

The Kwinana Shoreline Fumigation Experiment in Western Australia, Australia

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The Kwinana Shoreline Fumigation Experiment(KSFE) took place in Fremantle, WA, Australia between 23 January and 8 February, 1995. All measurement systems performed to expectation. The CSIRO DAR(Division of Atmospheric Research) LIDAR measured plume sections from near the Kwinana Power Station(KPS) stacks to up to about 5 km downstream. It also measured boundary layer aerosols and the structure of the boundary layer on some occasions. Both stages A and C of KPS were used as tracers at different times. Radiosonde and double theodolite sounding systems measured temperature, humidity, air pressure and wind structure at the coast(Woodman Point) and at the inland(ALCOA residue dump) site at intervals of roughly two hours. These were supplemented by mid afternoon soundings(radiosonde and single theodolite) by Department of Environmental Protection(DEP) at Swanbourne.

The Flinders aircraft measured wind, turbulence and temperature structure of the atmospheric boundary layer, concentrations of CO₂, O₃, SO₂ and NO_x in the smoke plumes and surface radiation over both land and sea. CSIRO DCET(Division of Coal and Energy Technology) vehicle successfully interceptde many smoke plumes and using a range of tracers will be able to identify the various sources much of the time. Routine data from the DEP and Kwinana Industrial Council(KIC) air quality monitoring networks were also automatically logged. Murdoch University measured surface heat flux at Hope Valldy monitoring station and also at Wattleup monitoring station for the last five days.

The heart of the LIDAR system is a Neodymium-doped Yttrium-aluminum-garnet(Nd:YAG) laser operating at a fundamental wavelength of 1064 nm, with harmonics fo 532 nm and 355 nm. A small fraction of the laser beam is scattered back to the LIDAR, collected by a telescope and detedted by a photomultiplier tube. The intensity of the signal as a function of time is a measure of the particle concentration as a function of distance along the line of the laser shot.

The results of nine days special field observations are summarized in detail.