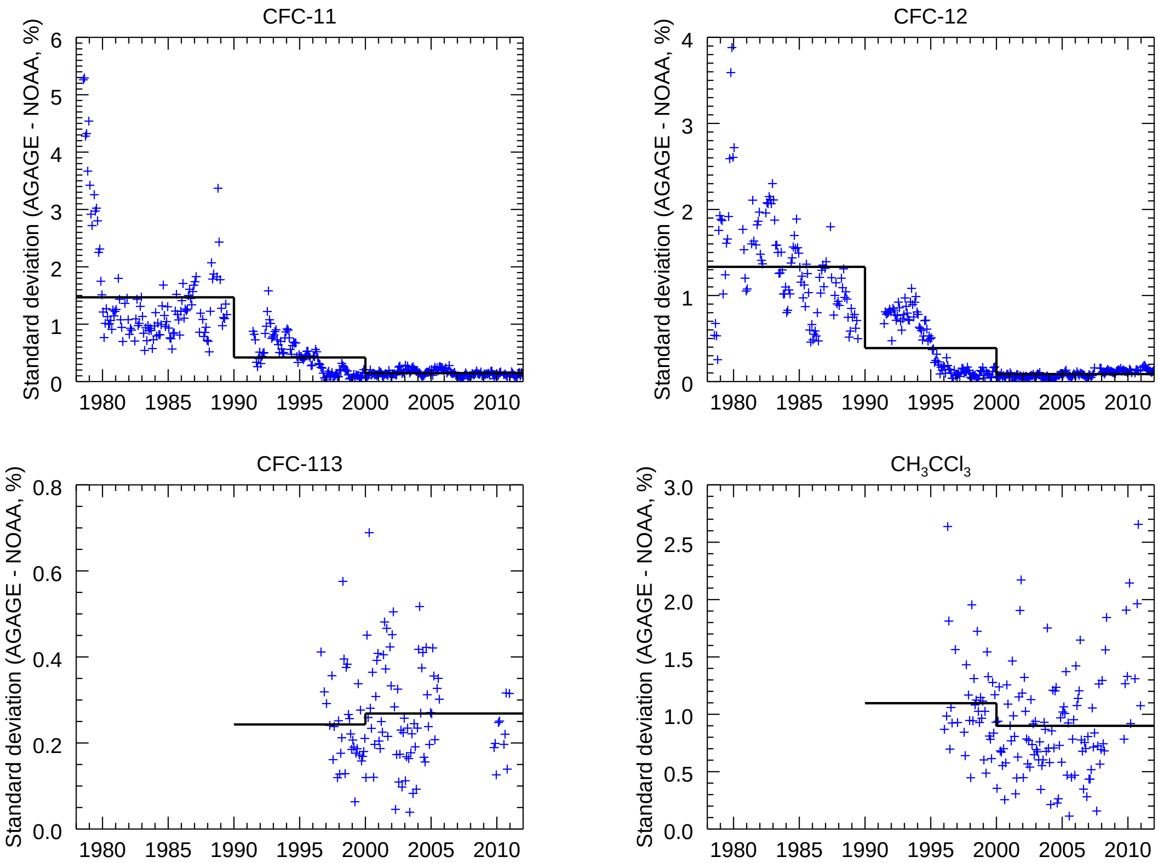

Figure 2. Standard deviations of monthly semi-hemispheric AGAGE - NOAA differences about the global mean difference (blue crosses). The solid black line shows the average standard deviation in each decade.