

International Conference on Ecohydrology of High Mountain Areas

24-28 March, 1996
Kathmandu

organised by

UNESCO
International Hydrological Programme
Man and Biosphere Programme

His Majesty's Government of Nepal (HMG/N)
Department of Hydrology and Meteorology

International Centre for Integrated Mountain Development
(ICIMOD)
Mountain Natural Resources' Division

German National Committee for the International
Hydrological Programme of UNESCO and for the
Operational Hydrology Programme of WMO

In cooperation with

The World Meteorological Organisation (WMO)
The National IHP Committee of Nepal
The National IHP Committee of Slovakia
The Steering Committee of the IHP FRIEND Project
The International Association of Hydrological Sciences (IAHS)
The IGBP/BAHC



MAB



Extended Abstracts

S.R. Chalise and N.R. Khanal (eds.)

Published for the Organisers of the Conference
by

**International Centre for Integrated Mountain Development
(ICIMOD)**

International Conference on Ecohydrology of High Mountain Areas

**24-28 March, 1996
Kathmandu**

organised by

**UNESCO
International Hydrological Programme
Man and Biosphere Programme**

**His Majesty's Government of Nepal (HMG/N)
Department of Hydrology and Meteorology**

**International Centre for Integrated Mountain Development
(ICIMOD)
Mountain Natural Resources' Division**

**German National Committee for the International
Hydrological Programme of UNESCO and for the
Operational Hydrology Programme of WMO**

in cooperation with

**The World Meteorological Organisation (WMO)
The National IHP Committee of Nepal
The National IHP Committee of Slovakia
The Steering Committee of the IHP FRIEND Project
The International Association of Hydrological Sciences (IAHS)
The IGBP/BAHC**

Extended Abstracts

S.R. Chalise and N.R. Khanal (eds.)

Published for the Organisers of the Conference

by
**International Centre for Integrated Mountain Development
(ICIMOD)**

PREFACE AND ACKNOWLEDGEMENTS

Rapid population growth and the indiscriminate race for accelerated economic development are causing enormous pressure on land and water resources. With the increasing demand for land for agriculture, urbanisation and infrastructural developments, forest areas and water bodies are decreasing rapidly. Such changes in land use have brought about modifications in water flows, nutrients, sediments and pollutants, and loss of biodiversity. Consequently, deterioration in the quality of surficial water in various parts of the world is increasing. Obviously, there is an urgent need for a better understanding of the vulnerability of the land-water system to human activities, particularly in high mountain areas, because of their fragile ecology and susceptibility to irreversible changes.

Theme 2 of the fifth phase of the International Hydrological Programme (IHP-V) of UNESCO, viz., **Ecohydrological Processes in the Surficial Environment**, is concerned with these issues and devoted to the development of improved knowledge and understanding of the processes involved.

Close collaboration of the International Centre for Integrated Mountain Development (ICIMOD) with UNESCO/IHP, The Department of Hydrology and Meteorology (DHM) of His Majesty's Government of Nepal (HMGN), WMO, and the German IHP/OHP committee in programme activities contributing towards a better understanding of Mountain Hydrology, particularly at the regional level, has been taking place over the last few years.

The recommendations made by the Regional Workshop on Mountain Hydrology, organised by ICIMOD, through its programme on Mountain Natural Resources (formerly Mountain Environmental Management), jointly with UNESCO/IHP and DHM/HMGN in December 1989 led to the establishment of a project on Mountain Hydrology (H-5-6) under UNESCO's IHP-IV and a Regional Working Group on Mountain Hydrology in the Hindu Kush-Himalayas. This International Conference on Ecohydrology of High Mountain Areas in Kathmandu has once again brought these collaborating institutions together to organise this important event in which UNESCO/MAB, IGBP/BAHC, IAHS, and the National IHP committee of Nepal and Slovakia have also joined hands.

This International Conference in Kathmandu was one of the activities identified under UNESCO's IHP-V Project 2.4: Comprehensive Assessment of the Surficial Ecohydrological Processes, and its objective is to discuss outstanding issues concerning the ecohydrology of high mountain areas and to help specify needs and relevant components for regional studies. Its aim is to facilitate the exchange of scientific knowledge by bringing together scientists involved in the study of ecohydrology of high mountain areas with special emphasis on regional aspects. It also allows ecohydrologists from different regions to establish contact with each other.

INSTITUTE OF MOUNTAIN ECOHYDROLOGY OF THE HIMALAYAS
SOME SHARED EXPERIENCES
B. SARDI

THE PARTICULARS OF TERRITORIAL DISTRIBUTION AND
ANTHROPOGENIC RIVER RUNOFF VARIATION FOR THE
MOUNTAINOUS AREA OF CENTRAL AND
VENIZIAN MOUNTAINS

The themes of this conference cover broadly all the relevant water-related problems of most complex high mountain ecosystems, and this is expected to encourage contribution from a wide range of specialists. The issue include:

- regional issues on high mountain ecohydrology;
- network design, instrumentation, data collection and processing, methodology, and modelling;
- atmospheric, hydrologic, and ecological interactions;
- role of permafrost, glaciers, and snow covers; and
- dynamics and hazards of erosion and sedimentation, ecosystems of high mountain areas, and landscape processes.

The response to the first announcement about the Conference was very encouraging and altogether 110 abstracts were received for oral and poster presentation. All of them were accepted and are included in this publication. The abstracts received were not uniform in length. During editing, minimum changes have been made in the length of the abstracts. However, some of the longer abstracts and some of the papers which were submitted in full had to be shortened for various practical reasons, including the incompatibility of computer programmes to read and print out mathematical equations and diagrammes provided by the authors. Due to the time constraint and difficulties in communication, it was not possible to send the shortened versions to the authors for their comments before publication. However, they were informed about it and, if some vital information has been omitted, the editors would like to express their regrets. Some papers submitted in French have also been included after translating the titles, subheadings, and figure captions into English. In terms of language, we have accommodated the original terminology used by the authors as far as possible.

The abstracts are arranged in alphabetical order using the name of the first author for each theme, and in each section abstracts for oral presentation are followed by those for poster presentation.

Prof. S. R. Chalise of ICIMOD edited the abstracts with the assistance of Mr. N. R. Khanal of the Central Department of Geography, Tribhuvan University, Kathmandu.

This publication would not have been possible within the time available without the support of our colleagues from the Documentation, Information, and Training Service (DITS) of ICIMOD. Special thanks are due to Greta Rana, Senior Editor, DITS, ICIMOD for providing us with assistance in copy editing through the services of Sangeeta Pandey and Veneeta Singha, Trainee Editors, DITS. The assistance of Greta Rana and Prof. Dr. A. Herrmann of the Technical University of Braunschweig in editing the French Papers is gratefully acknowledged. The Editors are also thankful to Mrs Reeta Rana, Secretary, Mountain Natural Resources' Division, ICIMOD, and Mr. Narendra R. Shrestha for their efficient secretarial assistance and for patiently bearing with the demands of a rush job.

The financial support of the German IHP/OHP Committee to meet the cost of printing this volume is also gratefully acknowledged.

Organisers of the Conference

Table of Contents

	page
WATER RESOURCES IN THE ALTIPLANO REGION IN SOUTHERN PERU, THEIR ISOTOPE COMPOSITION AND ORIGIN EDGAR ACOSTA, LUIS ARAGUAS ARAGUAS, GUIDO ARROYO PAUCA, AGAPITO MAMANI, RUBEN ROJAS MOLINA, JAN ŠILAR	1
THE USE OF SNOW LINE DATA FOR THE ASSESSMENT OF WATER RESOURCES IN THE HIMALAYAN-HINDU KUSH REGION: RESULTS AND PROBLEMS KRENKE ALEXANDER	3
THE HYDROGRAPHY OF MONGOLIA PUREV BAAST	9
ON ECOHYDROLOGICAL INVESTIGATION OVER THE HIMALAYAS JAGDISH BAHADUR	11
TREE GROWTH/GLACIER/CLIMATE RELATIONSHIP IN THE HIMALAYAN REGION AND ITS IMPORTANCE IN THE UNDERSTANDING OF HYDROLOGICAL RESPONSES AMALAVA BHATTACHARYA, RAM R. YADAV	13
OBJECTIVE EVALUATION OF SPECIFIC RATE OF RUNOFF DISTRIBUTION BY ALTITUDE IN MOUNTAIN REGION GLEB E. GLAZYRIN	15
ECOHYDROLOGY OF RIVER BASINS OF NEPAL N.R. KHANAL, A. POKHAREL, S.R. CHALISE	19
BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THE RIVER BAGMATI AND ITS TRIBUTARIES, KATHMANDU VALLEY, NEPAL OTTO MOOG, SUBODH SHARMA	23
VALUATION METHOD OF ECOHYDROLOGY CONDITIONS IN HIGH MOUNTAIN AREAS: AN EXAMPLE OF LAKE BAIKAL BASIN ALEXANDER PERTROVITCH KHAUSTOV, VALERY NIKOLAEVITCH ZYKOV	25
EFFECTS OF ALTITUDE ON ECOHYDROLOGICAL PROCESSES G. PESCHKE, C. SEIDLER, U. FEISTEL	33
WATER RESOURCES AND ECOHYDROLOGY OF THE HIMALAYAS: SOME SHARED EXPERIENCE[S] R. SAHU	35
THE PARTICULARS OF TERRITORIAL DISTRIBUTION AND ANTHROPOGENIC RIVER RUNOFF VARIATIONS FOR THE MOUNTAINOUS AREA OF CENTRAL ASIA VENIAMIN SEMYONOV	37

PRESENT STATUS AND PROBLEMS OF HYDROLOGY OF THE MOUNTAINOUS AREAS OF PAKISTAN SAEED SHAH, IFTIKHAR AHMAD	43
EFFECT OF GLOBAL WARMING ON THE STREAMFLOW OF A HIGH ALTITUDE SPITI RIVER PRATAP SINGH	45
A NEUTRON ACTIVATION STUDY OF THE GEOCHEMISTRY IN THE NATURAL WATERS OF LHASA, TIBET, CHINA GU WEI-ZU, ZHENG PINGSHENG, TUDENG-XIANGPEI, LI DAIMING, DANBA-GONGJUE	49
REGIONAL SCALE WATER BALANCE MODELLING FOR GLOBAL CHANGE STUDIES IN THE MOUNTAINOUS WESTERN UNITED STATES JEFFREY S. KERN, DANNY MARKS	53
AN INTEGRATED PEST MANAGEMENT (IMP) APPROACH AS AN ALTERNATIVE TO SAFE PESTICIDE USE IN NEPAL B.K. GYAWALI	59
DEVELOPMENT IN A METHODOLOGY OF CLASSIFYING SEDIMENTS IN HIMALAYAN RIVERS R.C. JOHNSON, R.P. COLLINS	61
STRIVING TOWARDS ASSESSMENT OF MOUNTAIN WATER RESOURCES Z. W. KUNDZEWICZ, D. KRAEMER	63
EVAPORATION OF INTERCEPTED SNOW - MODELLING OF THE AERODYNAMIC RESISTANCE ANGELA LUNDBERG, RICHARD HARDING	65
MEDIUM RANGE PREDICTION OF WINTER PRECIPITATION OVER NORTH-WEST INDIA FROM A GLOBAL CIRCULATION MODEL (T-80) NISHA MENDIRATTA, AKHILESH GUPTA, L.S. RATHORE, J. BAHADUR	69
HYDROLOGICAL STUDIES IN A HIMALAYAN CATCHMENT K.S. RAMASASTRI	71
HYDROLOGY IN AFGHANISTAN M. ISSMAEL SADIQ	75
TECHNIQUES FOR MAPPING HYDROMETEOROLOGICAL AND ECOLOGICAL INTERACTIONS AT VARYING SCALES IN THE DRAKENSBERG MOUNTAIN RANGE OF SOUTH AFRICA ROLAND SCHULZE	77
ERROR SOURCES IN THE ASSESSMENT OF PRECIPITATION ALTITUDE RELATIONSHIPS BORIS SEVRUK	79

COMBINED PARAMETERISATION OF OROGRAPHY-INDUCED PRECIPITATION AND RUNOFF FOR REGIONAL HYDROCLIMATIC STUDIES ANDREY B. SHMAKIN, ANDREY Y. MIKHAILOV, SERGEI A. BULANOV	83
PESTICIDE USE AND ITS EFFECT ON THE ENVIRONMENT IN NEPAL KRISHNA K. SHRESTHA	89
BIOGEOHYDROLOGICAL DATA AND GIS AS DECISION SUPPORT SYSTEM FOR NATURAL HAZARD MANAGEMENT IN HIMALAYAN WATERSHED R.B. SINGH	91
CALIBRATING A WATER YIELD MODEL FOR THE DEVELOPMENT OF HYDROLOGIC PARAMETERS OF UNGAGED SMALL WATERSHEDS IN MOUNTAINOUS TERRAIN OF TROPICAL MONSOON REGION SAHID SUSANTO	93
REGIONAL METHODS OF COMPUTATIONS OF MEAN SUMMER TEMPERATURE AND INTRAANNUAL COURSE OF GLOBAL RADIATION WITHIN CENTRAL ASIA KONOVALOV VLADIMIR, KARANDAEVA LIDIYA	99
PERFORMANCE OF HYDROMETEOROLOGICAL INSTRUMENTS UNDER HARSH ENVIRONMENTAL CONDITIONS IN THE NEPAL HIMALAYAS O.R. BAJRACHARYA, K. SHARMA, T. ADHIKARI, W. GRABS	105
ADAPTATION OF A HIGH ALPINE GAUGING STATION (VERNAGTBACH, OETZTAL ALPS/AUSTRIA) TO GREATLY ENHANCED GLACIAL DISCHARGE OSKAR REINWARTH, LUDWIG N. BRAUN	107
SOIL MOISTURE MEASUREMENTS WITH AN IMPROVED TIME DOMAIN REFLECTOMETRY SYSTEM (TRIME) ROBIN FUNDINGER, KURT KOEHLER, MARKUS STACHEDER	109
ADAPTATION AND CALIBRATION OF A CONCEPTUAL SNOW AND GLACIER MELT RUNOFF MODEL FOR OPERATIONAL PURPOSES IN THE NEPAL HIMALAYA C. HOTTELET, L. BRAUN, W. GRABS, O. BAJRACHARYA	113
HYDROLOGICAL APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT IN HIMALAYAN RIVERS: A CASE STUDY OF THE KHIMTI RIVER IN NEPAL PRAVIN KARKI	117
GROUNDWATER POLLUTION DUE TO MIGRATION OF COLIFORM AND FAECAL COLIFORM BACTERIA, ITS SOURCES AND PROTECTION M.H. MALIK, M. SALEEM KHAN	121

SHAPE DEPENDANT MANNING ROUGHNESS WITOLD G. STRUPCZEWSKI, ROMUALD SZYMKIEWICZ	123
RELATIONSHIP BETWEEN CLIMATE AND VEGETATION IN THE HIGH ATLAS MOUNTAINS OF WESTERN MOROCCO MOHAMED ALIFRIQUI, RICHARD MICHALET, JEAN PAUL PELTIER	127
LAND-ATMOSPHERE INTERACTIONS IN MOUNTAINOUS REGIONS RONI AVISSAR	133
SPATIAL DISTRIBUTED MODEL APPROACHES TO HYDROLOGIC PROCESSES AND RIVER FLOW FROM MOUNTAINOUS REGIONS A. BALTENSWEILER, J. GURTZ, H. LANG, J. SCHULLA	137
RAINFALL-RUNOFF DATA AND MODELLING IN THE LIKHU KHOLA CATCHMENT, NEPAL DAVID BOORMAN, ALAN JENKINS, ROBERT COLLINS	139
WATER LOSS STUDIES IN MANDLESHWAR-RAJGHAT REACH OF NARMADA BASIN S.A. CHAR, R.S. VARADARAJAN, N.K. BHANDARI	145
STREAMWATER ACIDIFICATION IN RESPONSE TO ANTHROPOGENIC POLLUTION INPUTS AT FORESTED AND CULTIVATED CATCHMENTS IN THE MIDDLE HILLS, NEPAL ROBERT COLLINS, ALAN JENKINS, DAVID BOORMAN, PAUL WHITEHEAD	147
THE SIGNIFICANCE OF RUNOFF AND WATER CHEMISTRY MEASUREMENTS WITHIN THE LANDSCAPE ECOLOGICAL INVESTIGATIONS OF A SWISS ALPINE CATCHMENT AREA CHRISTIAN DÖBELI	153
THE MICROBIOTA OF ALPINE LAKES AND PONDS AS AN INDICATOR OF CHANGES IN THE HYDROLOGICAL CONVEYOR BELT KURT HANSELMANN, KONSTANZE MEZ, JOSEF NIEDERBERGER, HANS-RUDOLF REISIG, MARKUS BAUMGARTNER, DONAT HÖGL, HANS-PETER NÄGELI	157
HYDROCHEMICAL CHARACTERISTICS OF HEADWATER STREAMS IN THE MIDDLE HILLS AND HIGH MOUNTAINS OF THE NEPAL HIMALAYAS ALAN JENKINS, JEREMY WILKINSON, ROBERT COLLINS	163
PRINCIPLES OF HYDROLOGICAL REGIONALISATION AN EXAMPLE OF THE UPPER VISTULA BASIN (POLAND, EAST-CENTRAL EUROPE) POCIASK-KARTECZKA JOANNA	169

SPATIAL VARIATIONS OF DAILY EVAPORATION RATES IN A HIGH ALPINE VALLEY CARMEN DE JONG, PETER ERGENZINGER	173
DIATOMS COMMUNITIES IN HIMALAYAN HILLSTREAMS L. JÜTTNER, H. ROTHFRITZ, S.J. ORMEROD	179
ESTIMATION OF HYDROLOGICAL BALANCE COMPONENTS AT VARIABLE CONDITIONS OF THE MOUNTAINOUS CATCHMENT Z. KOSTKA, L. HOLKO	181
WATER BALANCE OF THE MOUNTAINOUS REGIONS OF CHINA CHANGMING LIU	187
ESTIMATION OF MEAN ANNUAL WATER BALANCE COMPONENTS IN A MOUNTAINOUS CATCHMENT OTO MENDEL	189
ESTIMATION OF MEAN EVAPORATION PATTERNS WITH RESPECT TO ELEVATION PAVOL MIKLANEK	193
BIODIVERSITY, CHEMISTRY AND STRUCTURE IN STREAMS OF THE NEPALESE HIMALAYA S. J. ORMEROD, S. T. BUCKTON, P. A. BREWIN, A. JENKINS, R. C. JOHNSON, A. SUREN	197
ECOLOGICAL SEASONS IN THE HIGH ARCTIC (NW-SPITSBERGEN) DETERMINED BY TEMPORAL VARIATION OF STREAMWATER CHEMISTRY AND ITS SOURCES WITHIN THE CATCHMENT MARION B. POTSCHIN, HARTMUT LESER	201
HYDROECOLOGICAL ANALYSIS OF AN AGRAIAN WATERSHED OF THE SIKKIM HIMALAYA S.C. RAI, E. SHARMA	207
A STUDY OF WATER BALANCE PARAMETERS WITH REFERENCE TO ENVIRONMENTAL PROBLEMS IN KATHMANDU B. UPADHYAY, B. R. UPADHYAY	209
PECULIARITIES OF RADIATION BALANCE ON SLOPES AND THE IMPORTANCE OF THESE PECULIARITIES FOR THE COMPUTATION OF EVAPORATION FROM MOUNTAIN BASINS V. VUGLINSKY	211
CORRELATION BETWEEN WATER QUALITY AND PLANKTON COMPOSITION IN AN URBAN LAKE IN SRI LANKA PADMINI DE ALWIS, HEMANTHA DASSANAYAKE	213
CONTRIBUTION TO THE KNOWLEDGE OF GENUS HIMALOPSYCHE (TRICHOPTERA : RHYACOPHILIDAE) FROM NEPAL WOLFRAM GRAF, SUBODH SHARMA	215

A CHECKLIST OF WATER BEETLES OF NEPAL WITH DISTRIBUTION PATTERNS IN RELATION TO ALTITUDE MANFRED A. JÄCH, SUBODH SHARMA	217
WATER USES IN NEPAL - IMPACTS AND EFFECTS ON THE AQUATIC ENVIRONMENT OTTO MOOG, SUBODH SHARMA	219
DISTRIBUTION AND SPECIES' COMPOSITION OF LEECHES (ANNELIDA:HIRUDINEA) IN THE AQUATIC HABITATS OF NEPAL HASKO NESEMANN, SUBODH SHARMA	221
CHARACTERISTICS OF PRECIPITATION AND DISCHARGE OF A MOUNTAINOUS BEECH FOREST AREA IN NORTHEASTERN JAPAN KIYOTAKA SAKAIDA, HAJIME MAKITA, YUKIO TORIKAKA	223
USING SEVERAL INDICES IN WATER QUALITY ASSESSMENT OF HIGHER MOUNTAIN STREAMS OF NEPAL SUBODH SHARMA, OTTO MOOG	227
THE ROLE OF SNOW DEPOSITS IN RAINFALL-RUNOFF SIMULATIONS FOR SMALL HIMALAYAN BASINS, NEPAL J. BUCHTELE, A. HERRMANN, O.R. BAJRACHARYA	229
GLACIAL GEOMORPHOLOGY OF THE CHORABARI GLACIER, GARHWAL HIMALAYA RAVINDER KUMAR CHAUJAR	233
FOUR YEARS OF MONTHLY MASS BALANCE ON A TROPICAL GLACIER: THE ZONGO GLACIER, 16°S, CORDILLERA REAL, BOLIVIA BERNARD FRANCOU, PIERRE RIBSTEIN, PATRICK WAGNON	237
SCANNING ELECTRON MICROSCOPIC STUDY OF QUARTZ GRAINS OF DOKRIANI BAMAK (GLACIER), GARHWAL HIMALAYA, INDIA J.T. GERGAN, D.P. DOBHAL	241
SNOW AND GLACIER HYDROLOGY IN NEPAL: PROJECT RESULTS FOR THE PROVISION OF DATA AND INFORMATION FOR WATER RESOURCES' DEVELOPMENT W. GRABS, O. BAJRACHARYA, C. HOTELETT, R. KAYASTHA	243
EFFECT OF SNOW AND ICE ON THE GARHWAL HIMALAYA ECOSYSTEM SYED HASNAIN, RENOJJ THAYYEN, DEVENDRA S. CHAUHAN	245
RECENT CHANGES OF GLACIAL PHENOMENA IN THE KHUMBU REGION, NEPAL FUSHIMI HIROJI, YABUKI HIRONORI, SEKO KATSUMOTO, YAMADA YUZURU	247

THE EFFECT OF SNOW AVALANCHES ON THE HYDROLOGIC REGIME OF KUNHAR BASIN IN THE PUNJAB HIMALAYA, PAKISTAN M. INAMULLAH KHAN, ATHANASIOS LOUKAS, MICHAEL C. QUICK	249
MELTING AND EVAPORATION OF GLACIER SYSTEMS OF THE HINDU KUSH-HIMALAYAN REGION AND LIKELY CHANGES IN THE SYSTEMS AS A RESULT OF GLOBAL WARMING V.M. KOTLYAKOV, I.M. LEBEDEVA	253
SNOWMELT RUNOFF ESTIMATION FROM A HIMALAYAN CATCHMENT USING THE SRM MODEL B.P. PARIDA	257
THE DISTRIBUTION OF GLACIERS AND SNOW COVER IN THE YARLUNG ZANGBO-BRAHMAPUTRA RIVER BASINS Z. QUNZHU, Y. ZEHNIANG, M. DESHENG	259
GLACIER ABLATION UNDER DEBRIS COVER, FIELD OBSERVATION ON LIRUNG GLACIER, NEPAL HIMALAYA BIRBAL RANA, MASAYOSHI NAKAWO, YUTAKA AGETA, JUMPEI KUBOTA, ATSHUHI KOJIMA	263
DISTRIBUTION OF SNOW COVER IN THE MOUNTAINS OF CENTRAL ASIA IGOR V. SEVERSKY	267
THE CONTRIBUTION OF GLACIER MELT TO RIVER DISCHARGE IN AN ARID REGION YASUYUKI UJIHASHI, JINGSHI LIU, MASAYOSHI NAKAWO	275
MATHEMATICAL MODELLING OF FLOOD AND DEBRIS FLOWS CAUSED BY OUTBURSTS FROM HIGH MOUNTAIN LAKES YURI B. VINOGRADOV	281
FLOW SEPARATION ON ZONGO GLACIER PATRICK WAGNON, PIERRE RIBSTEIN, BERNARD FRANCOU	285
RESPONSE OF CRYOSPHERE TO CLIMATIC WARMING SINCE THE 1980s OVER THE NORTHERN HEMISPHERE DING YONG-JIAN	289
THE NATURE OF ABLATION AND AGGREGATION ON THE DUSTED SNOW SURFACE SUNIL ADHIKARY, KATSUMOTO SEKO, MASAYOSHI NAKAWO, YUTAKA AGETA, NOBUO MIAZAKI	293
THE ASSESSMENT OF SNOW ACCUMULATION, PRECIPITATION AND RUNOFF OVER THE KARAKORAM GLACIER SYSTEM FROM SATELLITE IMAGES KRENKE ALEXANDER, NOSENKO GENNADY	297

RECENT CHANGES IN MID-LATITUDE MOUNTAIN CLIMATE AND SNOW COVER CONDITIONS ROGER G. BARRY	299
APPROACHES TO REDUCING THE HAZARD OF AN OUTBURST FLOOD OF IMJA GLACIER LAKE, KHUMBU HIMAL RICHARD KATTELMANN, TELJI WATANABE	303
PERIGLACIAL PROCESSES IN HENTEI - MOUNTAINS RADNA LOMBORINCHEN, PUREV BAAST	307
STUDIES ON SNOW-COVER MONITORING ON THE TIBETAN PLATEAU BY REMOTE SENSING Z. QUNZHU, F. XUEZHI, W. GUANGYU, L. XING	309
HAZARDS OF EROSION AND SEDIMENTATION DUE TO CLOUD BURST IN SMALL CATCHMENTS - A CASE STUDY FROM KUMAUN HIMALAYA, INDIA R. ANBALAGAN	313
SOIL DEVELOPMENT ON GLACIAL AND GLACIOFLUVIAL DEPOSITS IN CENTRAL AND EASTERN NEPAL IN RELATION TO CLASSIFICATION AND LANDSCAPE HISTORY RUPERT BÄUMLER, WOLFGANG ZECH	315
INTERDISCIPLINARY ALTITUDINAL TRANSECT AND RIVER CATCHMENT STUDIES IN MOUNTAIN REGIONS ALFRED BECKER	319
SEDIMENT TRANSPORT IN GLACIER-FED RIVERS IN THE KARAKORAM DAVID N. COLLINS	321
RESEARCH ON ENVIRONMENTAL CHANGE IN SOUTHERN TIBET LEBER DIETHARD, HÄUSLER HERMANN	323
EROSION PHENOMENA ON THE OLYMPUS MOUNTAIN, NORTH GREECE DIMITRIOS EMMANOULOUDIS, THEOFANIS PAVLIDES	327
PROBLEMS OF LATE-GLACIAL AND HOLOCENE ADVANCES IN LANGTANG, NEPAL HELMUT HEUBERGER, HORST IBETSBERGER	331
VARIATION OF EROSION AND SEDIMENT YIELDS IN MOUNTAIN AREAS OF LIAONING PROVINCE YIN HSUEH-CHUN	335
SOME RESULTS OF LONG-TERM VARIABILITY OF AVALANCHE ACTIVITY OF CIS MOUNTAINS LEONID A. KANAEV, YELENA G. KAKURINA	339

HYDROLOGIC ASPECTS OF THE SIERRA NEVADA ECOSYSTEM PROJECT RICHARD KATTELMANN	343
HAZARDS OF EROSION AND ITS EFFECTS ON THE WATER RESOURCES OF PAKISTAN M.H. MALIK, M. SALEEM KHAN	345
SOIL EROSION AND GEOMORPHODYNAMICS IN THE HIGH MOUNTAIN REGION, EASTERN CENTRAL HIMALAYA. A CASE STUDY IN THE BAMTI/BHANDAR/SURMA AREA, NEPAL JOHANNES B. RIES	349
SOIL EROSION AND NUTRIENT DYNAMICS IN A MIDDLE MOUNTAIN WATERSHED H. SCHREIER, M. CARVER, S. BROWN, P.B. SHAH, G. NAKARMI, B. SHRESTHA	353
ASSESSMENT OF EROSIONAL HAZARDS IN THE HIMALAYA: A CASE STUDY OF CHAMOLI DISTRICT IN UTTAR PRADESH (INDIA) JAGBIR SINGH	357
TEMPORAL CHANGES IN HIGH MOUNTAIN ECOSYSTEMS AND ECOHYDROLOGY: TWO CASE STUDIES FROM THE AUSTRIAN ALPS AND THE CHILEAN ANDES HEINZ VEIT	359
ECOLOGICAL CHARACTERISTICS OF BENTHIC MACRO INVERTEBRATES FROM HIGH ALTITUDE STREAMS (MOROCCO) AICHA AJAKANE, ALI BOUMEZZOUGH	363
WATER CYCLE AND VARIATIONS IN SOIL-WATER CONTENT IN A JUNIPERUS THURIFERA STAND IN THE HIGH ATLAS MOUNTAINS OF MOROCCO WADI BADRI, THIERRY GAUQUELIN	367
HYDROLOGY OF NAKHU WATERSHED - BEFORE AND AFTER THE 1981 DISASTER JAGAT K. BHUSAL	375
THE IMPACT OF FLOODS ON THE BENTHIC AND RIPARIAN COMMUNITIES OF THE RIVER OURIKA IN THE HIGH ATLAS MOUNTAINS (MOROCCO) ALI BOUMEZZOUGH, BOUCHRA ALIFRIQUI	381
SURFACE RUNOFF, SOIL LOSS AND LAND USE STUDIES IN TWO MICRO-CATCHMENTS OF THE WESTERN HIMALAYA, INDIA VARUN JOSHI, G.C.S. NEGI	387
IMPACT OF TOURISM ON ECOHYDROLOGY IN THE HEADWATER REGION OF BEAS, HIMACHAL HIMALAYA B.W. PANDEY, R.B. SINGH	389

