BOOK REVIEW

"CLIMATE OF PAPUA NEW GUINEA"

McAlpine, J.R. and Keig, Gael with Falls, R. (1983). CSIRO and ANU Press, 200 pp. Aus$12.95.

The aim of the authors is to describe the climate of Papua New Guinea and, with the aid of the description, to produce a climatic classification especially suited for that nation. They directed their work toward a wide audience, including experts in the life sciences, engineers and planners.

Beginning with an account of the development and nature of the network of meteorological stations, they proceed to a discussion of the features of the circulation in the West Tropical Pacific that help to explain the climate of New Guinea. Maps of vector mean wind speed and direction at the surface and at the 700 millibar level are shown for four different months while line disturbances of the trades, shifts in the intertropical convergence zone and tropical cyclones are depicted with a series of satellite images. A brief history of tropical cyclones is supplemented with a map of their tracks. An exposition on the linkage between frequently occurring synoptic patterns to precipitation would have been useful at this point.

In a chapter on local controls and surface winds there is an excellent account of the effects of physiographic features — mountains and valleys, land and seas on air movements, ascending and descending, converging and diverging. Maps at a scale of about 1:3,000,000 illustrate the general patterns of these phenomena. Other maps display resultant surface winds at six stations for the months of January, April, July and October at 0900 and 1500 h local time. Two figures show the seasonal variation of the mean three-hourly observations of wind speed and direction at Rabaul and Lae.

Rainfall is given a generous treatment with many maps that show: mean annual rainfalls, January and July mean monthly rainfall, time of occurrence of maximum monthly rainfall, distribution of the index of seasonality, coefficient of variation of annual rainfall, regional and national correlations of logarithms of annual and of selected monthly values of rainfall, average number of days per year with rainfall exceeding specified amounts, maximum recorded daily rainfalls and maximum daily rainfalls likely every two years. Graphs indicate: mean monthly distribution of rainfall for six stations; mean number of rainy days per month for the same six stations; percentile ranges of annual rainfall for 12 stations; monthly rainfall variability expressed as percentile ranges for the same 12 stations plus one; rainfall intensity-duration combinations with return periods of two and twenty years for six stations; average number of daily occurrences by month according to time of day for eight stations; mean length of rainy and rainless periods for six stations by season; diurnal cycle of rainfall for six stations; frequency distribution of rainless periods for six stations over a 5-year standard period.

Mean maximum and minimum temperatures for January and July are displayed on maps while graphs show mean monthly maxima and minima and extreme temperatures for 11 stations, lapse rates, diurnal temperature cycles for two stations and maximum temperature cumulative probability curves by fortnight for six stations. In a discussion of lapse rates and vegetation boundaries asso-

ciated with altitude it would have been well to add that vegetation boundaries rise rapidly from the margins to the interior of the Highlands. Upper limits of agriculture correspond quite neatly with the levels at which afternoon clouds hang on the mountains, levels whose altitude also increases rapidly as one penetrates the mountains. Also a more detailed account of the effects of local relief features and aspects on temperature would have been worthwhile as many of the inhabitants of New Guinea do live in the mountains and are influenced by topoclimate. For example the favored ridge crest house sites are relatively cool in the day and relatively warm at night. There seem to be few data about topoclimates. Even so, characteristic patterns might well be described and explained for the benefit of the lay reader.

Mean monthly relative humidity index ("the ratio of the 9 a.m. vapor pressure to the saturation vapor pressure at the average mean temperature") is mapped for January and July. Another map shows Class A pan evaporation as estimated from mean monthly temperature, relative humidity, sunshine and wind data, while graphs indicate: the annual cycle for relative humidity index for 9 stations; the effect of altitude on seasonal variability of relative humidity index; daily variation in relative humidity index by fortnight for six stations; mean three-hour relative humidities for January and July at 11 stations; and seasonal variation in measured U.S. Class A pan evaporation at 7 stations. There is some confusion in the use of the terms evapotranspiration and evaporation.

Information about the levels at which clouds hang on the mountains would be quite useful, since the clouds strongly influence temperatures, relative humidity, evapotranspiration and insolation. Also fog drip may contribute appreciably to precipitation.

Maps display global solar radiation for four months of the year as well as for the whole year, while graphs show monthly variation in daylength, times of sunrise and sunset, cumulative probabilities of cloudiness by fortnights at 0900 and 1500 h. Other graphs depict: monthly variation in mean daily sunshine hours; cumulative probabilities of sunshine duration by fortnights; annual variation in the ratio of mean daily recorded sunshine hours per month to maximum possible duration of bright sun; mean daily solar radiation per month; ratio of mean daily global solar radiation per month to mean daily total radiation per month received above the atmosphere.

In contrast with this work's depiction of a winter minimum for most of New Guinea, global radiation measurements taken by H.I. Manner near Jimi River Patrol Post indicated a maximum in the winter dry season. Street's observation, in this same area, of a concentration of anthropogenic grasslands on north-facing slopes accords well with Manner's findings.

Maps show frequency and intensity of soil moisture deficiencies and mean annual water surplus while graphs display statistics on mean monthly water balance components, mean weekly soil moisture storage, frequency distribution of specified levels of soil moisture, frequency of drought periods during a standard 15-year period; frequency and lengths of periods of possibly saturated soil; mean weekly water surplus; frequency distribution of specified levels of water surplus; variability of annual water surplus. Unfortunately the description of the water balance model on p. 134 is quite confused.

The final chapter presents on maps the climates of New Guinea according to Thornthwaite, Köppen, Holdridge and Terjung classifications. A new classification of climate that "can satisfactorily distinguish all the major climatic types which are generally and locally recognised" is based on altitude and average precipitation and presented in a

table and graphs.

Concluding efforts to link climate with vegetation, land use and resource assessment are weak, ineffectual and probably clouded by error. Medical geography, which in New Guinea is strongly influenced by climate, was accorded but a sentence; a brief essay at agricultural geography produced such controversial statements as: "The almost universal use of hill terrain for traditional agriculture is most likely a response to the need for adequate drainage"; and, with reference to the general lack of inhabitants in the premontane zone, it "is too cold for optimum production of lowland crops and too warm for highland crops." The authors might better to have brought to the attention of their readers some of the excellent new literature in bioclimatology.

An extensive appendix contains tables of data for from 2 to 95 stations on aspects of winds, rainfall, temperature, relative humidity, estimates of pan evaporation, sunshine hours and solar radiation. Also there are a list of about 100 references and an index.

As simply (and importantly) a source of numerical data on the climate of eastern New Guinea the book is excellent. Presentation of climate in terms of probabilities of, for example, droughts and water surpluses of various magnitudes, makes the work especially useful for planning. Larger scale fold-out topographic maps with climate superimposed would make it even more useful.

As mentioned above, there is room for improvement in the explanation of the climate and in the discussion of its relationship to public health and agriculture.

JOHN M. STREET
Department of Geography
University of Hawaii at Manoa
Honolulu, Hawaii, U.S.A.