

correlation had been noted possibly because of the limited latitudinal range of the network. However, very strong jets in excess of 200 kt had been noted at relatively low latitudes and in particular a recent case with an observed wind over 270 kt from a station at about 35°S. These cases did not seem to fit readily into a pattern prescribing strongest jets at high latitudes.

MR. J. N. McRAE stated that, when completed, a project* currently under investigation by A. J. Muffatti of the Bureau would probably answer Dr. Frenzen's query regarding the latitude dependence of the intensity of jet streams over eastern Australia.

DR. FRENZEN (the speaker) replying to a question by Mr. Clarke said that Dr. Fultz believed that the unstable two-wave flow in the "dishpan" has some relevance to the sudden stratospheric warming observed in the Arctic circle in February and that possibly this applies also to that observed in the Antarctic circle in October.

It may be that in the mid-winter stratosphere the circulation around the polar vortex is strong enough to support a one wave perturbation. The weakening of the circulation in late winter or spring (the difference between the hemispheres should be instructive) makes possible a two wave system, which, at least in Arctic regions, behaves somewhat similarly to that in the "dishpan". The anticyclone appears to push a ridge through to the pole, breaking the elongated two-wave flow pattern into two cyclonic vortices.

MR. R. H. CLARKE said that in Antarctica less information is available, but it cannot be said so far that the process is similar there. An amplifying one-wave pattern appears to be responsible for the "high" replacing the "low" in the polar stratosphere. (C. E. Palmer and R. C. Taylor, 1960: Journal of Geophysical Research, 65,3319). Sudden temperature rises occur as a result of descending motion accompanying the replacement process.

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AGROMETEOROLOGY IN U. K. AND EUROPE

by C. E. Hounam

Mr. C. E. Hounam of the Bureau of Meteorology, who had recently made an extensive study tour of Agrometeorological establishments in the United Kingdom and Europe, expressed the opinion that there was not much interest in the measurement of evaporation from tanks but interest in estimating evaporation is fairly widespread, particularly in the U. K. The Meteorological Office plays a leading part in irrigation prediction services but other useful contributions are carried out by some Universities and other authorities. In West Germany an irrigation service is based on an equation developed by Haude using the saturation vapour pressure deficit of the air and a crop factor. By contrast, a well equipped station exists in Denmark using both small and large evaporimeters and data from small (1/3 sq. metre) tanks are used in predicting irrigation requirements.

Soil moisture measurements are made fairly generally but techniques vary. Various types of porous block and elements such as stainless steel-nylon are used, but of interest were two more approximate methods used in Germany for field use. One mixed calcium carbide with the weighed soil sample in a cylinder and a pressure gauge observation was calibrated to give moisture content. In another method the soil sample was weighed, wetted with alcohol and fired, then reweighed.

Lysimeters are used in most countries but designs have not been standardized. The Morris balance at Silsoe, referred to at a Colloquium in September 1962, is an outstanding instrument which has been duplicated at several sites in England and at two C. S. I. R. O.

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stations in Australia. The Dutch have some very impressive lysimetric equipment notably at Wageningen, whilst at Copenhagen two large semi-floating instruments give a continuous recording of positive and negative changes in weight.

Wind barriers are in use in many agricultural areas of U. K. and Europe, and have been put to effective use in exposed highland areas of Scotland and Wales for animal protection. An impermeable barrier, such as galvanized iron sheet, increases the turbulence behind it, and may result in more damage in local spots than no protection. However, a semi-permeable barrier (approx. 50 percent space/material ratio) overcomes this effect and reduces the wind speed behind the barrier, the degree depending on distance and height of barrier. Barriers are also in use adjacent to highways to precipitate wind-borne snow near the barrier and hence lessen build up on the highway. Although significant increases in crop yields may be expected using barriers, the benefits with respect to animals are not so certain; for example, animals congregating behind shelter may aid the spread of disease. In Kent, improved apple yields have been obtained in elevated windy areas by planting larger varieties at mid-points between smaller trees.

In Wales, a technique has been developed for measuring "weathering" using flags which are planimetered at regular intervals to assess the diminution in flag area; these "weathering" assessments correlate well with animal behaviour in seeking shelter. In West Germany a vast amount of experimentation has been carried out on wind shelter, notably by Kreutz at Giessen where an elaborate wind tunnel has been built. Plants are grown in this tunnel under controllable wind conditions.