

13 UNIVERSITA' DI PADOVA

Quaderni del Dipartimento di Geografia
Padova 1991

PROCEEDINGS OF
THE INTERNATIONAL
CONFERENCE ON
ENVIRONMENTAL CHANGES
IN KARST AREAS
I.C.E.C.K.A.
Italy, September 15th-27th, 1991

Edited by:

Ugo SAURO
Aldino BONDESAN
Mirco MENEGHEL

INTERNATIONAL GEOGRAPHICAL UNION
Study Group: "Environmental Changes in
Karst Areas"

INTERNATIONAL SPELEOLOGICAL UNION
"Commission for physics-chemistry and
hydrology of Karst"

This volume was printed with the contribution of
C.N.R. (National Council of Research - Altri
Interventi AI90.01568.05), the Commission
of the European Communities, ENEA, Consorzio
Frasassi and others sponsors (see following pages)

Atti del Congresso finanziati con contributi
del C.N.R. (AI - 90.01568.05)
della Comunità Europea e di altri Enti
(si veda l'elenco nella pagina che segue)

ORGANIZERS

U. Sauro, M. Meneghel, A. Bondesan
(Dipartimento di Geografia - Università di Padova)

L. Sorbini
(Museo Civico di Storia Naturale di Verona)

P. Forti
(Istituto Italiano di Speleologia)

A. Cigna
(E.N.E.A.)

S. Macciò
(Società Speleologica Italiana)

E. Burri
(Dipartimento di Scienze Ambientali - Università dell'Aquila)

L. Tulipano
(Facoltà di Ingegneria, Università "La Sapienza", Roma)

F. Boenzi, G., M. Maggiore, Palmentola
(Dipartimento di Geologia e Geofisica - Università di Bari)

F. Zezza
(Grotte di Castellana)

G. Campanella, P. Palmisano
(Federazione Speleologica Pugliese)

ORGANIZING COMMITTEE FOR THE PUGLIA REGION

Simone Pinto (Soc. Speleol. It.)
Luigi Tulipano (Fac. Ingegn., Univ. "La Sapienza", Roma)
Federico Boenzi (Dipart. Geol. Geof. - Univ. Bari)
Fulvio Zezza (Direttore Scientifico Grotte di Castellana)
Gianni Campanella (Federazione Speleol. Pugliese)
Pino Palmisano (Federazione Speleol. Pugliese)
Rosari Capozzi (Gruppo Speleologico del Gargano, Puglia)
Michele Lo Mele (Speleo Club Sperone - S. Giovanni Rotondo)
Enza Angelastri (Centro Altamurano di Ricerche Speleologiche)
Nunzio Pacella (Associazione Speleologica Pugliese)
Giuseppe Savino (Gruppo Puglia Grotte)
Tina Sibilìa (Gruppo Puglia Grotte)
Dino Grassi (Gruppo Speleo Statte)
Enzo Pascali (Gruppo Speleologico Martinese)
Filippo Favale (Centro Ric. Stor. Art. e Speleo-Archeol. - Polignano a Mare)
Fernando Ladiana (Direttore di "Itinerari Speleologici")

PROMOTERS & SPONSORS

Main Session and

post congress excursions

Commission of the European Communities
CNR - Consiglio Nazionale delle Ricerche
ENEA
Ministero dell'Ambiente
Gruppo Nazion. Geografia Fisica e Geomorfologia
Società Geografica Italiana
Regione del Veneto
Regione Abruzzo
Museo Civico di Storia Naturale di Verona
Telespazio
Provincia di Padova
Comune di Padova
Comune di Verona
Comunità Montana della Lessinia
Bacini Imbriferi Montani dell'Adige
Comunità Montana dei Sette Comuni
Azienda di Promozione Turistica della Lessinia
Comune di Valstagna
Consorzio Grotte di Frasassi
Cassa di Risparmio di Padova e Rovigo
Banca Popolare di Verona
Apple Computers - Italia
Azienda Trasporti Padova, Padova
Università degli Studi di Padova
Dipartimento di Geografia dell'Università di Padova
Dipartimento di Geografia dell'Univers. di Bologna
Dipart. di Sc. Ambientali dell' Univers. dell'Aquila

Post Congress excursion in Abruzzo

Diparti. di Scienze Ambientali- Univers. dell'Aquila
Regione Abruzzo
Telespazio
Gruppo Speleologico Aquilano
Speleo Club Chieti
Centro Speleologico Maiella
Comune di San Demetrio nei Vestini
E.R.S.A.-Ente Sviluppo in Abruzzo
I.N.F.N. - Laboratorio del Gran Sasso d'Italia

Post Congress excursion in Puglia

Regione Puglia
Amministrazione Provinciale di Bari
Amministrazione Provinciale di Foggia
Amministrazione Provinciale di Lecce
Amministrazione Provinciale di Taranto
Comunità Montana del Gargano
Comunità Montana della Murgia Sud Orientale
Comune di Altamura
Comune di Castellana Grotte
Comune di Castrignano del Capo
Comune di Massafra
Comune di Otranto
Comune di S.Cesarea Terme
Ente Provinciale per il Turismo di Lecce
Az. di Cura, Sogg. e Turismo di S.Cesarea Terme
Azienda di Soggiorno e Turismo di Otranto
Pro-Loco di Massafra
Cassa di Risparmio di Puglia
Terme di S.Cesarea S.p.A
INSUD-Roma
MIT-Roma

PARTICIPANTS

- AMBERT Dr. Martine, Université P. Valéry, Montpellier, 190 Rue de Genevriers, F. 34830 Clapiers
- AMBERT Dr. Paul, URA 903 - CNRS Aix en Provence, 190 Rue de Genevriers, F 34830 Clapiers
- BARANY- KEVEY Dr. Ilona, University of Szeged, Physical Geographical Institut , Egyetem U.2 H. 6722-SZEGED Hungary
- BOENZI Prof. Federico, Dipartimento di Geologia e Geofisica Campus Universitario Via Giustino Fortunato 70100 BARI (Italy) *
- BONDESAN Dr. Aldino, Dipartimento di Geografia, Università di Padova, via del Santo, 26 35123 Padova Italy *
- BOSÁK Dr. Pavel RNDr., Geindust. Komunardu 6, 17004 PRAHA 7, Czechoslovakia
- BURRI Dr. Ezio, Dip. di Scienze Ambientali, Università 67100 L'AQUILA (Italy) *
- CALAFORRA CHORDI Dr. Maria José, Department of Geodinamycs, Campus Fontanueva 18071 E Granada, Spain
- CAMPANELLA GIANNI, Federazione Speleol. Pugliese, Castellana Grotte, Bari, Italia *
- CAPUTO Prof. Claudio, Dipart. di Scienze della Terra, Univer. di Roma "La Sapienza", P.le Aldo Moro, 5 00185 Roma Italy
- CELI Dr. Monica, BASSANO (VI) *
- CELICO Prof. P., Dip. Scienze della Terra, Università di Napoli, Largo San Marcellino 10, 80100 NAPOLI *
- CHARDON Prof. Dr. Michel, Institut de Géographie Alpine, University J.Fourier, rue Maurice Gignoux F 38031 Grenoble Cedex, France
- CHOPPY Ing. Jacques, 182 Rue de Vangirard, 75015 Paris France
- CIANCIAN MARCO - Padova
- CICACCI Dr. Sirio, Dipart. di Scienze della Terra, Univer. di Roma "La Sapienza", P.le Aldo Moro, 5 00185 Roma, Italy
- CIGNA Prof. Arrigo A., c/o ENEA, 13040 SALUGGIA VC (Italy) *
- CROUCH Prof. Dora, Polk Ressenlaer Polytechnic Institute, 1160 Justin Ave., 5 91201 GLENDALE California-USA
- DAY Dr. Michael, University of Wisconsin - Milwaukee, P.O.Box 413 53201 Milwaukee Wisconsin U.S.A.
- FORD Prof..D. C. Derek, Department of Geography McMaster University, 1280 Main street, West Hamilton, Ontario L8S4K1 Canada
- FORTI Prof. Paolo, Istituto di Speleologia, Via Zamboni, 67 40127 BOLOGNA, Italia *
- FREDI Dr. Paola, Dipart. di Scienze della Terra, Univer. di Roma "La Sapienza", P.le Aldo Moro, 5 00185 Roma Italy
- GAMS Prof. Ivan, Department of Geography, University of Ljubljana, Askerceva 12 61000 Ljubljana SLOVENIA
- GINÉS Prof. Angel, Universitat de les Illes Balears, CTRA Valldemossa, km 7,5 E-07071 Palma de Mallorca
- GOLDIE Dr. Helen Sylvia, University of Durham, South Road, DHI 3LE Durham United Kingdom
- GREEN Dr. Martin R., University of Durham, South Road, DHI 3LE Durham United Kingdom
- GUNN Prof. John, Dept. of Environm. Sc. & Geogr. Manchester Polytechnic, Chester Street, Manchester M1 5 GD United Kingdom

HABIC Prof. Peter, Institute for Karst Research, ZRC -Sazu Postojna, Titov Trg. 2
66230 Postojna Slovenia

HALLIDAY Dr. William R., National Speleological Society, 6530 Cornwall Court,
37205 Nashville TN Tennessee- U.S.A.

HALLIDAY Mrs. Louise B., National Speleological Society, 6530 Cornwall Court ,
37205 Nashville, TN Tennessee - U.S.A.

ISSAR Mrs Margalit, The J.Blaustein Institute for Desert Research Ben Gurion,
University of the Negev, Sede Boker Campus, 84990 Israel

ISSAR Prof. Arie, The J.Blaustein Institute for Desert Research Ben Gurion, University
of the Negev, Sede Boker Campus, 84990 Israel

JAMES Prof. Julia Mary, School of Chemistry, University of Sydney, NSW 2006,
Sydney Australia

KUNAVER Mrs Jelka, Department of Geography, University of Ljubljana, Askerceva
12, 61000 Ljubljana, Slovenia

KUNAVER Prof. Juri, Department of Geography, University of Ljubljana, Askerceva
12, 61000 Ljubljana, Slovenia

LABORDE Dr. Paul, Université Libre du Vivarais Le Lauzas, 07200 Ucel France

LASCU Dr. Cristian, Inst. of Speleology "Emil Racovita", Str. Frumoasa, 11, 78114
BUCARESTI (Romania)

LAURETI Prof. Lamberto, Dipart. di Scienze della Terra, Corso Strada Nuova, 65
27100 PAVIA (Italy)

LJESEVIC Prof. Milutin, Geographical Faculty of Belgrade, Studentski trg 16, 11001
BEOGRAD P.O.B 550 (Yugoslavia)

LUPIA PALMIERI Prof. Elvidio, Dipart. di Scienze della Terra, Univer. di Roma "La
Sapienza", P.le Aldo Moro, 5 00185 Roma Italy

MACALUSO Dr. Tommaso, Dipart. di Geologia e Geodesia, Università di Palermo,
Corso Tukory 131, 90134 Palermo Italy

MAGGIORE Prof. Michele, Dipartimento di Geologia e Geofisica, Campus
Universitario, Via Giustino Fortunato, 70100 BARI (Italy) *

MENEGHEL Dr. Mirco, Dipartimento di Geografia, Università di Padova, via del
Santo 26, 35123 Padova Italy *

MICZEK Dr. George, Depart. of Physical Geography, Eotvos University, Ludovica ter
2 1083 Budapest Hungary

NICOD Prof. Jean, Florida 1 Av. 24 Avril 1915, F 13012 Marseille

NIEWDANA Ing. Jozef, Sejmik Samorzadowy woj. kat. Uniwersytet , Slaski Stare
Bukowno 34 32332 Bukowno Poland

OROMBELLI Prof. Giuseppe, Dipartimento Scienze della Terra, Università di Milano,
via Mangiagalli, 34 20133 Milano 84.

PALMISANO PINO, Federazione Speleol. Pugliese, Castellana Grotte, Bari, Italia *

PANOS Prof. Vladimir, Institute of Geography, Czechoslovak Accademy of Sciences,
Mendelovo sg, No 1, 66282 Brno Czechoslovakia

PELLEGRINI Prof. G. Battista, Dipartimento di Geologia, Paleontologia e Geofisica,
Università di Padova, via Rudena, 3 35100 Padova Italy

PONTA Dr. George, Inst. Geography and Geophysics, Caransebes Street, n° 1,
Bucharest (Romania)

PUGLIESE Dr. Francesco, Dipart. di Scienze della Terra, Univer. di Roma "La
Sapienza", P.le Aldo Moro, 5 00185 Roma Italy

SANTO Dr. Antonio, Istituto Geologia Applicata, Università di Napoli, Piazzale Vecchio 80125 Napoli Italy

SAURO Prof. Ugo, Dipartimento di Geografia Università di Padova, via del Santo 26, 35123 Padova Italy *

SORBINI Dr. Lorenzo, Museo di Storia Naturale, L.adige Porta Vittoria 9, 37100 VERONA*

STECL Ph.D. Otakar, Institute of Geography, Czechoslovak Academy of Sciences, Mendelovo sg, No 1, 66282 Brno Czechoslovakia

TRIMMEL Mrs. Erika, Union Int. de Speleologie, Draschestrasse 77, A-1232 WIEN, Austria

TRIMMEL Prof. Dr. Hubert, Union Internationale de Speleologie, Draschestrasse 77, A-1232 WIEN Austria

TUCCIMEI Dr. Paola, Dipart. di Scienze della Terra, Università di Roma, Piazzale Aldo Moro, 5, 00185 Roma, Italy

TULIPANO Prof. Luigi, Ist. di Geologia Applicata e Geotecnica, Via Re David 200, 70125 BARI (Italy) *

URUSHIBARA YOSHINO Prof. Kazuko, Department of Natural Sciences, The Komazawa University, Komazawa I-23-1 Setagaya-Ku Tokyo 154 Japan

VIGNA Dr. Bartolomeo, Politecnico di Torino, Corso Duca degli Abruzzi, 24 10129 Torino Italy

YOSHINO Prof. Dr. Masatoshi, Department of Natural Sciences, The Komazawa University, Komazawa I-23-1, Setagaya-Ku Tokyo 154 Japan

ZAMBO Prof. Lazlo, Depart. of Geography, Eotoos L. University, Unn Bèlater 2, 1083 Budapest, Hungary

ZAMPIERI Dr. Dario, Dip. di Geologia, Paleontologia e Geofisica, Via Giotto Padova (Italy) *

ZEZZA Prof. Fulvio, Istituto di Geologia Applicata e Idrogeologia, Via Re David 200, 70125 BARI (Italy) *

ZORZAN Paolo Dipart. di Geografia Univ. di Padova via del Santo, 26 35123 Padova Italy *

(all the persons indicated with * have taken part to the scientific and or logistic organization of the Conference)

LOCAL PARTICIPANTS TO THE EXCURSION IN THE PUGLIA REGION

TULIPANO Luigi, Facoltà di Ingegneria, Università la Sapienza, 00100 ROMA
BOENZI Federico, Dip. di Geol. e Geofisica, Univ. Bari, Campus Univ., 70125, BARI
ZEZZA Fulvio, Istituto di Geol. Appl. e Geot., Via Re David 220, 70125 BARI
MAGGIORE Michele, Dip. di Geol. e Geof., Univ. Bari, Campus Univ., 70125, BARI
LUPERTO SINNI Elena, Dip. di Geol. e Geof., Univ. Bari, Campus Univ., 70125, BARI
CHERUBINI Francesco, Istituto di Geol. Appl. e Geot., , Via Re David 220, 70125 BARI
CALDARA Massimo, Dip. di Geol. e Geof., Univ. Bari, Campus Univ., 70125, BARI
BABOCI Klidi, Accademia delle Scienze, Centro Studi di Geografia, TIRANA (Albania)
BRUNO Giovanni, Istituto di Geol. Appl. e Geot., Via Re David 220, 70125 BARI
RAMUNNI Francesco, Istituto di Geol. Appl. e Geot., , Via Re David 220, 70125 BARI
PAGLIARULO Rossella, CNR -C.S.A.T.A.I., Via Re David 220, 70125 BARI
LOLLINO Giorgio, CNR -C.S.A.T.A.I., Via Re David 220, 70125 BARI
FIDELIBUS Maria Dolores, Istituto di Geol. Appl. e Geot., Via Re David 220, 70125 BARI
SERRAVEZZA Carla, CNR -C.S.A.T.A.I., Via Re David 220, 70125 BARI
RUSSO Massimo, CNR -C.S.A.T.A.I., Via Re David 220, 70125 BARI
REINA Alessandro, Dip. di Geol. e Geofisica, Univ. Bari, Campus Univ., 70125, BARI
SANTERCOLE Rocco, Dip. di Geol. e Geof., Univ. Bari, Campus Univ., 70125, BARI
CAMPANELLA Gianni, Federazione Speleologica Pugliese, via Selva di Fasano 75, 70013
CASTELLANA GROTTA, BA
PALMISANO Pino, Federazione Speleologica Pugliese, via Dott. Guarnieri 58, 70010
LOCOROTONDO, BA
SAVINO Giuseppe, Gr. Puglia Grotte, via Pio XII, 6, 70013 CASTELLANA GROTTA, BA
SIBILIA Tina, Gr. Puglia Grotte (Interprete), via Contrada Putignano, 12 70014
CONVERSANO BA
LO MELE Michele, Gr. Speleol. Sperone, via Tiziano 3, 71013 S. Giovanni Rotondo, FG
PACELLA Nunzio, Ass. Speleol. Magliese, via G. Rossa 1, 73024 MAGLIE, LE
GRASSI Dino, Gr. Speleo Statte, via Mezzetti 19, 74100 TARANTO
LO MELE Antonio, Gr. Speleol. Sperone, v. d. Gioventù, 71013 S. GIOVANNI
ROTONDO, FG
FINI Nicola, Gr. Speleol. Sperone, via Foggia 21, 71013 S. Giovanni Rotondo, FG
LAPORTA Marco, Gr. Speleol. Sperone, via De Gasperi n.c. 71013 S. Giovanni Rotondo, FG
PASCALI Vincenzo, Gr. Speleol. Martinese, via M. D'Enghien, 74015 MARTINA
FRANCA, TA
ANGELASTRI Enza, C.A.R.S., via Belluno 6, 70022 ALTAMURA (BA)
PORTALURI Oronzo, Ass. Speleol. Magliese, via V. Emanuele 22, 73024, MAGLIE, LE
COLUCCIA Antonio, Gr. Speleol. Castrense, via V. d'Ostuni 52, 73010 CASTRO, LE
NEGRO Paolo, Gr. Speleol. Salentino "P. De Lorentis", via P. De Lor. 23, 73024 MAGLIE, LE
PERRONE Antonio, Gr. Speleo Statte, viale Marcus, Z.I., 74010 STATTE, TA
ORLANDO Franco, Gr. Speleol. Neretino, via A. Moro 12, 73048 NARDO', LE
ROTUNNO Vito, C.A.R.S., via Pasquale Sabini 3, 70022 ALTAMURA (BA)
MARVULLI Marco, C.A.R.S., Piazza Laudati 11, 70022 ALTAMURA (BA)
CICCIMARRA Domenico, C.A.R.S., via Eguaglianza 12, 70022 ALTAMURA (BA)
FAVALE Filippo Centro Ric. Sor. Archeol., via Cardinal Ciasca 79, 70044 POLIGNANO A
MARE, BARI

OPENING CERIMONY OF THE CONFERENCE AND PROPOSITIONS OF THE PARTICIPANTS
Padova, 16/9/91

Welcome of Prof Ugo Sauro, Chairman of The Study Group

As Chairman of the Study Group "Environmental Changes in Karst Areas" I feel really happy and deeply moved to be here to open the Second Conference of the Study Group "Environmental Changes in Karst Areas".

I bring here the greetings of all the Organizations which have sponsored and supported the Conference (see the list of promoters and sponsors and in particular the list of supporters of the proceedings of the Conference in this volume).

In particular the President of the Italian Geographical Society has pried me to represent him and to transmit to all the welcome of the Society in Italy and in Padova.

I have also to thank the Director of the Department of Geography and all the Colleagues and technicians for the collaboration. In particular a warm thank to Mirco Meneghel and Aldino Bondesan for the strong support for the organization of the Conference.

I express to all You the hearty welcome by name of all the Study Group and of the Organizing Committee

The Study Group "Environmental Changes in Karst Areas" is an organization of the International Geographical Union; but this Conference, like the previous one is a Joint meeting with the Commission for physics-chemistry and hydrology of karst of the International Geographical Union. Here we have as welcome guest the President of UIS Prof. Hubert Trimmel and the Vice-President Dr. Julia James.

Between the participants are present also some members of the Karst Commission of IAH and some cooperators of the IGCP 299 about Karst

The Group "Environmental Changes in Karst Areas" exists from 3 years, in fact it was approved during the International Conference of Sydney in August 1988.

The Group represent a development of the activity and projects of a previous Study Group about the "Man's impact in Karst". We thank Prof. Ivan Gams who was chairman of this Group for his important contribution to the cooperation in karst research.

The time we are living is surprising for the many unforeseen changes in political and economical geography of the World. But also the natural and semi-natural environments are rapidly changing, and urbanization is extending more and more in wide areas.

Man is the main protagonist of these changes and bears the responsibility to transfer to the future generations an environmental heritage better for living and cultural improvement.

So it is necessary to know better the environment, to be able to promote the wisest chooses for future development.

This Conference represents an important moment of deepening by scientific contributions and discussions of problems about environments which are extended in large sectors of Earth surface, the karst environments, the environments of soluble rocks which hide inside inner spaces without light; the environments which often represent natural monuments and biotopes rich in singularities; the environments which preserve important resources as karst waters, karst minerals, building stones, etc.

Karst regions, with their characteristic aquifers and sediments, constitute peculiar natural systems able to memorize environmental changes. So the study of such systems helps to understand the interactive processes and especially the human influence on such geoeosystems.

I think that between the many objectives one of the more important is that to establish an international inventory of karst resources which could serve as the basis of a scheme for listing of threatened, rare or fragile karst areas. We could search to establish an UNESCO convention for the protection of karst areas (as "an International Register of Karst Geoeosystems - IRKG").

I emphasize that the results of research on Karst depend so much on the work and cooperation between all the research workers on karst.

I am sure that we will be able not only to show to the Community the interest and importance of karst research but also to provide a considerably accelerated impetus to environmental research in karst regions.

Good scientific work to all us!

Welcome of Prof. Marcello Zunica Director of the Department of Geography

As Director of the Department of Geography of this University and on behalf of all the Colleagues of the Department I express to all You an hearty welcome for Your stay in Padova and in our University and Department.

Prof. Sauro in his brief presentation has jet remembered and thanked the Department and myself but I think that a special thank must be expressed to Prof Sauro, Dott. Meneghel, Dott. Bondesan and all the Technicians of The Department, who have spent a great effort to prepare this Conference for the best scientific results and for an agreeable stay of all You.

I express my wish that this effort may bring to important outcomes in the field of geographical and environmental research on karst regions.

Welcome from Prof. Elvidio Lupia Palmieri, Coordinator of the National Group for Physical Geography and Geomorphology

Ladies and Gentlemen

I am very pleased to Welcome, on behalf of the National Group for Physical Geography and Geomorphology, all the distinguished researchers who wanted to honour with their presence our country and the town of Padova in particular.

This Conference, which is carried out on the initiative of the International Geographical Union and the International Speleological Union, was organized with the contribution of some researchers of the National Group for physical Geography and Geomorphology, among whom in particular the Chairman Ugo Sauro, Aldino Bondesan and Mirco Meneghel. For these reasons the National Group considers itself particularly involved in this meeting which it wanted to sponsor and to which it contributes through many researchers.

Some of You Are acquainted with the activity of our Group, because they are frequently in touch with single italian researchers, some other got acquainted with our existence on the occasion of the International Conferences of Geomorphology held in Manchester, in 1985, and in Frankfurt, in 1989. This Group, which numbers at present 250 researchers from all the Italian Universities and from different public and private institutions, has intensely promoted and coordinated the scientific researches in the fields of Physical Geography and Geomorphology for many years.

The scientific meetings, like the one which has gathered us in Padova, are a great satisfaction to us, because they allow the confronting with other researchers and the enriching of our knowledge.

If these meetings are going to be held under the auspices of institutions as IGU and UIS and if they are attended by very qualified researchers, the National Group for Physical Geography and Geomorphology feels particularly honoured to help the scientific activity of the meeting themselves.

I am sure that this Conference will help in making stronger the relations already existing among us as well as in giving rise to new stimulating scientific collaborations and human contacts.

As Coordinator of the National Group for physical Geography and Geomorphology I wish You a pleasant and useful stay in Padova and I give You my hearty regards.

Thank You

Welcome from Arch. Franco Posocco, Secretary of the Department of Territory of the Veneto Region

Ladies and gentlemen's, I am engaged in the problems of land planning of the Veneto Region. Many technical problems are concerned in such task, regarding also the geology and geomorphology of the region.

In the Veneto Region there are many Karst Areas as the Dolomites and the high mountains of Venetian Prealps near to the plain which we call "altopiani"

In this area the waters which are inside the karst massifs are often in peril; we are conscious of this peril and we are working in the very difficult problem of safeguard of this patrimony.

For this reason We are very interested in the conclusions of this conference and we are politically convinced that the collaboration with the University and the geologists and scientists who are working on this subject is very important for us.

We are also convinced that the interdisciplinary: I mean the collaboration between the disciplines of different branches of sciences is very important

The planning is in fact the synthesis of many decisions and of models which comes from many different ways by the collaboration of different researchers.

This is a great challenge for saving environment who mainly in our region, because the Veneto from the economical and from the development point of view is very interesting; it has changed with a great speed; for this reason it is in peril and the pollution represents a great problem for us

I thank you all very much for your engagement in this problem, which is the karst areas destiny. Our Region is very near the Classical Karst and is characterized by a large mountain area mostly in karstifiable rocks. Here the problems and the knowledges about karst environments are not very advanced as in other places. For this reasons we thank You very much for Your scientific work and we will be very interested in the conclusions of this Conference to be helped in our decisions.

Proposition approved during the meeting of the Study Group (18/9/91)

Karst research requires an understanding of many disciplines including geomorphology, hydrogeology, speleology and chemistry. At present the efforts of physical Scientists with interests in these areas are dispersed over four international groups:

IAH
IGCP
IGU
UIS

Many karst researchers are members of more than one group and some are members of all four. Each group holds regular international meetings but few people can attend more than each year. As a result there is never a time when all karst scientists can meet together and share ideas. We propose that the leaders of the four groups should meet together and work towards closer cooperation. Such a coordinating meeting may be possible at the 3rd International Geomorphology Conference in Hamilton, Canada, which will be attended by members of all groups.

We also propose a joint meeting of all groups in 1995 or 1996. This should be the only meeting of each group that year and should have lectures from invited speakers representing each group. A possible location which should be of interest to all groups would be the Moulis-Montpellier area in the South of France (written by J.Gunn).

DECLARATION

issued by participants of the International Conference on Environmental Changes in Karst Areas, Padova Italy, September 15th-28th, 1991

We, the participants of the International Conference on Environmental Changes in Karst Areas, held from September 15th through 27th, 1991, in the Department of Geography, the University of Padova, Italy, are extremely worried because of the civil war in Yugoslavia, which is also going on in some famous Dinaric Karst regions. We have learned from our own experience that the Dinaric Karst represents a unique type of World landscape. Thus it is an inspiration for every student of karst phenomena.

We admire the features of the Dinaric Karst as well as its people, and we have studied its peculiarities again and again. Therefore we cannot agree with the hostilities by the army which caused pain among the civil population, and with general violence which has not spared even historical places of this region.

We, the researchers in the Karst, are deeply concerned about the future destiny of the people, places and countries of the Dinaric Karst. It is our sincere wish that the people in these regions should live in peace and friendly neighbourhood, regardless of their nationality or religion. We also wish for a normal economic development - touristic development in particular - of these

beautiful and interesting regions, just as it used to be in the case of the famous Plitvice Lakes. Therefore, we all ask all the state governments, diplomats, international and national institutions and also individuals, all those who have the possibility, will, and strength, to contribute to the re-establishment of peace in the above mentioned regions.
(prepared by the Yugoslav participants and approved by the participants to the Conference, September 19th, the evening, after the dinner)

Selected parts of a letter of Dr. Bozidar Biondic (Director, Division of Hydrogeology, Engineering Geology, and Mineral Resources, Institute of Geology, Sachsova 2, 41000 Zagreb, Yugoslavia), read by Prof. L. Tulipano during the symposium of Castellana, September the 26, 1991

Dear Colleague,

We never imagined that we would be communicating with You for any other purpose than for promoting scientific activity and friendly contact. We never thought that the political tension which appeared during the preparations on the project "Hydrogeological Aspects of Groundwater Protection in Karstic Areas" (COST Project 65) would escalate into an

Scientists are generally not fond of analyzing the political situation in any country, butthere is the great danger of an environmental catastrophe within and around the Mediterranean region. This has forced us scientists to speak out and warn the public. As scientists, we try to understand the mechanisms of natural systems and try to secure a safe environment for human life. However, the ...forces ... threaten to destroy the national pipeline that passes through the entire karst region of Croatia, the nuclear plant at Krsko, and large petroleum refineries and chemical industry complexes.

These treats could mean an environmental catastrophe of immense size, not only for Croatia and Slovenia but also for a much wider European Area.

We appeal to You to use whatever influence you can in your country to STOP THE WAR IN CROATIA, for the consequences this war may reach well beyond the borders of Croatia and Yugoslaviawe alone cannot prevent the environmental devastation of large parts of central and southern Europe.

LIST OF THE PUBLICATIONS OF THE INTERNATIONAL CONFERENCE ON ENVIRONMENTAL CHANGES IN KARST AREAS

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON ENVIRONMENTAL CHANGES IN KARST AREAS. SAURO U., BONDESAN A., MENEGHEL M. (eds.), Quaderni del Dipartimento di Geografia 13, Università di Padova ISSN: 1120-9682, 1991 Padova; issued in the preliminary edition ((23 papers, 214 pp); the definitive edition will be printed by the end of 1991.

ITINERARI SPELEOLOGICI s.2, n.5, Federazione Speleologica Pugliese; LADIANA F., CAMPANELLA G., GUARNIERI G., GILIBERTO M., ONORATO R., PALMISANO M. (eds.) 179 pp. (special number issued for the International Conference on Environmental Changes in Karst Areas, Italy, 1991). Contiene 19 contributi connessi con l'escursione scientifica ed i seminari tenuti in Puglia fra il 24 ed il 28 settembre 1991.

THE PARK OF THE GYPSUM KARST NEAR BOLOGNA (Appennino Emiliano). (FORTI P., ed.) (in print);

SOME KARST AREAS IN CENTRAL APPENNINE (BURRI E. ed.) (in print).

INDEX

The origin of the term Karst in the time of transition of Karst (Kras) from deforestation to forestation, Ivan GAMS,	
Natural hazards and engineering impacts in the Karst of Mediterranean France, Jean NICOD,	9
A new method for dating of natural materials with periodical macrostructure by autocalibration and its application for study of the solar activity in the past, Y.Y. SHOPOV, V. DERMENDJIEV and G. BUYUKLIEV,	17
Karst as a basis of Greek urbanization, Dora P. CROUCH,	23
Resource use in rural tropical Karstlands: the Hummingbird Karst, Belize, Michael DAY	31
Stress on tropical Karst resources exploited for the cultivation of wet rice, Peter B. URICH,	39
Exploitation of tropical Karst resources for the cultivation of wet rice, Peter B. URICH,	49
Landuse and soils in Karst areas of Java, Indonesia, Kazuko URUSHIBARA-YOSHINO,	61
Limestone quarrying & limestone quarry reclamation in Britain, J. GUNN & D. BAILEY,	69
The Karstic glaciated area of la Grande Motte (3563m, Savoie, France), Michel CHARDON,	77
Endokarstic evolution of carbonatic massifs in Campania (Southern Italy): geological and geomorphological implications, Nicoletta SANTANGELO, Antonio SANTO,	83
Karst processes and potential vulnerability of the Campanian carbonatic aquifers: the state of knowledge, Antonio SANTO,	95
Un esempio di impermeabilizzazione di rocce calcaree fessurate e carsiche sotto falda, C. CHERUBINI, F. RAMUNNI, F. BLASI,	109
Le sorgenti sepolte: due esempi nelle aree pedemontane alpine, M. CIVITA, A. UGGERI, B. VIGNA,	
Further morphometrical data from some important Hungarian Karst areas, I. BARANY-KEVEI, G. MEZOSI,	137
Some morphometric and environmental aspects of dolines in Berici Hills (Vicenza, Italy), Benedetta CASTIGLIONI,	143
Karst management issues in New South Wales, Australia, R.A. L. OSBORNE and D.F. BRANAGAN,	157
Karst and soils developed on limestone in Vietnam, Tran KONG TAU,	165
A proposal study of Sinkholes as a point source contamination in Karst Terrain, Jan CHEN,	173
Mining versus Karst hydrogeology: Vroclav graphite mine near Blizna, South Boemia, Czechoslovakia, P. BOSAK & I. KOROS,	177
The function of Karst aquifer to clean polluted water in south suburb of Beijing, Song LIN HUA,	185
New tracing experiences in the Sebes Mountains - Romania, G. PONTA,	195
The Nullarbor carbonate aquifer, Australia: the impact of Man and suggestions for a future management, J. JAMES, G. PILKINGTON, P. ROGERS, A. SPATE,	205
History of Karst hydrogeological studies, Philip E. LaMOREAUX	215
International co-operation in research on Karst environments, Brian FINLAYSON & Ugo SAURO	231
World Inventory of Karst researchers: preliminary report, Mirco MENEGHEL and Aldino BONDESAN	

The springs of Montorio and the Karst aquifer in the central-western Lessini Mountains (Verona, Venetian Pre-Alps), Renzo ANTONELLI, Elisabetta CASTELLANI, Sandro CONSOLARO, Antonio PERETTI, Ugo SAURO, Lorenzo SORBINI, Rodolfo ZAMBRANO, Dario ZAMPIERI, Roberto ZORZIN	
Karst environment and human impact in the Sette Comuni Plateau (Venetian Pre-Alps), Ugo SAURO, Gian Vittorio MARTELLO e Giovanni FRIGO	
The impact of bombs of World War I on limestone slopes of Monte Grappa, Monica CELI	
The Karst system "Grotta Grande del Vento-Grotta del Fiume" and the conservation of its environment, Mario BERTOLANI, Arrigo A. CIGNA , Sergio MACCIO', Lucio MORBIDELLI, Gian Paolo SIGHINOLFI	
Some considerations on the potential for revitalization of show caves, Ezio BURRI and Arrigo A. CIGNA	
The climate in deep zones of Karst, Arrigo A. CIGNA and Jacques CHOPPY	305
Hydrogeological model of ground water supply to San Nazario Spring (Gargano, Southern Italy), Michele MAGGIORE & F. MONGELLI	307
Corrosion terraces as a geoecological response to postglacial development of glaciokarstic rock surface, Jurij KUNAVER	
The soil effect in Karst development, Lazslo ZAMBO	333
Solution environmental problems of speleotherapy in the Tresin Karst region (Czechoslovakia), Vladimir PANOS	341
Radon accumulation in the caves of the Moravian Karst, Otakar STELCL	345
Deforestation in the South China Karst and its impact on stone forest aquifers, Peter W. HUNTOON	353
Hydrogeochemical patterns and mathematical correlations in Karst at the examples of Cuba, J. R. FAGUNDO CASTILLO, J.E. RODRIGUEZ RUBIO	
Topoclimatic factors of air pollution in Karst, Milutin LJESEVIC	371
Town and land use planning in karst poljes, Milutin LJESEVIC, Branko CAVRIC, Bogdan LUKIC	377
Karst Groundwater resources in Puglia in human impact on Karst aquifer, L. TULIPANO	
Il ruolo della tettonica nel processo di carsificazione: l'esempio dei giacimenti di bauxite di Spinazzola (Murge Baresi, Puglia), E.LUPERTO SINNI, A.REINA, R.SANTARCANGELO	

POSTER AND BRIEF CONTRIBUTIONS

Human impact on the Cuilcagh Karst, Ireland, John GUNN, Sarah CORNELIUS, Michelle GRAY, Christine HUNTING & Rob HYLAND	405
On The fragility of Karst environment, Y. MINGDE	406
Karren development and deforestation processes, A. GINES	407
Some problems of groundwater resources and quality protection of Karst areas, J. LISZKOWSKI, M. PULINA	409
The natural resources in the karst area of Guangxi, China, Zhong KENG	408
The influence of neotectonics on Karst Hydraulics and morphogenesis, J. LISZKOWSKI	410
Engineering-geological and geo-environmental mapping of Karst areas: objectives, problems and methods, J. LISZKOWSKI	
A study of impact of primary deforestation upon limestone slopes in Northern Vancouver Island, Canada, and of natural rates of forest regrowth, Kathleen HARDING, Derek FORD	411
Protection of limestone Pavements in Britain: a progress report, Helen GOLDIE	

GENERAL KEY WORDS

- agrochemistry, 377-382
- air in caves and soils, 333-340
- air pollutants, 371-376
- aquifers, 109-116, 117-136, 205-214, 353-360
- artificial dolinas, 279-288
- bauxite deposits, 399-404
- biological resources, 408
- biology, 289-298
- bombs impact, 279-288
- cave deposits, 17-22
- cave environment, 341-344
- cave tourism, 157-163
- cave use and management, 299-304
- changes in human ecology, 23-30
- collapse and sinkhole formation, 9-16, 137-142
- conservation of Karst, 77-82, 231-240
- dams in karst, 9-16
- deforestation, 61-68, 353-360, 407, 411
- denudation rate, 77-82, 333-340
- doline environments and forms, 137-142, 143-156
- ecosystem, 377-382
- endokarst, 83-94
- energy, 408
- engineering mapping, 410
- environmental changes, 1-8, 17-22, 39-48, 61-68, 231-240, 325-332, 353-360, 361-370, 406, 407
- environmental mapping, 410
- environmental tracers, 383-398
- geochemistry, 361-370
- geoecology, 69-76, 137-142, 407
- geography of karst regions, 77-82, 269-278, 325-332
- global changes in the past, 17-22
- groundwater protection, 409
- groundwater reserves, 117-136
- historical landuse, 23-30
- history of natural sciences, 215-230
- human impact, 9-16, 23-30, 31-38, 39-48, 69-76, 95-108, 157-163, 173-175, 177-183, 185-193, 205-214, 249-268, 269-278, 289-298, 383-398, 405, 406, 409, 411
- hydrochemistry, 383-398
- hydrochemistry, monitoring techniques, 361-370
- hydrology in Karst areas, 95-108, 307-324, 195-204, 117-136, 177-183, 215-230, 249-268, 289-298, 405, 409
- IGU Karst Study Group, 241-47
- impact of war, 269-278
- irrigation in karst, 49-60
- Karren as indicators of soil erosion, 407
- Karst Collaps, 109-116
- Karst hydraulics, 410
- Karst hydrogeological research, 215-230
- Karst landscape, 143-156
- Karst morphogenesis, 410
- Karst pollution, 279-288
- Karst research, 215-230, 231-240, 241-247
- Karst resources, 341-344
- Karst environment, 377-382
- Karst, 1-8
- land reclamation, 69-76
- landforms destruction and modification, 69-76, 143-156, 325-332
- landuse, 1-8, 31-38, 61-68, 165-171, 405
- leakage, 125, 185-193, 333-340
- limestone pavements, 412-413
- management strategies, 299-304, 157-163, 289-298
- meteorology in caves, 305-306
- mineral resource, 408
- minig, 177-183, 157-163
- morphodynamic processes, 407
- morphogenetic processes, 333-340
- mountain Karst areas, 83-94, 325-332, 77-82
- natural and environmental changes, 345-352
- natural hazards, 9-16, 177-183
- natural parks and reserves, 405
- natural resources of Karst area, 408
- neotectonic, 83-94, 410
- paleokarst, 399-404
- planning, 157-163
- pollution of water, 173-175, 185-193
- pollution, 377-382
- protection, 289-298, 412-413
- quarries and quarrying, 69-76, 399-404, 412-413
- radon radiation, 345-352
- regrowth of forest, 411
- resources of Karst regions, 31-38, 39-48, 49-60, 195-204, 205-214, 399-404
- show caves, 299-304
- soil dynamic and erosion, 61-68, 165-171
- soil, 109-116, 137-142, 165-171, 333-340
- speleology, 95-108, 289-298, 299-304, 305-306
- speleotherapy, 341-344
- springs, 23-30, 117-136, 307-324, 383-398
- stable isotopes, 383-398
- temperature, 383-398

topoclimate changes, 371-376
 tracing experiments, 195-204
 urban development, 23-30, 109-116
 urban pollution, 371-376
 vegetation, 143-156, 165-171
 war impact, 279-288
 water quality 249-268
 water supply, 9-16, 185-193
 water use and protection, 95-108, 205-214
 weather, 408

GEOGRAPHICAL KEY WORDS

Alps, 77-82
 Apulia: see Puglia
 Australia, 157-163, 205-214
 Baleari Islands, 407
 Beijing, 185-193
 Belize, 31-38
 Bohol, 38-48, 49-60
 Bosnia, 377-382
 Bulgaria, 17-22
 Campanian Apennine, 83-94, 95-108
 Canada, 411
 carbonatic Apennine, 95-108
 Castellana, 299-304
 Cetinje, 377-382
 China, 185-193, 353-360, 406, 408
 Co.Fermanagh, 405
 Croatia, 377-382
 Cuba, 361-370
 Cuilcagh, 405
 Czechoslovakia, 177-183, 345-352
 Dinaric Mts., 325-332, 371-376
 Dragova luka, 371-376
 Eastern Alps, 325-332
 England 412-413
 France, 9-16, 77-82, 305-306
 Frasassi, 289-298
 Gargano, 307-324
 Global Karst, 17-22, 333-340
 Great Britain, 69-76
 Guangxi, 353-360, 408
 Guizhou, 353-360, 406
 humid tropics, 31-38
 Hungary, 137-142, 333-340
 Indonesia, 61-68
 Ireland, 405
 Italy, 1-8, 23-30, 83-94, 95-108, 109-116, 117-136,

143-156, 249-268, 269-278, 279-288, 289-298,
 299-304, 305-306, 307-324, 383-398, 399-404
 Java, 61-68
 Kanin Mts., 325-332
 Karst Areas in general, 17-22
 Languedoc, 9-16
 Mallorca, 407
 Marche, 289-298
 Monte Grappa, 279-288
 Montenegro, 371-376, 377-382
 Monti Lessini, 249-268
 Moravian Karst, 345-352
 Murge, 109-116
 Murge, 399-404
 New South Wales 157-163
 Niaux, 305-306
 Niksieko polje, 371-376
 Northern Moravia, 341-344
 Nullarbor Plain, 205-214
 Peak District 69-76
 Philippines, 39-48, 49-60
 Pinar del Rio, 361-370
 Postojna, 299-304
 Provence, 9-16
 Puglia, 109-116, 307-324, 383-398
 Puglia, 399-404
 Romania, 95-108
 Sebes Mountains, 195-204
 Sette Comuni Plateau, 269-278
 Sicily, 23-30
 Sierra del Rosario, 361-370
 Slovenia, 377-382
 South and West Australia, 205-214
 South Bohemia, 177-183
 South China, 353-360
 Southern Italy, 83-94
 Sumava foothills, 177-183
 Syracuse, 23-30
 Tresin Karst Region, 341-344
 Trieste, 305-306
 Vancouver Island, 411
 Venetian Pre-Alps, 143-156, 249-268, 269-278, 279-288
 Veneto, 143-156
 Vietnam, 165-171
 Western Mediterranean, 407
 World karst, 215-230
 Yugoslavia, 1-8, 299-304, 371-376, 377-382
 Yunnan, 353-360

**TO THE MEMORY
OF ROBERTO BALDONI
PRESIDENT OF
“CONSORZIO FRASASSI”**

The President of “Consortio Frasassi”, Mr. Roberto Baldoni had an ictus on September 15, 1991 and died on September 20, 1991 just before the Frasassi session of the International Conference on Environmental Changes in Karst Areas.

The important support given to the this Conference by the “Consortio Frasassi” through the action of its Presidents is here acknowledged. The organizers and the participants to the Conference are very grateful and they wish to express their great sorrow for the sudden death of Mr. Baldoni. They express also their sympathy to his Family and will never forget the kindness and all the qualities of Mr. Baldoni.

see the lectures presented during the symposium of Frasassi
from page 289 to page 306,