

UNESCO has taken the initiative from EUTG, IUGG, IUSU and IASH (in which Australia is not an active participant) and is organizing a Hydrological Decade as part of the U. N. Development Decade to stimulate social and economic development.

Summing up, Mr. Kohler stressed that water was a very important commodity, and finance and managerial ability were urgently required for the more efficient use of the available water in nearly all countries.

## 2. THE INTERNATIONAL HYDROLOGICAL DECADE

by W. B. Langbein

Mr. Langbein, Staff Scientist of the U. S. Geological Survey, Washington, commenced his talk by stressing the importance of water to the social and economic welfare of man. His organisation is greatly interested in the proposed Hydrological Decade and will play a major role in the United States contribution to the Decade.

Water is as yet freely available in the Western World, but in areas such as Pakistan and Latin America there is a serious lack of water. Water science has now become a technology in the United States and its know-how is available for export to other countries.

Improvements in the design of water resource development works were slow until the last few decades because of the absence of reliable long term hydrological records. In 1890 the River Murray Commission began measuring the flow of the Murray River at Jingellic. This was one of the earliest systematic measurements of streamflow made, and the data have been used in many studies carried out in other countries.

Long period records of rainfall and river heights are required for the design of reservoirs. In the design of reservoirs without records, the first on a stream is easy to build, but the second and subsequent storages are difficult. Models of various complex processes of the hydrologic cycle need to be developed from an analysis of hydrological records. Not even the U. S. A. has an adequate range or quantity of data. The U. S. S. R. has a vast store of information and the U. S. A. is looking forward to an exchange of information.

UNESCO is organising the proposed International Hydrological Decade. Because of the spatial and temporal variability of hydrological elements, ten years is the shortest period from which useful results can be expected. The 1964 meeting of the WMO Commission for Hydrometeorology will discuss fully the UNESCO plans and the role that WMO might play in the Decade.

The next UNESCO meeting on the Decade will be held in April 1964. Principal subjects for discussion will be:-

- (i) Collection of basic data and improvement of networks;
- (ii) Collection of special data for specific research projects;
- (iii) Education in Hydrology;
- (iv) Bench Mark Stations - Research.

Attention will also be given to such subjects as:-

Bench mark stations in areas where free land development and use is permitted;

Collection of data for special studies of water balance and evapotranspiration;

Chemical quality of water;

Soil conservation.

These headings could be further sub-divided.

A programme has been prepared for international studies of rivers. Each nation is to undertake its own work to cover the rivers within its own regions. The circulation of salts in the hydrologic cycle, sediment transport and its relation to type of vegetation, are aspects which will be studied on an international basis. Australia is unique in various ways and hydrologic data gathered here would be of great value in building up a global picture of the distribution and behaviour of water.

Mr. Langbein finally discussed requirements for education and training in hydrology. Better training for hydrologists than was available at present was required. International co-operation was also required to create an interest in the subject among young people. Grants to students for research were very necessary.

24 September 1963

## RECENT ADVANCES IN RADAR PROBING OF THE ATMOSPHERE

by D. Atlas

(The Bureau of Meteorology participated in this Colloquium an Atmospheric and Electrical Physics sponsored by the Physics and Electrical Engineering Departments of the University of Melbourne and the RAAF Academy, Point Cook).

Dr. Atlas, Chief of the Weather Radar Laboratory, U. S. Air Force Cambridge Research Laboratories, Office of Aerospace Research, Sudbury, Massachusetts, U. S. A. , prefaced his talk with the observation that about 15 years ago radar observations were only qualitative but now it has advanced to a quantitative science.

Continuing, Dr. Atlas said the reflectivity of a raindrop depended directly on the sixth power of its diameter. The total reflectivity from precipitation depended on the cumulative effect of the number and diameter of raindrops.

It was found that for precipitation the relation between the diameter of the raindrops and log number of raindrops in rainfall was linear, the slope of the line varying with the rainfall rate. There is also a relationship between reflectivity and rainfall rate. When reflectivity is plotted against rainfall rate a scatter about a mean line through the origin is obtained. This scatter indicates an uncertainty in the instantaneous estimate of the rainfall rate.

The 24-hour rainfall could be obtained by integration of this rainfall rate and could be accurate to about 2 per cent. It is noted that a Japanese estimate of the accuracy compared with ordinary rain gauge results was only 14 per cent.

An automatic computer has been built which can select average intensity levels (rainfall rates) of echoes from rainfall and from these the total rainfall in a period of time. It can also select and remember the maximum altitude of the echo.

From the intensity of echoes at heights of 20,000 feet and above it is possible to detect tornadoes and severe storms. A continuous watch would need to be maintained for strong intensity echoes at this height. This continuous watch need not be kept by an observer on duty all the time, but an alarm can be used to warn the operator whenever any special phenomenon occurs.

In reply to questions from the audience, Dr. Atlas made the following comments.

(a) The correction for attenuation due to rain should be made when assessing rainfall rate. It must be understood, though, that the application of this correction may not be meaningful if the calibration of the radar is not accurately known. Recent measurements indicate that corrections for attenuation in the past have been too large.