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Winds in Sydney

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In a wide-ranging talk, Professor Linacre, Associate Professor of Climatology at Macquarie University, outlined the various studies and data collection programs his team is involved in to provide input for a model of atmospheric quality for the Sydney environment. These involve detailed vertical soundings for thermal structure of the lower atmosphere and studies of low-level winds due to geostrophy, cold-air drainage and sea-breezes. With these data, the dispersal of air pollutants both vertically (a function of atmospheric stability) and horizontally (by advection and turbulence) should be forthcoming from the model studies.

First, Professor Linacre outlined the geography of the Sydney environment: extending from the coast, west to Penrith and the Blue Mountains, north to the Hawkesbury River basin and south to the Georges River basin. He singled out the Hawkesbury basin for particular study because it is badly ventilated in parts.

Professor Linacre's impressive organising ability was demonstrated when he described a study of low-level winds undertaken on three occasions over the past two years for the Hawkesbury region. Data from hundreds of volunteers using self-constructed inclinometer-type wind indicators, and 16 continuous recorders were obtained over approximately 36-hour periods. The data analysis shows the strength and extent of cold-air drainage flows, the sea-breeze and the considerable effect of shelter and slope on low level winds. For easy comprehension of the data by planners and others, Professor Linacre has devised the statistic 'windiness': (the 5 km × 5 km areal average of wind speed) ÷ (wind at Observatory Hill in Sydney at the same time). He showed that the windiness decreased strongly to the north in the Hawkesbury River valley.

Mention was made of the Botany Bay Project: a study of the social and physical well-being of the region. As part of the atmospheric aspects of the project the vertical structure of the wind has been studied, using small balloons and double theodolites. Marked decoupling of lower and upper winds is a feature of early morning soundings. Sea-breezes arriving at Mascot, on the Bay, have been studied for frequency and penetration distance inland. Further studies of the region were foreshadowed as part of the Sydney Oxidant Study. Utilising constant level balloons tracked by theodolite and helicopter, mobile laboratories and offshore temperature and wind profiles obtained by the Navy, a study is to be made of the circulation, mixing and chemical reactions of Sydney pollutants. It is hoped that the sea-breeze cell will be delineated.

The height, extent and slope of atmospheric inversions is also under study by Professor Linacre. Thermographs set up on the Blue Mountains were shown to be able to determine inversions equally as well as instrumented model aircraft and tethersondes.

The model aircraft, built and operated by a local club, have been used day and night with good results. The tethersonde, too, is of local production. The many detailed soundings obtained are invaluable in compiling frequency statistics of inversion strength and height. The evidence obtained so far suggests that atmospheric inversion over Sydney have negligible slope.

P.C.M.