LABORATORY EVALUATION OF SELECTED METHODS FOR DETERMINING BLACK CARBON SOURCE EMISSIONS[1]

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Abstract

A number of studies have been conducted which compare various methods for the determination of black carbon in the atmosphere. Relatively little attention has been paid, however, to similar measurements of black carbon from different types of emission sources. Of particular interest are the non-volatile emissions from commercial aircraft engines. In this research, four different techniques were compared in the laboratory using a flow tunnel system and a soot aerosol generated by a propane diffusion burner (Mini-CAST). The four methods evaluated were: NIOSH Method 5040, multi-angle absorption photometry (MAAP), laser-induced incandescence (LII), and photoacoustic detection (Micro Soot Sensor). All of these techniques were compared to Teflon filter gravimetric analysis corrected for organic carbon content. Six tests were conducted at soot concentrations of 10, 50, 100, 500, and 1000 μg/m^3 both with and without pre-treatment using a catalytic stripper. Study results showed excellent correlation between all techniques and the filter gravimetric method. In addition, the data also suggest the possibility of some sensitivity of the instrumental methods with varying levels of organic carbon in the aerosol.

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