

ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

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Atmospheric Characteristics of High Oxidant Days in Melbourne

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Dr Spillane, CSIRO Division of Atmospheric Physics, began his talk with a presentation of the observed characteristics of 'event days' - days on which the ozone concentration exceeded the WHO recommended upper level of 5.6 ppm at any monitoring site in Melbourne. Ozone density peaks about 5 hours after the peak of NO (produced from early morning traffic emission). Once an 'event' sets in it may occur on two, or three, days but rarely longer; the period of recurrence of such runs of events is typically 6 days. These time scales suggest synoptic control of such events.

Ninety-one per cent of events occurred on days of moderate wind or less. Almost all occurred with east/northeast/north or northwest winds.

The land/sea (bay) breeze circulation can remove urban air from its source of pollutants (thereby affecting its photochemistry) and then return it later in the day. A bay breeze occurred on two-thirds of event days. The onset of the bay breeze will suppress mixing. On event days mixing depths were found to be typically 300 to 400 m.

Dr Spillane suggested that a significant factor in the creation of events is the lack of ventilation induced by the blocking action of the Australian Alps. In stable night-time conditions an easterly flow over the hills could generate a wake eddy over Port Phillip Bay. All of the ten worst event days were preceded by a night favourable to such eddy formation. The expected time scale for the formation of an eddy is about 15 hours, so it would not become fully developed overnight.

Films were shown by the speaker of a laboratory experiment he had conducted to demonstrate the formation of this eddy. A scaled model of Victoria was towed through a tank of salt-stratified water; under suitable conditions the formation of a wake eddy and the concomitant stagnation in the Melbourne area was clearly visible. Surface wind observations from a number of stations around Melbourne were shown and appeared to confirm its existence.

In reply to questions, Dr Spillane remarked that a wind speed of about 6 m/s and direction 050 to 120° was required for formation of the eddy. He was asked whether there was any evidence of pollution being carried back into the urban area. The speaker replied that there was, and that pollution is increased by overnight and early morning emissions into the eddy.

R.A.P.

