JOINT COLLOQUIA

25 May 1961

The Restriction of Evaporation by Means of Surface Film

by W. W. Mansfield

Mr. Mansfield of the Division of Physical Chemistry, C. S. I. R. O, Melbourne, described how many substances spontaneously spread to form monomolecular surface films. If the molecules of the substance are of appropriate shape and size, the surface film is compact, coherent and capable of reducing evaporation in the laboratory. Many such films can reduce natural evaporation also. For practical use, a substance should form a liquid surface film of high intrinsic resistance to evaporation and should be cheap, readily available and non-toxic. At the present time the most suitable materials are hexadecanol and octadecanol mixtures.

The major losses of film, he continued, are due to retraction downwind and to evaporation of the film itself – the first is controlling for small dams and the second for large reservoirs. Estimates of these losses can be made. From experiments on rates of spreading, the amount of solid needed to replace continuously the film losses can be determined. Thus one can draw up tables giving dosages required for a given type of application, for a given storage size and shape, and for a given wind velocity.

The present major methods of application include the raft process for small areas, and the dusting and solution techniques for large areas; all give reductions in evaporation of about 30 per cent in most instances. In conclusion he mentioned that a number of reasons for occasional failure have been found, and improvements are being attempted.

29 June 1961

The Mountain Lee Wave Problem

by C. K. Rider

Mr. C. K. Rider of the Meteorology Department, University of Melbourne, discussed mountain lee waves. The mathematical theory of the problem was traced from Scorer's model to Wurtele's model. The latter, which assumes a troposphere with constant stability and wind shear, and constant wind in the stratosphere, was used to evaluate the wave length of the Warburton wave on June 4th, 1958. The value of $14\frac{1}{2}$ mile agreed tolerably with observation. A new model was described wherein the wind increases from the ground to some height then decreases to a constant value at very great height. The model gave good agreement with observations at Hobart on 31. 1. 55.

REFERENCES

M. Wurtele — Studies of lee waves in atmospheric models with continuously distributed static stability. Scientific Report No. 4. Contract AF M (122) - 263 1953.

E. Palm — Two-dimensional and three-dimensional mountain waves. Geofysiske Publikasjoner No. 20. 1957.

27 July 1961

Mean Westerly Jet Streams in the Southern Hemisphere

by H. R. Phillpot

Mr. Phillpot of the International Antarctic Analysis Centre, Melbourne, described some investigations that he had made for presentation at the Matthew Fontaine Maury Memorial Symposium for Antarctic Research to be held in conjunction with the Tenth Pacific Science Congress in Honolulu in August 1961.

Meridional cross-section diagrams of temperature and zonal wind had been constructed. Some were for selected days in September 1959 and January 1960, extending along a meridian through eastern Australia, south of latitude 25°S across the Antarctic continent and the Pole into the South American sector, to show the temperature and zonal wind distribution between 500 mb and 50 mb; other diagrams showed mean monthly cross-sections for July 1959, October 1959, January 1960 and April 1960 drawn along meridians through (i) eastern Australia (ii) South Africa and (iii) South America, again to show the temperature and zonal wind profiles from latitude 25°S to the Pole, between 500 mb and 50 mb; and a third set had been drawn for selected days in 1960 extending along a meridian through eastern Australia south of latitude 30°S to the Pole, to show the zonal wind distribution up to the 30 km level.

The thermal wind equation was used to derive wind values where direct measurements were lacking.

It was established that two westerly wind maxima might be found simultaneously on a given meridian. It was also shown that in all seasons except summer a mean wind maximum having jet stream characteristics could be found between latitudes 20° and 35°S near the 200 mb level with speed ranging from 50 to 85 kts but exceeding 100 kts over Australia; whilst another westerly wind maximum might be found between latitudes 40° and 55°S throughout the whole year. The high latitude westerly wind maximum had jet stream characteristics only in summer and autumn — in winter and spring it was found to be portion of a broad westerly circumpolar current similar to that suggested by Murgatroyd, although the mean speed, exceeding 200 kt at 30 km, was very much greater than that so far depicted for the northern hemisphere winter.