

001 Acharya, L.M. Frequency analysis of 24 hour maximum precipitation of Kathmandu. In: Majupuria, T.C. (ed.), Nepal: Nature's paradise, Bangkok, White Lotus, 1984, 59-63p.

002 Acharya, L.M. Precipitation distribution in Nepal in 1992. In: Annual Disaster Review 1992, Kathmandu, Water Induced Disaster Prevention Technical Centre, 1993, 37-44p.

003 Acharya, L.M. Precipitation over Nepal 1993 : An overview. In: Annual Disaster Review 1993, Kathmandu, Water Induced Disaster Prevention Technical Centre, 1994.

004 Agre, Y. Characteristics of precipitation during monsoon season in Khumbu Himal. *Sagitta*, Vol. 38, Special Issue, 1976, 84-88p.

Loc: ICIMOD, DOM

Based upon the observations taken at fifty different sites in Imja Khol catchment, ranging from the bottom of the valley to the glaciers near the ridge, the author has presented the behaviour of precipitation during monsoon season in the Himalayas. The nocturnal precipitation observed has also been related to the diurnal variation of clouds caused by the local circulation associated with the orographic condition.

005 Basnet, K. Temperature variation in Nepal. *The Himalayan Review*, Vol. 20-23 (1989-1992), 25-34p.

Loc: NDS, ICIMOD

In this paper an attempt has been made to analyse the variation in the distribution of temperature in Nepal.

006 Berthelot, E. Une interprétation climatique des données météorologiques du Népal. Grenoble, Université Scientifique de Médecine, thèse doct. 3ème cycle, 1989.

007 Bishop, B.C., Barry, C., Angstrom, A.K., Drummond, A.J., Roche, J. Solar radiation measurements in the high Himalayas (Everest region). *Journal of Applied Meteorology* 5, (1966), 94-104p.

Loc: DOM

This paper discusses the solar radiation data assembled during the Himalayan Scientific and Mountaineering Expedition of 1960-61, led by Sir Edmund Hillary, and the American Mt. Everest Expedition of 1963 led by Norman Dyhrenfurth.

008 Boesch, H. Zwei Jahre wetterbeobachtungen in Nepal (1961-1963) (Two years of weather observation in Nepal (1961 - 1963)). *Geographica Helvetica*, Number 3, 1964.

009 Chalfe, S.R. Ecology and climate in the mountain system - A review. Kathmandu, International Centre for Integrated Mountain Development, Working Paper No. 12, 1986, 60p.

Loc: ICIMOD

In this paper an attempt has been made to consider climate as a resource for development. The general features of the climate in the Himalayas are described basically against the background of precipitation distribution. The paper contains elaborate discussions on the general climatic features of Nepal. Finally, a detailed scenario of the development of meteorology and hydrology in Nepal is presented.

010 Chalfe, S.R. Mountain environments and climate change in the Hindu Kush-Himalayas. In: Martin Beniston (ed.), Mountain environments in changing climates. London and New York, Routledge, 1994, 383-404p.

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005 Basnet, K. **Temperature variation in Nepal.** *The Himalayan Review*, Vol. 20-23, (1989 - 1992), 25-34p.

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006 Berthillot, E. **Une interprétation climatique des données météorologiques du Népal.** Grenoble, Université Scientifique et Médicale, thèse doct. 3^{ème} cycle, 96p.

007 Bishop, B.C., Barry, C.; Angstrom, A.K., Drummond, A.J., Roche, J. **Solar radiation measurements in the high Himalayas (Everest region).** *Journal of Applied Meteorology* 5, (1966), 94-104p.

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008 Boesch, H. **Zwei jahre wetterbeobachtungen in Nepal (1961-1963) [Two years of weather observation in Nepal (1961 - 1963)].** *Geographica Helvetica*, Number 3, 1964.

009 Chalise, S.R. **Ecology and climate in the mountain system - A review.** Kathmandu, International Centre for Integrated Mountain Development, Working Paper No. 12, 1986, 60p.

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In this paper an attempt has been made to consider climate as a resource for development. The general features of the climate in the Himalayas are described basically against the background of precipitation distribution. The paper contains elaborate discussions on the general climatic features of Nepal. Finally, a detailed scenario of the development of meteorology and hydrology in Nepal is presented.

010 Chalise, S.R. **Mountain environments and climate change in the Hindu Kush-Himalayas.** In: Martin Beniston (ed.), *Mountain environments in changing climates.* London and New York, Routledge, 1994, 383-404p.

Loc: ICIMOD

In this paper, an attempt has been made to consider climate and climatic change as factors affecting the Himalayan environment. The paper starts with a brief discussion on the general aspects of the climate and ecology of the Hindu

Kush-Himalayas. It is interesting to note that a comparison is made of the distribution of monthly means of noon-time temperatures (1802 - 1803 and 1968 - 1990) in Kathmandu. Some implications of the potential impact of climate change on mountain environments in the HKH are also discussed.

011 *Chhetri, T.B. Evaporation study over Nepal.* M.Sc. Dissertation, Kathmandu, Tribhuvan University, 1993, 83p.

Loc: CDOM

In this dissertation, evaporation distribution over Nepal and its rate during various seasons are presented. It also deals with the latitudinal, longitudinal, and altitudinal distribution of evaporation in Nepal.

012 *Devkota, L.P. An isentropic investigation of the monsoon trough displacement and corresponding rainfall distribution in Nepal.* M.S. Thesis, USA, The University of Wisconsin, 1992, 57p.

Loc: DOM

In this thesis, the temporal and spatial distribution of summer rainfall over south Asia is studied through analyses of the distribution of the sea-level pressure, wind vector, atmospheric heating, mass transport potential, absolute vorticity, and precipitation minus evaporation (P-E) for July 1988. The diagnostics are derived in an isentropic coordinate system using ESMWF/TOGA analysis. The active break epochs of the Indian monsoon are determined through an analysis of the Hovemoller diagrams of sea-level pressure, the distribution of vertically integrated heating, and P - E.

013 *Devkota, L.P. On-set of summer monsoon in Nepal.* The Himalayan Review, Vol. XV, 1983-84, 11-20p.

Loc: NGS

The paper deals with the on-set of summer monsoon in Nepal during 1981. It examines the use of synoptic and upper air flow patterns to find out the on-set date. It concludes that the formation of depression over the Bay of Bengal and its movements accelerated the northward

shift of the monsoon trough, which started monsoon rainfall in Nepal.

014 *Dhar, O.N. The diurnal variation of rainfall at Barakshetra and Kathmandu during monsoon months.* Indian Journal of Meteorology and Geophysics, 11, 1960, 153-56p.

015 *Dhar, O.N.; Soman, M.K.; Mulye, S.S. Distribution of rainfall in the Himalayan and sub-Himalayan regions during 'breaks' in monsoon.* In: Proceedings of Hydrological Aspects of Mountainous Watersheds, India, Roorkee, University of Roorkee, 1982, 1-22 - 1-26p.

Loc: ICIMOD

In this paper, the distribution of rainfall over the Koshi Himalayas and their submontane area to the south has been studied for all the 'break' monsoon situations that occurred during the period from 1949 to 69. Only those 'break' situations having a duration of 3 days or more are considered.

016 *Dittmann, E. Statistical studies on the structure of precipitation in Nepal.* In: Studies on the climatology and phytogeography of the Himalayas, Selections from Khumbu Himal, Nepal Research Centre, Kathmandu, 1988, 1-20 p.

This paper presents several aspects of the distribution of precipitation in Nepal. The study includes regional rainfall in southern Nepal, time-series precipitation distribution, rainfall variability, and daily precipitation variation in the Kathmandu valley.

017 *Dobremez, J. F. Le Népal: Écologie et biogéographique (French language).* Paris, CNRS, 1976, 355p.

Loc: ICIMOD

The first and pioneering study published in French on the ecology and biogeography of Nepal. Comprehensive and systematic analysis of available climatic data (temperature, precipitation, humidity, and radiation) and

bioclimatic classification of Nepal are given in the first chapter of this book (31-91p), which also includes information on all types of climatic stations operating at that time.

018 *Domroes, M. Temporal and spatial variation of rainfall in the Himalayas with particular reference to mountain ecosystems. Journal of the Nepal Research Centre 2/3, 1979, 49-67p.*

Loc: ICIMOD

This paper investigates the reasoning behind the weaker regime of monsoon in the Himalayas, non-uniform Himalayan climate, and orographic effect on the Himalayan climate. The investigation is primarily based on temporal and spatial analyses of rainfall in the Himalayas. Finally, some important aspects of the ecological implications of rainfall are also discussed.

019 *ERDC. Preliminary study of sunshine duration and wind speed in some sample districts of Nepal. Kathmandu, Tribhuvan University, Institute of Science and Technology, ERDC, 1979.*

020 *Flohn, H. Contributions on the meteorology of the Himalayas, In: Studies on the climatology and phytogeography of the Himalayas, selections from Khumbu Himal, Nepal Research Centre, Kathmandu, 1988, 21-58 p.*

Loc: ICIMOD

The study is mainly based upon the thermal circulation of the Himalayas, with Tibet as the heat source. Temperature distribution, heat budget, and precipitation regime of the Himalayas are studied.

021 *Ghimire, B.R.; Upadhyay, B.P. General climatology & pollution concentration in Kathmandu valley. Presented: International Conference on Tropical Meteorology and Air Pollution, Delhi, India, (1988), 7p.*

022 *Gill, G.J. But how does it compare with the real data? In: Research report*

series Number 16, Kathmandu, HMG, Ministry of Agriculture/Winrock International, 1992, 20p.

Loc: ICIMOD

This paper analyses different temporal patterns of rainfall at Lumle (West Nepal) using bar diagrams.

023 *Glaciological Expedition of Nepal. Meteorological Data in Shorong Himal, East Nepal. Seppyo, Vol. 41, Special Issue, 1980, 111p.*

Loc: ICIMOD, DOM

This paper presents the monthly rainfall and snowmelt amount and the mean and extreme air temperatures at Shorong Himal during the period from May to Sept. 1978.

024 *Higuchi, K. Effect of nocturnal precipitation on the mass balance of the Rikha Samba glacier, Hidden valley, Nepal. Seppyo, Vol. 39, Special Issue. 1977, 43-49p.*

Loc: ICIMOD, DOM

More than 75% of the annual precipitation in Nepal occurs during the monsoon season. About 60% of the total precipitation during the monsoon season occurs mainly at night and in the form of snow in the ablation area of the Rikha Samba glacier and in the day time it is in the form of rain. The author has focussed his study mainly on the mass balance of the Rikha Samba glacier, precipitation in the Hidden Valley, temperature condition for change of precipitation form, and the effect of nocturnal precipitation on the ablation area of Rikha Samba glacier.

025 *Higuchi, K.; Ageta, Y.; Yasunari, T.; Inoue, J. Characteristics of precipitation during the monsoon season in high mountain areas of the Nepal Himalaya. In: Hydrological Aspects of Alpine and High Mountain Areas, IAHS Publ. No. 138, United Kingdom, Oxfordshire, Institute of Hydrology, July 1992, 21-30p.*

Meteorology

026 Hindman, E.E. *Air motions in the Khumbu Himal and possible soaring flights.* *Tech. Soaring*, 18, 1994.

027 Hindman, E.E. *Ascending Mt. Everest through soaring flight.* *Tech. Soaring*, 10, 1990, 44-52p.

028 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, 1966*, Kathmandu, Department of Hydrology and Meteorology, 1968, 194p.

Loc: DHM, ICIMOD

In this publication air temperature and precipitation data for 1966 are tabulated.

029 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, 1967 and 1968*, Kathmandu, Department of Hydrology and Meteorology, 1971, 89p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, and precipitation data are tabulated for 1967 and 1968.

030 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, 1969*. Kathmandu, Department of Hydrology and Meteorology, 1972, 47p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, and precipitation data for 1969 are tabulated.

031 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, 1970*. Kathmandu, Department of Hydrology and Meteorology, 1973, 54p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, and precipitation data for 1970 are tabulated.

032 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, Vol. I, 1971-1975*. Kathmandu, Department of Hydrology and Meteorology, 1977, 366p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, and precipitation data for the period from 1971 to 1975 are tabulated.

033 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, Vol. II, (1921 - 1975), Special supplement, Kathmandu Valley*. Kathmandu, Department of Hydrology and Meteorology, 1977, 129p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, and the wind of Kathmandu for the period from 1921 to 1975 are tabulated.

034 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, Vol. III, (1967 - 1975), Special supplement, Kathmandu Valley*. Kathmandu, Department of Hydrology and Meteorology, 1977, 26p

Loc: DHM

In this publication air temperature, relative humidity, and the wind of Kathmandu for the period from 1967-1975 are tabulated.

035 HMG, Department of Hydrology and Meteorology. *Climatological records of Nepal, Vol. I, 1976 - 1980*. Kathmandu, Department of Hydrology and Meteorology, 1982, 410p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, vapour pressure, and precipitation data for the period from 1976-1980 are tabulated.

036 HMG, Department of Hydrology and Meteorology. *Climatological records of*

Nepal, Vol. I, 1981 - 1982. Kathmandu, Department of Hydrology and Meteorology, 1984, 174p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, vapour pressure, and precipitation data for the period from 1981 to 1982 are tabulated.

037 HMG, Department of Hydrology and Meteorology. **Climatological records of Nepal, Vol. I, 1983 - 1984.** Kathmandu, Department of Hydrology and Meteorology, 1986, 187p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, vapour pressure, and precipitation data for the period from 1983 to 1984 are tabulated.

038 HMG, Department of Hydrology and Meteorology. **Climatological records of Nepal, 1976-1984, supplemental data, Vol. II.** Kathmandu, Department of Hydrology and Meteorology, 1986, 51p.

Loc: DHM, ICIMOD

In this publication evaporation, sunshine, wind, and soil temperature data for the period from 1976 to 1984 are tabulated.

039 HMG, Department of Hydrology and Meteorology. **Climatological records of Nepal, 1985 - 1986.** Kathmandu, Department of Hydrology and Meteorology, 1988, 232p.

Loc: DHM, ICIMOD

In this publication air temperature, relative humidity, vapour pressure, and precipitation data for the period from 1985 to 1986 are tabulated.

040 HMG, Department of Hydrology and Meteorology. **Climatological records of Nepal, 1987 - 1990.** Kathmandu,

Department of Hydrology and Meteorology, 1992, 253p

Loc: DHM, ICIMOD

In this publication precipitation data for the period from 1987-1990 are tabulated.

041 Horman, K. **Computer-based climatological maps for high mountain areas.** MEM (Mountain Environmental Management) series no. 18, Kathmandu, ICIMOD, 1994, 33 p.

Loc: ICIMOD

In this paper, computer-based climatological maps of the Himalayas are presented. The author also discusses the techniques for the development of spatial climatic regression models and their application in the computation of climatological grid data sets and finally climatological maps.

042 Howell, J.; Sunwar, I.; Kafle, I. **The 1990 monsoon on the Koshi zone roads.** Roughton and Partners, Eastern Region Interim Project, Dharan, 1990, 59p.

Loc: ICIMOD

043 Ikegami, K.; Higuchi, K.; Ono, A. **Preliminary report on the vertical distribution of aerosol particles over the Nepal Himalaya.** *Seppyo*, Vol. 41, Special Issue, 1980, 86-89p.

Loc: ICIMOD, DOM

Aircraft observation of aerosol particles was undertaken over the Nepal Himalayas on October 22, 1978. Analysis of the samplings of aerosols taken at ground level (1320masl), 2000m, 3000m and 5000masl over Kathmandu, and 5600m and 7800masl over Langtang valley are presented. The collected particles are classified into four types and their characteristics are discussed.

044 Ikegami, K.; Inoue, J.; Higuchi, K.; Ono, A. **Atmospheric aerosol particles observed in high altitude Himalayas.**

Seppyo, Vol. 40, Special Issue, 1978, 50-55p.

Loc: ICIMOD, DOM

Studies of the atmospheric aerosol particles are important from the point of view of cloud physics, atmospheric optics, and air pollution. Aerosol observation was carried out at Lhajung (4420m), Shorong (4900m), and Muktinath (3700m). From the physical appearance and chemical tests of individual particles under an electronic microscope, it was concluded that the particles mostly contained sulfate during the monsoon season.

045 *Inoue, J. Climate of Khumbu Himal.* Seppyo, Vol. 38, Special Issue, 1976, 66-73p.

Loc: ICIMOD, DOM

Based upon the meteorological data from 1973 to 1974 at Lhajung (4420m), the author illustrates that, in Khumbu Himal, there exists marked rainy and dry seasons with 70 - 80% of the precipitation occurring in the monsoon season. The mean annual temperature of Lhajung is nearly 0° C. The climate of Lhajung fits "the polar climate due to high altitude" under Koeppen's classification. Precipitation, radiation, temperature, humidity, and wind are also discussed separately.

046 *Inoue, J. An extraordinary gale at the end of winter in the Himalayas.* Seppyo, Vol. 38, Special Issue, 1976, 102-104p.

Loc: ICIMOD, DOM

A strong gale of 25m/s was observed on March 20, 1974, at Lhajung station. The author suggests that the gale, which continued for half a day, was probably due to the foehn wind from the Tibetan Plateau.

047 *Inoue, J. Gales over the Nepal Himalayas in 1976.* Seppyo, Vol. 40, Special Issue, 1978, 56-59p.

Loc: ICIMOD, DOM

Over a four-year observation period in the Nepal Himalayas, three extraordinary gales were recorded. A synoptic analysis of the gales is presented and discussed. The gale, which is

northerly, is thought to have been caused by the foehn wind. It concludes that cyclogenesis over the Himalayas is a necessary condition for the occurrence of a gale.

048 *Inoue, J.; Hayashi, T. On the wind energy in the Himalayas.* Seppyo, Vol. 41, Special Issue, 1980, 100-103p.

Loc: ICIMOD, DOM

In this paper, the wind power in the mountains and valleys of the Nepal Himalayas is estimated through parameterisation of the wind speed distribution according to the Weibull distribution. The calculations were estimated for winter, summer, monsoon and pre-monsoon. The data at Lhajung station (4,420m) in Khumbu Himal, East Nepal, from April 1973 to Dec. 1974 were used.

049 *Joshi, D.P. Climate of Kathmandu: A bioclimatic analysis.* Cahiers Nepalais Documents (CNRS, Paris), 10, 33-46p.

050 *Joshi, D.P. The climate of Namche Bazar: A bioclimatic analysis.* Mountain Research and Development, Vol. 2, No. 4, 1982, 399-403p.

Loc: ICIMOD

The climate of Namche Bazar is classified as a humid and tropical region based on the seasonal occurrence of rains, range in annual precipitation, number of rainy days in the year, and length of dry season in the months. Statistical analysis of a probable year is also made.

051 *Kraus, H. The climate of Nepal.* In: Studies on the climatology and phytogeography of the Himalaya, Selections from Khumbu Himal. Kathmandu, Nepal Research Centre, 1988, 59-96p.

Loc: ICIMOD

In this paper an attempt has been made to describe the climate of Nepal. The study is mainly based upon the general circulation of the atmosphere over India and Nepal as well as the data from meteorological observations made in

Nepal. Finally, climatic classification of some stations based upon Koeppen is presented.

052 Lambert, L.; Chitrakar, B. **Variation of potential evapotranspiration with elevation in Nepal.** Mountain Research and Development, Vol. 9, No. 2, 1989, 145-152p.

Loc: ICIMOD

The paper analyses potential evapotranspiration (PET) in Nepal by using a form of the Penman method. The PET values for each month regressed against elevation give quite consistent, good correlations.

053 Maie, M. **Meteorological data in the Numbur area.** Namuta M. (ed.), Ecological Study and Mountaineering of Mt. Numbur in Eastern Nepal, 1963. Japan, Chiba, Himalayan Expedition of Chiba University, 1965, 124-154p.

Loc: ICIMOD

This paper presents three-hourly data of the wind, cloud, temperature, relative humidity, and weather of the Numbur area during the expedition period.

054 Malla, U.M. **Climatic elements and seasons in Kathmandu valley.** The Himalayan Review, 21st International Geographical Congress, Special Issue. Kathmandu, Nepal Geographical Society, 1968, 53-77p.

Loc: NGS

This is one of the pioneering works on the climate of Nepal. In this paper a seasonal analysis of the climatic elements of Kathmandu valley is presented. The elements include temperature, pressure, wind, relative humidity, cloud, and rainfall. The rainfall data are for the period from 1949 to 1967. A table containing the seasonal mean of the data used in the analysis is also given.

055 Mitsudera, M.; Numata, M. **Meteorology of Eastern Nepal.** Journal of the College of Arts and Sciences. Natural

Sciences Series, Vol. 5, No. 1. Japan, Chiba University, Natural, 1967, 75-83p.

Loc: ICIMOD

The authors have analysed wind direction, air temperature, and humidity distribution by using the data measured by the Chiba University Himalayan expedition to the Mt. Numbur area in the southern-most part of the Rolwaling Himal during April to June of 1963. However, the treatment of such data is very difficult because the observation network moved day to day. Various plates showing distribution of clouds during the expedition are also presented.

056 Nakajima, C. **Movement and development of the clouds over Khumbu Himal in winter.** Seppyo, Vol. 38, Special Issue, 1976, 89-92p.

Loc: ICIMOD, DOM

By taking photographs of the clouds at periodic intervals over Khumbu Himal, the thickness of the cloud is estimated. The alto-cumulus cloud formed during a clear afternoon is estimated to be about 100-200m thick. The thickness of the cloud formed during winter season, when the weather condition is changing from clear to cloudy, is estimated at 500-1000m.

057 Nakajima, C. **On climatic change in South Asia.** In: International Symposium on Recent Climatic Change and Food Production, 1976, 3-16p.

Loc: ICIMOD

In this paper, five-year moving averages of monthly rainfall at 30 stations in South Asia are presented. The standard deviations of monthly rainfall are also calculated. The variability of rainfall according to place and season are discussed from the synoptic point of view. Interaction between large and small-scale phenomena and the relationship between atmospheric circulation in the middle and low latitudes are also discussed.

058 Nakajima, C.; Chalise, S.R.; Shrestha, M.L. **On the fog in the Kathmandu valley.** Seppyo, Vol. 41, Special Issue, 1980, 90-99p.

Loc: ICIMOD, DOM

Fogs are virtually a daily phenomenon in Kathmandu valley during the winter season. The study of fog is important from the point of view of aviation (air, land, or sea), because visibility plays an important role. Most of the early morning flights in the valley are delayed due to fog. In this paper, photographs of fogs (December 1976) taken at certain intervals at two different locations in Kathmandu Valley are depicted. The mechanism of fog formation in the valley on the basis of meteorological data is analysed for January 1978. It suggests that fog can be forecasted by meteorological analysis.

059 Nakajima, C.; Inoue, J.; Yasunari, T. **On the climate of the Himalayas.** *Annals of DPRI*, Japan, Kyoto University, No. 19A, 1-30p.

This paper summarises the history of studies on the climate of the Himalayas. The meteorological data from April 1973 to March 1975 were observed by the authors at Lhajung (4420m) in Khumbu Himal. These data are analysed and the influences of the Tibetan high and the subtropical jet streams are discussed. On the basis of climatic conditions, the growth of the glaciers is also discussed. The thickness of the valley wind over Khumbu Himal is estimated from photographs. Spectral analyses are made and discussed.

060 Nakajima, C.; Shrestha, M.L.; Basnyat, M.B. **Synoptic analyses of precipitation over Nepal and India.** *Seppyo*, Vol. 38, Special Issue, 1976, 50-58p.

Loc: ICIMOD, DOM

Synoptic analysis of the precipitation for the month of August and December 1974 is presented in this paper. It was observed that the types of precipitation during the summer season differed in the north of the Bay of Bengal Coast and the high mountain area. The authors suggest that this might be due to the possibility of the intrusion of the monsoon wind into the high mountain area affected by the behaviour of the westerly current in middle latitudes. The authors conclude that, to understand the precipitation in Nepal, the interaction of the middle and low latitude atmospheric circulation and also the local behaviour of the mountain and valley

winds in relation to the orographic conditions must be studied.

061 Nayaju, R.P. **Extreme rainfall analysis for Pokhara and Kathmandu.** In: Report of the seminar on information exchange in the field of disaster prevention/preparedness - HMG/DPTC/ UNDP, Kathmandu, 29 - 30 March, 1993, 24-30p.

Loc: DOM

In this paper ten years of annual extreme rainfall values for different seasons in Pokhara and thirteen years in Kathmandu are used to develop simple extreme rainfall models.

062 Nayava, J.L. **Areal rainfall in the Kathmandu valley.** *Mausam*, 32, 4, 1981, 343-348p.

Loc: DOM

The mesoscale variation of rainfall in the Kathmandu valley and surrounding regions has been computed for 1225 grid points. The effect of orography has been considered an important factor in areas like Kathmandu valley where sharp topographical variations occur within small distances.

063 Nayava, J.L. **Brief notes on climates of Nepal and their implications for agricultural development.** In: Proceedings of Eight Summer Crops Workshop, Nepal, Rampur, Jan. 25 - 29, 1981, 1-10p.

064 Nayava, J.L. **Climate of Nepal.** *The Himalayan Review*, Vol. 11, 1974, 15-20p.

065 Nayava, J.L. **Estimation of temperature over Nepal.** *The Himalayan Review*, Vol. 14, 1983, 13-24 p.

066 Nayava, J.L. **Heavy rainfall over Nepal.** *Weather*, Vol. 29, 1974, 443-450p.

Loc: DOM

This paper contains a study of heavy rainfall during 1968.

067 *Nayava, J.L. Rainfall in Nepal. The Himalayan Review*, Vol. 12, 1980, 1-18p.

Loc: NGS, ICIMOD

This paper briefly describes the general features of the atmospheric circulation over Nepal for all four seasons. Thirty years of mean rainfall data have been used for few places in Nepal. However, 68 stations covering different regions over a minimum period of 20 years are used. Special emphasis is given to mean monsoonal rainfall. The paper concludes that, in general, the intensity of rainfall is much higher in lower elevations than in higher elevations.

068 *Nayava, J.L. The summer monsoon in Nepal and southern Asia. M.Sc. dissertation, England, Birmingham University, 1974.*

069 *Nayava, J.L. A topoclimatological investigation of solar radiation in the Kathmandu valley, Nepal. The Australian Meteorological Magazine*, Vol. 28, No. 2, 1980, 79-95p.

Loc: ICIMOD

In this paper, the mean monthly isopleths of clear and average day insolation for Kathmandu valley are plotted and discussed. A computer model was used to separate direct, diffuse, and circum solar diffuse components from the observations of the total global radiation at the Tribhuvan International Airport. Direct and diffuse components are combined with sunshine hour data to estimate average or mean monthly insolation on horizontal and sloping surfaces.

070 *Nayava, J.L. Topoclimatology of the Kathmandu valley. In: Proceedings of the Tenth New Zealand Geography Conference and 49th ANZAAS Congress, Geographical Sciences, New Zealand, Auckland, Geog. Soc. Conf. Ser No. 10, 1979, 33-38p.*

Loc: DOM

The monthly mean insolation, precipitation, and maximum and minimum temperatures were estimated for a grid net using 394 grid points to study the topoclimatology of the Kathmandu valley. The estimation procedures used regression methods and theoretical models.

071 *Neininger, B.; Reinhardt, M.; Kuettemer, J. Valley circulations as measured in the Himalayas by instrumented motor glider. GARP Publication Series No. 27, WMO/TD No. 108, 501-508p.*

072 *Ohata, T.; Higuchi, K. Valley wind revealed by wind-shaped trees at Kali Gandaki valley. Seppyo*, Vol. 40, Special Issue, 1978, 37-41p.

Loc: ICIMOD, DOM

Strong valley winds occur in the Kali Gandaki Valley. The trees are deformed by the valley wind. This paper studies the valley wind, based upon wind-shaped trees. The most strongly deformed trees were found between Larjung and Jomsom. The deformations were weak along the tributaries of the Kali Gandaki.

073 *Ohata, T.; Higuchi, K.; Ikegami, K. Mountain-valley wind system in the Khumbu Himal, East Nepal. Journal of Meteorological Society of Japan* 59, 1981, 753-762p.

074 *Rajopadhaya, D.K.; Acharya, L.M. Wet spell and persistence of rainy days in Kathmandu valley. In: Proceedings of the National Conference on Science and Technology, Kathmandu, Royal Nepal Academy of Science and Technology (April 24-29, 1988), Kathmandu, RONAST, 1989, 521-525p.*

Loc: RONAST, ICIMOD

Newton's Raphson method is used to find the rainfall pattern by using logarithmic series. It was found that the difference between the calculated and observed frequencies of wet spell are not significant in July and October.

075 Reiter, E.R.; Heuberger, H. A Synoptic example of the retreat of the Indian summer monsoon. Geografiska Annaler, Nr. 1, 1960, 17-35p.

Loc: ICIMOD

The paper is divided into two parts. The first part basically describes the general weather condition, high level winds, temperatures, humidity, and precipitations encountered by the Australian Cho-Oyu expedition in 1954. The Cho-Oyu lies approximately 30km northwest of Mount Everest, close to the Nangpa pass which leads from Nepal into Tibet. The second part of the paper describes the previous works undertaken by other scientists on the role of Jet stream on the monsoon. The paper concludes that the travelling disturbances, which move with the Jet stream, carry along their own patterns of vertical motions and thus account for winter precipitation.

076 Seko, K. Seasonal variation of altitudinal dependance of precipitation in Langtang valley, Nepal Himalayas. Bulletin of Glacier Research 5, 1987, 41-47p.

Loc: ICIMOD, DOM

In this paper the precipitation in Langtang valley is analysed focussing mainly on the orographic effects on the altitudinal distribution of precipitation. It was observed that there existed remarkable seasonal difference in the altitudinal dependance of precipitation. The article mainly focusses on the seasonal variation of precipitation, precipitation caused by local circulation, and precipitation associated with synoptic scale disturbances.

077 Seko, K.; Takahashi, S. Characteristics of winter precipitation and its effects on glaciers in Nepal Himalaya. Bulletin of Glacier Research 9, 1991, 9-16p.

Loc: ICIMOD, DOM

Mass balance associated with winter time precipitation in the Nepal Himalayas is studied in this paper. The authors found that glacier fluctuation follows the fluctuation of air temperature rather than precipitation.

078 Shrestha, D.L. On the scale of impacts of unprecedented havoc due to heavy downpour in Nepal during July 1993. Presented: Int'l UNESCO Symposium on Water Resources Planning in a Changing World, Karlsruhe, Germany, June 1994,9p.

Loc: ICIMOD

Even though the worst natural disasters are caused by heavy monsoonal rainfall, study in this field has been ignored by planners. In July 1993, Nepal witnessed heavy rainfall. Most of the districts in the hilly and *terai* regions in Central and Eastern Nepal were hit by devastating floods and landslides. A death toll of human lives of over 2,000 and heavy loss of property and resources was reported. The capital city, Kathmandu, was ruptured from its supplies due to severe damage of the main highways and the sweeping away of major bridges. In this paper, an attempt has been made to identify the implication of such events, which are not uncommon in this region. The July event is described fully with some synoptic description and its major impacts on the Kulekhani Hydel Station and the Bagamati Irrigation project.

079 Shrestha, K.D. Minimum temperature forecasting at the Kathmandu airport. M.Sc. Dissertation, Kathmandu, Tribhuvan University, February 1991, 102p

080 Shrestha, M.L.; Fujii, Y.; Nakawo, M. Climate of hidden valley, Mukut Himal, during the monsoon in 1974. Seppyo, Vol. 38, Special Issue, 1976, 105-108p.

Loc: ICIMOD, DOM

To understand the climate of a region, it is necessary to study the different meteorological variables such as pressure, temperature, evaporation, etc. In this connection, in 1974, a temporary station was set up in Mukut Himal at an elevation of 5055m. The results obtained from the observatory regarding diurnal pressure variation, daily mean maximum and minimum temperatures, daily precipitation, and daily evaporation are presented in this paper. The authors suggest that the monsoon season in the

hidden valley is from the middle of July to August.

081 *Shrestha, M.L.; Murakami, T.* **Intraseasonal fluctuations in low-level meridional winds over the Indian ocean and monsoonal convection over South Asia.** *Tellus*, 40 A, 1988, 120-132p.

Loc: DOM

A conceptual precipitation runoff model was originally developed for the Scandinavian catchment. Necessary changes were made and applied to the 38% glacierised basin of the Langtang Khola. The model requires daily values of air temperature and precipitation. Among other parameters of the water balance, the model allows the simulation of snow storage and glacier mass balance at various elevations as well as of the daily discharge. The paper discusses the method and data. Finally, the results obtained from the model pertaining to snow cover, glacier mass balance, water balance of the basin, changes in snow and ice storage, etc are presented and discussed.

082 *Smadja, J.* **Studies of climatic and human impacts and their relationship on a mountain slope above Salme in the Himalayan middle mountains, Nepal.** *Mountain Research and Development* 12 (1), 1992, 1-28p.

Loc: ICIMOD

This paper shows, with evidence from the Salme slope, the relationship between human pressure, monsoon rains, and erosion in the Middle Mountains of Central Nepal. Observations on selected climatic parameters for a period of five years are also given.

083 *Sthapit, K.M.; Bhattarai, R.* **Agro-climatic classification system for Nepal.** Kathmandu, Department of Soil Conservation and Watershed Management, Watershed Management Project, 1988, 7-24p.

084 *Subrahmanyam, V.P.; Upadhyay, B.P.* **A Study of rainfall patterns in Nepal.** In:

Proceedings of Hydrological Investigations during the last 25 years in India, Waltair, Andhra University, May 1982, 43-50 p.

Loc: CDOM

Nepal being a mountainous country, the distribution of rainfall is not linear. In this paper an attempt has been made to study the annual and seasonal rainfall patterns assuming the four seasons to be those specified by the Nepal Meteorological Services. Since rainfall varies from season to season as well as from region to region, a detailed statistical study on rainfall characteristics, such as variability, intensity and number of rainy days, and their maps, are presented and discussed.

085 *Takahashi, S.; Motoyama, H.; Kawashima, K.; Morinaga, Y.; Seko, K.; Lida, H.; Kubota, H.; Tuladhar, N.R.* **Meteorological features in Langtang valley, Nepal Himalayas, 1985 - 1986.** *Bulletin of Glacier Research* 5, 1987 35-40p.

Loc: ICIMOD, DOM

Based upon meteorological data from July 1985 to July 1986 at Kyangchen (3920m), the meteorological conditions, such as precipitation, temperature, humidity, wind, radiation, etc, are discussed. Finally, the climate of this district is outlined.

086 *Takahashi, S.; Motoyama, H.; Kawashima, K.; Morinaga, Y.; Seko, K.; Lida, H.; Kubota, H.; Tuladhar, N.R.* **Summary of meteorological data at Kyangchen in Langtang valley, Nepal Himalayas, 1985 - 1986.** *Bulletin of Glacier Research* 5, 1987, 121-128p.

Loc: ICIMOD, DOM

Meteorological observations of the Langtang valley were made from July 1985 to July 1986. The instruments used, the data types, and measurements are summarised in this paper.

087 *Thapa, K.B.; Acharya, L.M.* **Study of drought over Nepal.** Kathmandu, Tribhuvan University, Rector's Office, Research Division, 1993.

088 Thompson, A.H.; Devkota, L.P. **Weather behavior during the Manaslu-Ganesh expedition.** In: Martson, R.A. (ed.) *Environment and Society in the Manaslu-Ganesh Region of the Central Nepal Himalayas. A final report of the 1987 Manaslu Ganesh expedition*, University of Idaho, Foundation for Glacier and Environmental Research, 1989, 7-23p

Loc: DOM, ICIMOD

During the fall of 1987, an expedition was conducted jointly by the University of Idaho and the Foundation for Glacier and Environmental Research to Manaslu and Ganesh Himal of Nepal. During the expedition period, meteorological studies were carried out and a final report on the same is presented in this paper. The report describes the observations, together with the conditions and limitations in taking them. The general trends of meteorological events during the expedition period are also provided. Finally, the severe storm that occurred from 17-19 October, 1987, is discussed.

089 Thyer, N. **Looking at Western Nepal's climates.** *Bulletin of American Meteorological Society*, Vol. 66, No. 6, June 1985.

Loc: ICIMOD

This article discusses the working environment, the present state of climatology, some recent findings, and the prospects for future development in the study of climate in western Nepal.

090 Troll, C. **The climatic and phytogeographical division of the Himalayan system.** In: *Studies on the climatology and phytogeography of the Himalaya, selections from Khumbu Himal*, Kathmandu, Nepal Research Centre, 1988, 97 - 151 p.

Loc: ICIMOD

In order to study the geographical and climatic position of the Himalayas, the three dimensional landscape divisions are presented. The paper also deals with topoclimatic as well as edaphic-micro climatic differentiations in vegetation.

091 Ueno, K.; Shiraiwa, T.; Yamada, T. **Precipitation environment in the Langtang valley, Nepal Himalayas.** In: Young, G.J. (ed.) *Snow and Glacier Hydrology, Proceedings of the Kathmandu Symposium*, (Nov. 1992), IAHS pub. No. 218, UK, Oxfordshire, Institute of Hydrology, 1993, 207-219p.

Loc: DHM, ICIMOD

The characteristics of precipitation distribution, particularly with their temporal and spatial variations are investigated through intensive observations around Langtang valley in the monsoon season. The effects of cyclonic activities on winter precipitation in Kathmandu are also examined.

092 Ueno, K.; Yamada, T. **Diurnal variation of precipitation in Langtang valley, Nepal Himalayas.** *Bulletin of Glacier Research* 8, 1990, 93-101p.

Loc: ICIMOD

In this paper, the characteristics of diurnal variation of precipitation in the Langtang valley are investigated using 10-minute precipitation data during the late monsoon season up to the post-monsoon season in 1987. Three types of precipitation are classified and their distributions are discussed. Finally, the lapse rate of surface air temperature along the mountain slope is also discussed.

093 Ueno, K.; Yamada, T. **Diurnal variation of precipitation in Langtang valley, Nepal Himalayas.** In: *Glacial studies in Langtang valley: Report of the Glaciological Expedition of Nepal Himalayas, 1987-88*, Japan, Sapporo, Glaciological Expedition of Nepal Project, 1989, 47-58p.

Loc: ICIMOD

In this paper, the characteristics of spatial as well as temporal diurnal variation of precipitation in the Langtang valley are investigated using 10-minute precipitation data from the late-monsoon to the post-monsoon season of 1987. The lapse rate of temperature along the mountain slope is also investigated.

094 Upadhyay, B.P. **Distribution of solar radiation in Nepal.** Presented at the Regional Training Seminar on the Presentation and Use of Meteorological Data for Solar and Wind Energy, WMO, Kathmandu, 1991, 7p.

095 Upadhyay, B.P.; Chimire, B.R. **Application of meteorological parameters using gamma probability model for crop scheduling and management in Nepal.** Presented at the Second Science Congress, Kathmandu, Royal Nepal Academy of Science and Technology, June 1994, 7p.

096 Weickmann, L. **Large-scale analysis of meteorological phenomena for the period of the "First Himalayan Soaring Expedition".** *Tech. Soaring*, 12, 1988, 44-51p.

097 Yasunari, T. **Air-borne measurement of the surface temperature over Nepal Himalayas.** *Seppyo*, Vol. 41, Special Issue, 1980, 82-85p.

Loc: ICIMOD, DOM

In the post-monsoon period of 1976, a geological expedition team measured the air temperature over Shorong, Khumbu, and Langtang Himal by air craft using infrared (IR) radio meter. The results are reported in this paper.

098 Yasunari, T. **Heavy snowfalls in Nepal Himalayas in December, 1977.** In: Proceedings of the Symposium of the Japan Society of Snow and Ice in 1981, 99 p.

099 Yasunari, T. **Seasonal weather variations in Khumbu Himal.** *Seppyo*, Vol. 38, Special Issue, 1976, 74-83p.

Loc: ICIMOD, DOM

In this paper the author has used two-year data (Apr. 1973 to Mar. 1975) at a station called Lhajung which is 4420m above sea level. The data used while studying the seasonal weather

trends of Khumbu Himal relate to daily precipitation, cloud, temperature, humidity, and 500 mb weather chart. The author suggests that the seasonal weather variation in high altitude Himalayas is mainly affected by the Tibetan high in the monsoon season and the subtropical jet stream in other seasons. It is also suggested that the moisture supply to this region in the monsoon season is from the Indian Ocean.

100 Yasunari, T. **Spectral analysis of monsoonal precipitation in the Nepal Himalayas.** *Seppyo*, Vol. 38, Special Issue, 1976, 59-65p.

Loc: ICIMOD, DOM

A spectral analysis of precipitation data of the Nepal Himalayas is made in this paper. By carrying out power spectral analysis, the author found out that there exists a predominant periodicity of around 10 days and a secondary periodicity of about 5 days. The 10-day periodicity is related to the oscillation of the Tibetan high.

101 Yasunari, T.; Inoue, J. **Characteristics of monsoonal precipitation around peaks and ridges in Shorong and Khumbu Himal.** *Seppyo*, Vol. 40, Special Issue, 1978, 26-32p.

Loc: ICIMOD, DOM

The primary precipitation data during the summer monsoon of 1976 around peaks and ridges of high altitudes in Shorong and Khumbu Himal are observed. These data are compared with the precipitation at Lhajung. The statistical features of precipitation as a function of time is studied along with distribution of precipitation along the slope of different glaciers .

102 Yasunari, T.; Nakajima, C. **Air-borne measurements of the temperature field over the Nepal Himalayas: A preliminary observation.** *Seppyo*, Vol, 40, Special Issue, 1978, 33-36p.

Loc: ICIMOD, DOM

The authors have measured air temperature over the Shorong-Khumbu region and from Langtang Himal to the Indian plains using thermister and

psychrometer set up on a Pilatus Turbo Porter aircraft. The observation made revealed that the air temperature over the Himalayas is affected

by high altitude orography and surface conditions.

Yasuni, I. Spectral analysis of monsoonal precipitation in the Nepal Himalayas. *Science and Technology*, 1978, Vol. 40, Special Issue, 1978, 33-36.

Yasuni, I. Spectral analysis of monsoonal precipitation in the Nepal Himalayas. *Science and Technology*, 1978, Vol. 40, Special Issue, 1978, 33-36.

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Yasuni, I. Spectral analysis of monsoonal precipitation in the Nepal Himalayas. *Science and Technology*, 1978, Vol. 40, Special Issue, 1978, 33-36.

103 Braun, L.N.; Grabs, W.; Rana, B. **Application of a conceptual precipitation runoff model in the Langtang Khola basin, Nepal Himalayas.** In: Young, G.J. (ed.) *Snow and Glacier Hydrology: Proceedings of the Kathmandu Symposium (Nov. 1992)*, IAHS Publ. No. 218, 1993, 221-237p.

Loc: DHM, DOM, ICIMOD

A conceptual precipitation runoff model was originally developed for the Scandinavian catchment. Necessary changes were made and applied to the 38% glacierised basin of the Langtang Khola. The model requires daily values of air temperature and precipitation. Among other parameters of the water balance, the model allows the simulation of snow storage and glacier mass balance at various elevations as well as of the daily discharge. The paper discusses the method and data. Finally, the results obtained from the model such as snow cover, glacier mass balance, water balance of the basin, changes in snow and ice storage, etc are presented and discussed.

104 Chalise, S.R.; Adhikary, S.P.; Shankar, K. **Research in meteorology and hydrology, Tribhuvan University.** *Journal*, Vol x, No. 1, Special Issue, Kathmandu, Tribhuvan University, Research Division, July 1978.

Loc: ICIMOD

In this paper the historical background, the present situation, and the development of meteorology and hydrology in Nepal is analysed. Strategies for research and development of meteorology and hydrology in Nepal are also discussed.

105 Dhital, M.R.; Khanal, N.; Thapa, K.B. **The role of extreme weather events, mass movements, and land use changes in increasing natural hazards: A report of the preliminary field assessment and workshop on causes of the recent damages incurred in South-Central Nepal (July 19-20, 1993).** Kathmandu, International Centre for Integrated Mountain Development, 1993, 123p.

Loc: ICIMOD

This is a field report which contains the description of the natural event of July 19-20, 1993, in south-central Nepal. The report also contains the final overall assessment of the field work as well as the workshop discussions.

106 Dongol, R. M. **A study of water balance of the Koshi river basin.** M.Sc. Dissertation, Kathmandu, Tribhuvan University, Jan 1993, 85p.

Loc: CDOM

In this dissertation, the water balance of the Koshi river basin is presented and discussed. The Koshi river basin covers land mass within both Nepal and Tibet. In this study only those areas lying in Nepal are considered.

107 Fukushima, Y.; Watanabe, O.; Higuchi, K. **Estimation of streamflow change by global warming in a glacier-covered high mountain area of the Nepal Himalayas.** In: *Proceedings of the Vienna Symposium (Aug. 1991)*, IAHS Publ. No. 205, United Kingdom, Oxfordshire, Institute of Hydrology, 1991, 181-188p.

108 Rajbhandari, R.M. **Some aspects of hydrometeorological study over Karnali river basin.** M.Sc. Dissertation, India, Waltair, Andhra University, 1981, 42p.

Loc: DOM

In this dissertation, a study of the precipitation in the Karnali river basin of west Nepal is presented. Seasonal and annual precipitation distribution maps are presented and discussed in detail. Along with the precipitation maps, precipitation variability maps are also presented and discussed. Finally, the relationship between precipitation and runoff of the basin is also discussed. The relationship between runoff and precipitation is determined through regression analysis.

109 Rajbhandari, R.M. **To prepare a climatic map of the Bagmati zone based upon Thornthwaite's method using GIS technology.** In: *Project paper on GIS Training for Professionals*, Kathmandu,

International Centre for Integrated Mountain Development, 1992, 8p.

Loc: ICIMOD, DOM

This is a paper presented at the end of the training as project work. In this paper the author has tried to classify the climate of the Bagmati Zone using the GIS technique. Due to boundary problems, the study focusses mainly on the Nuwakot District. Almost all meteorological stations located in the Bagmati Zone are considered. The classification is based upon the book-keeping procedure developed by W.C. Thornthwaite.

110 *Sharma, K.P.* **Hydrological and meteorological services to mitigate natural disaster.** In: Report on Information Exchange in the Field of Disaster Prevention/Preparedness - Kathmandu, HMG/DPTC/UNDP, March 1993, 80-84p.

111 *Subrahmanyam, V.P.; Upadhyay, B.P.* **Water balance and agricultural operation in Nepal.** Presented at the National Seminar on integrated farming in India, India, Kolhapur, Shivaji University, Dept. of Geography, 1982, 8p.

112 *Subrahmanyam, V.P.; Upadhyay, B.P.* **Water balance and climatic types of Nepal.** In: Proceedings of "Hydrological Investigations during the last 25 years in India", India, Waltair, Andhra University, Association of Hydrologists of India, May 1982, 163-170p

Loc: DOM

Thornthwaite's method of climatic classification is used in this paper to study the climate types of Nepal. Potential evapotranspiration, actual evapotranspiration, water surplus, and water deficiency maps as obtained from the water budget table are presented and discussed. Finally, the climatic classification map of Nepal, based on moisture regime and thermal regime, is also presented and discussed.

113 *Subrahmanyam, V.P.; Upadhyay, B.P.* **Water balance and water potential of the**

Koshi River basin in Nepal. In: Proceedings of the National Seminar on Assessment, Development and Management of Ground Water Resources, New Delhi, Central Ground Water Board, Ministry of Irrigation, Govt. of India, April 1983, 113-153p.

Loc: CDOM

This paper describes the hydrometeorological features and the water potential of the Koshi river basin using the water balance procedure. The hydrometeorological elements, namely, actual evapotranspiration, water deficiency, and water surplus of the basin for a normal year are climatically computed employing Thornthwaite's book-keeping procedure. Based on the water-budget computations, the climate types of the stations in the river basin are presented and their implications considered from the point of view of water resource development.

114 *Subrahmanyam, V.P.; Upadhyay, B.P.; Rajbhandari, R.M.* **Hydrometeorology and water balance of the Karnali river basin in Nepal.** In: Proceedings of the Seminar on "Hydrology", India, Andhra Pradesh, Osmania University, June 1983, 73-80p.

Loc: CDOM

Thornthwaite's well-known, water balance (1948) procedure is used to study the water potential of the Karnali river basin. Precipitation data belonging to twenty-four stations are used to analyse the rainfall pattern both on an annual basis and for different seasons. Regression formula between potential evapotranspiration and height are derived for each individual month from the available number of temperature stations. Using these formula, potential evapotranspiration values are calculated for all other stations having known elevations. Seasonal as well as annual potential evapotranspiration maps are presented. The derived elements of water balance, namely, actual evapotranspiration, water surplus, and water deficiency are presented. The monthly water balance of the river throughout the year is graphically presented and discussed. Lastly, the climate types of the Karnali river basin, based on moisture regime according to the 1955 scheme of Thornthwaite, are presented.

115 Upadhyay, B.P. **Water balance of Nepal with reference to water resources and agricultural development.** Ph.D. thesis, India, Waltair, Andhra University, 1984, 320p.

116 Upadhyay, B.P.; Subrahmanyam, V.P. **Estimation of water yields on the Himalayan rivers of Nepal by water balance procedure.** Presented: National Symposium on Water Balance and National Development, India, Waltair, Andhra University, Dept. of Meteorology and Oceanography, 1983, 7p.