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Project No. 92-Z13 - Assessing Dust from Production

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Objectives:

1. Quantify the impact of almond orchard canopies on ambient PM_{10} levels.
2. Compare deposition rates of particulate material inside and outside of an almond orchard.

Summary:

The California Central Valley has persistently elevated levels of fine, inhalable aerosols as measured by California Air Resources Board PM_{10} aerosol samplers. PM_{10} stands for particulate matter below 10 micrometers (about 1/100 the thickness of a human hair) which can be ingested deep into the human respiratory system posing potential health effects. Under the National Clean Air Act and their amendments, as well as the California Clean Air Act, Air Pollution Control Districts in nonattainment of national and state standard levels must form plans and regulations to reduce PM_{10} levels. To help address these tasks, the role of California agriculture needs to be understood. We have begun to measure the impacts, both positive and negative, of agricultural upon PM_{10} levels. Last year we quantified the levels of PM_{10} generated by almond harvest operations. This year, we examined how much particulate matter is "filtered" out of the atmosphere by a typical almond orchard canopy.

Three weeks of field measurements took place in October near Fresno. Measurements were made upwind, inside (above and below canopy), and downwind of an almond orchard. We then examined the vertical and horizontal PM_{10} fluxes and the deposition rates of particulate matter inside and outside of the almond canopy.

Figure 1 shows the measured PM_{10} mass concentrations for 16 sampling days at the upwind

(UP1), downwind (DOWN1), and the first inside (upwind edge, below canopy)) (IN1) sampling location. There was a measurable reduction in PM10 before and after the almond canopy. Overall, PM_{10} concentrations inside and downwind of the almond canopy were roughly 10-15% lower than upwind concentrations. These amounts varied with meteorological conditions.

Measured deposition rates inside an almond canopy were about 1/3 larger than outside the canopy. The increase of turbulent airflow near the top of the canopy increases PM_{10} flux into the canopy. This together with a sharp decrease in wind below the canopy, appeared to trap particles inside the canopy. Coupled with the deposition area of the leaves, the almond canopy tends to "filter" particulate matter out of the air. This effect, although not dramatic, appears to be measurable. Throughout a growing season, this positive impact upon PM_{10} could be significant.

Figure 1.