The eddy diffusivity for any quantity is defined as the ratio of the flux to the concentration gradient. Determining ozone eddy diffusivity requires accurate specification of the very small ozone concentration gradients to allow comparison with values for heat and momentum.

A straight line of the form $C = a + b \ell n z$ was fitted to the ozone profiles, and similar fits were made to the velocity and temperature profiles as well. An estimate of $\partial C/\partial z$ at $z = 10$ m is then given by b/10, and $K_C \approx Flux(O_3)/(\partial C/\partial z)$. Similar calculations were carried out for velocity and temperature, and some results are summarized in Table 1.11.

TABLE 1.11. Estimated Values of Momentum (K_M), Diffusivity for Heat (K_H) and Eddy Diffusivity (K_C) at 10 m.

Run	K_M, m²/sec	K_H, m²/sec	K_C, m²/sec
1	3.29	3.87	3.63
2	3.32	3.58	4.42
3	1.90	2.99	3.80
4	1.73	2.27	4.65
5	1.48	4.31	2.59

From these values, the ratio K_C/K_M is found to be 1.77 ± 0.62 while $K_C/K_H = 1.22 \pm 0.54$. A value of unity would be expected for one of these ratios if the transport mechanisms for ozone were identical with that for momentum or heat. The significantly better agreement with the eddy diffusivity for heat suggests that it is the more appropriate value.

Surface resistance values for ozone have been measured at two sites and were found to agree well with each other. The combined measurement of concentration profiles and eddy fluxes is a useful technique in transport and resistance studies. Results obtained from these indicate that the eddy diffusivity for ozone is more similar to that for heat than to that for momentum.

PROFILE MEASUREMENTS OF AEROSOL DEPOSITION

J. C. Doran and J. G. Droppo

A field test program, which assesses the accuracy of the gradient profile method of determining deposition velocities, is described.

The gradient method of deposition velocities has proved useful in the study of dry removal of gases, such as SO_2 and O_3 (e.g., Garland 1976). Measurements of particulate deposition by this technique are considerably more difficult, but reported results (Droppo 1977) suggest that the approach is feasible. One of the major objections to this method is that the expected small values of deposition velocity would result in exceedingly small gradients that would not be sufficiently well resolved by available measuring and analysis procedures. However, recent results (Wesely et al. 1977; Hicks and Wesely 1978) indicate that deposition velocities for small particles may be higher than previously anticipated; thus, the gradient method becomes more attractive.

Critical to the successful application of this method is the relative accuracy with which concentration differences between various heights can be measured. A careful study of this aspect of the problem has, therefore, been undertaken.

A 12.2-m tower was erected and used to mount the holder and filters that sample the ambient air. Eight filters were mounted on the tower, and they were divided into two groups of four. Each filter in a group was connected to a common pressure manifold by 1.9-cm I.D. flexible tubing. The manifold was used to equalize the pressure in each of the lines so that identical flow conditions for each filter might be established. In actual practice, minor variations in the filter holder geometries resulted in different flow rates. These rates, however, were monitored by Roots meters located at the manifold, which ensured that the meter readings were recorded at the same pressure for each line. This made pressure corrections unnecessary. The manifold itself was attached to three pumps, which were used to draw air through the lines. An independent set of pumps, meters and manifold were connected to the second group of filters. Figure 1.24 shows a schematic diagram of the arrangement.

The two lower levels of two filters each were each fixed in position on the tower at heights of 1.2 m and 2.6 m, respectively. The upper two pairs of filters could be raised and lowered by means of a cable, rope and pulley assembly. In the lowered position, the heights were 2.85 m and 3.16 m; in the raised position, they were 5.26 m and 11.7 m. This feature allowed the filters to be changed when the holders were in the lower position, thereby eliminating the need for extensive tower climbing to carry out the experiments.

Thus far, several calibration runs have been carried out with the filter holders in their lowered position, and one run has been done with the filters raised. The filters are currently being analyzed for sulfur concentration using x-ray fluorescence. Further experiments in this area are contingent upon evidence that the required concentration accuracies have been realized in these initial tests.

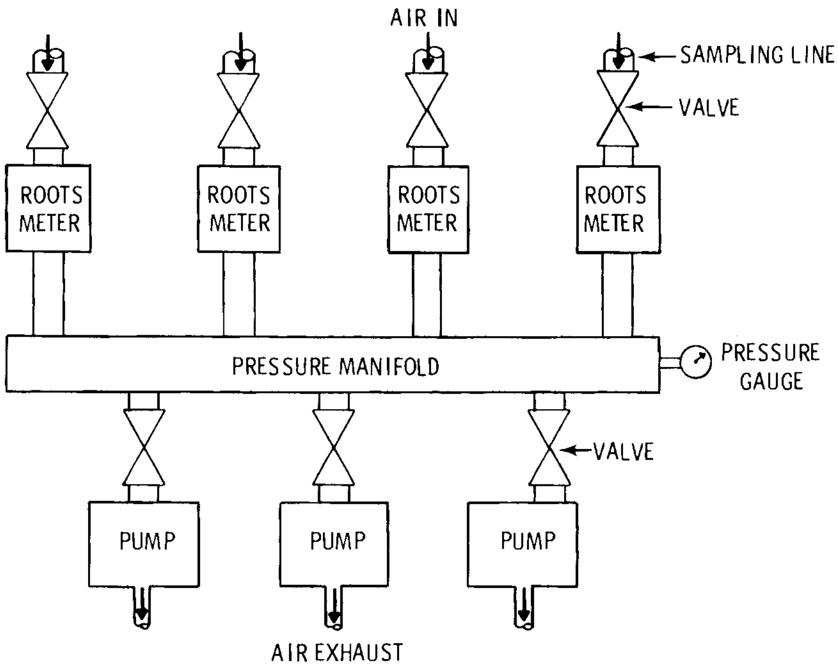

FIGURE 1.24. Schematic Diagram of Flow Measurement and Regulation System