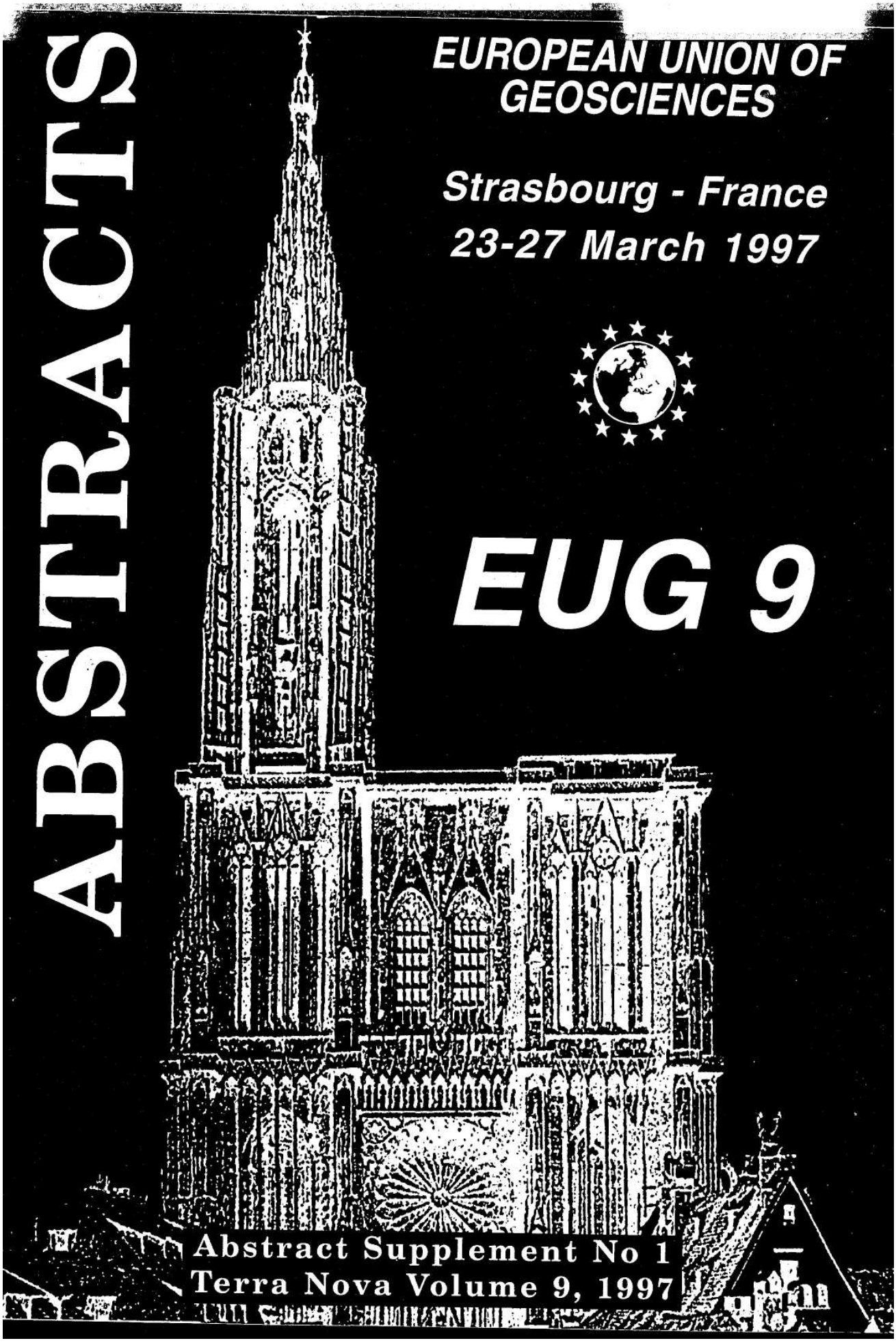
ABSTRACTS

EUROPEAN UNION OF GEOSCIENCES

Strasbourg - France

23-27 March 1997

EUG 9



Abstract Supplement No 1
Terra Nova Volume 9, 1997

EUG 9

EUROPEAN UNION OF GEOSCIENCES

23-27 MARCH 1997,
STRASBOURG (FRANCE)

ABSTRACTS OF ORAL AND POSTER PRESENTATIONS

EUG 9

Symposium 16

Mitigation of Geological Hazards

Convenors:

J. Zschau
G. F. Panza
F. Roth
R. Stefansson

technique based on mode summation and finite differences, and an analytical technique based on mode summation. These methods take into account the source, path and local site effects for calculating the local wavefield generated by a seismic event, both at small or large epicentral distances. The input data used for computation consist of the 2-D structural model and the focal mechanism of the source. The structural information is organised in I-Data format, defined in the framework of ILP Task Group II-4, and includes the layer structure in the seismic source region, along the path from source to Bucharest, and the local structure of this target area.

Since the most destructive effects generated by strong motions in Bucharest are due to the intermediate depth seismic active Vrancea region, Romania, the focal mechanisms considered in this study correspond to the following strong Vrancea intermediate depth earthquakes: March 4, 1977 (M_w=7.4), August 30, 1986 (M_w=7.1), May 30, 1990 (M_w=7.9), May 31, 1990 (M_w=6.3).

The main features of the synthetic seismograms computed for Bucharest area are calibrated with the strong motion data records.

16/3P10

Chlorine Anomaly of Alet Groundwaters Prior to the February 18th 1996, M = 5.5 Pyrenean Earthquake

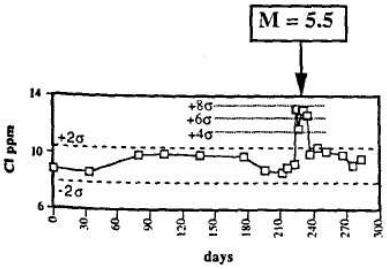
Marguerite Munoz (margot@lucid.ups-tlse.fr) & **Jean-Paul Toutain** (toutain@lucid.ups-tlse.fr)

Observatoire Midi-Pyrénées, UMR CNRS 5563, Laboratoire de Géochimie, 38 rue des 36 Ponts, 31400 Toulouse, France.

On February 18th, 1996, an earthquake (M=5.5) occurred in the eastern part of the Pyrenees, close to the city of Saint-Paul de Fenouillet.

The mineral springs of Alet rise at 29 km from the epicenter. These groundwaters are bottled for commercial purpose, therefore they offer the opportunity of having samples prior and after the quake with known collection dates. Chemical analyses have been performed on bottled waters collected between July 1995 and April 1996. A chlorine anomaly has been evidenced starting 5 days prior the quake and lasting 10 to 13 days. The anomaly consisted in an increase of Cl^- concentrations about 40% above background values.

This precursory chemical change is attributed to a preseismic strain-induced mixing of chemically different aquifers. Chlorine-bearing groundwaters are known to rise between the Alet springs and the epicenter, and simple calculations suggest that a limited inflow of such waters within Alet hydrologic system may account for the Cl anomaly. These results confirm the potentiality of mineral springs as optimum sites for the search for chemical precursors of earthquakes.



16/3P11

Gas-Geochemical and Gas-Dynamic Parameters as Potential Precursors of Natural Disasters

Valentin A. Nivin[1] (nivin@ksc-gi.murmansk.su) & **Nikolai I. Belov**[2] (nika@rocknet.murmansk.su)

[1] Geol. Inst., Kola Sci. Centre, Apatity, Russia.
[2] Mining Inst., Kola Sci. Centre, Apatity, Russia.

Taking into account that gas phase of different composition and quantity in rocks of all geological formations by virtue of its fluidity participates in or accompanies most geological and geophysical processes, we made use of the Khibiny and Lovozero alkaline nepheline-syenite massifs on the Kola peninsula (Russia) as a testing ground to research possibilities for application of some gasometric parameters as indicators of rock tectonophysical state and, consequently, of such rock pressure dynamic manifestation as shocks and shallow-focus earthquakes. The shocks and earthquakes that occurred here had up to 10 joules energy and magnitude 5-6 accordingly. The massifs under examination are characterized by block and zonal abundance pattern of hydrogen-hydrocarbon with some amount of N_2, He and CO_2 gas phase and stress fields varying not only with space but also in time. The gases are found both in vacuoles of fluid inclusions in minerals and intermineral pores (occluded gases - OG) and in fractures of different width, extent and coherence (FG). By means of field observations and laboratory experiments we have revealed the relationship between composition, content of OG and such geomechanical properties as elastic wave velocity, transverse deformation coefficient, the values of ultimate compressive stress and tension, the response of FG (composition, gauge pressure, flow rate) to variations and relocation of stresses, the reversal of compression and tension areas caused by moon-solar tides, natural tectono-seismic events, industrial explosions. Thus, gas-geochemical and gas-dynamic indices can be considered as perspective for prediction of natural or man-made disasters like rock bursts and earthquakes.

16/3P12

Seismic Microzonation of the City of Basel (Switzerland) Based on Geological and Geotechnical Data and Numerical Simulations

Thomas Noack[1] (noack@ubaclu.unibas.ch), **Donat Fäh**[2] (faeh@seismo.ifg.ethz.ch), **Peter Kruspan**[1] (peter.kruspan@eawag.ch) & **Erik Rüttener**[2] (erik@seismo.ifg.ethz.ch)

[1] Geological Institute, Universität Basel, Switzerland.
[2] Swiss Seismological Service, Institut für Geophysik, ETH Zürich, Switzerland.

In 1356 a strong earthquake destroyed the city of Basel. The maximum epicentral intensity was probably equal or greater IX (MSK). Although the present seismicity in the Basel area is low, another strong earthquake has to be expected due to the city's location close to the northern end of the African-European convergence zone at the southern end of the Rhinegraben. The microzonation of the city of Basel presented in this study is one step towards preparedness for future events and mitigation of earthquake risk. A large number of geological and geotechnical data has been compiled and can be translated into parameters relevant for local amplification or attenuation of ground motion.

The local geological and geotechnical conditions are known to a great detail. The logs of over 2700 shallow wells are contained in a geological database. This includes detailed lithological descriptions of the cores, thicknesses of the strata, groundwater data, SPT measurements and other geotechnical investigations. In order to interpret this rather descriptive dataset in terms of parameters relevant for local amplification of seismic waves, one- and two dimensional numerical simulations of expected ground motion during earthquakes have been carried out. These can be compared to strong motion recordings at sites with a well known geology. Measurements of ambient noise and their interpretation with local geological and geotechnical data lead to a characterization of different soil types. Thereby differences in the lithology of the Prequaternary layers turn out to be very important. Different parameters characterizing the overlying Quaternary gravels, such as their compaction, their content of sand and conglomerates, lateral variations in thickness and water content can be worked out. The resulting preliminary microzonation map is presented and discussed by comparing it to the historically reported damage of the 1356 earthquake.

16/3P13

AUTO-SEISMO-GEOTECH: A GIS Based Multidisciplinary Microzonation Project – Part II Geophysical Investigations

Taxiarchis Papadopoulos[1] (tpapadop@atlas.uoa.gr), **George Stavrakakis**[2] (g.stavr@engelados.gein.noa.gr), **John Alexopoulos**[1] (jalexop@atlas.uoa.gr), **Nicholas Voulgaris**[1] (nvoulgar@atlas.uoa.gr) & **John Drakopoulos**[1] (jdrakop@atlas.uoa.gr)

[1] Geophysics-Geothermy Division, Department of Geology, University of Athens, Panepistimioupoli, Ilissia, 157 84 Athens, Greece.
[2] Institute of Geodynamics, National Observatory of Athens, 118 10 Athens, Greece.

In the first stage of our research work the computation of the expected ground motion is referred to the seismic bedrock. However, the transformation of these values at the ground surface requires detailed knowledge of the underground structure. For that purpose different geophysical measurements have been carried out to obtain the elastic parameters of the medium as well as very detailed tomograms, showing the velocity variations beneath the city of Heraklion and nearby areas.

To achieve that goal a grid of boreholes has been designed to improve and verify available information from geotechnical and geological sources. Between specific pairs of boreholes cross-hole tomography measurements have been undertaken and the detailed P and S velocity distribution has been obtained. By combining these results with those obtained by geoelectrical and seismic refraction surveys, as well as cross-hole measurements, a model for the underground structure is proposed and integrated in the GIS structure for further use and in other applications including land use, urban planning and relevant environmental issues.

16/3P14

Possibility of Induced Seismicity on the Reservoirs of the Angara River

V. A. Pavlenov (san@cora.irkutsk.su), **E. N. Chernykh** (san@cora.irkutsk.su), **V. V. Chechelnitsky** (san@cora.irkutsk.su), **S. I. Golenetsky** (san@cora.irkutsk.su) & **S. I. Sherman** (san@cora.irkutsk.su)

Inst. of the Earth Crust of the Siberia branch of the RAS, Russia.

Recent years are characterised by a prominent number of cases of a local seismicity occurred in the areas rather quiet in seismic respect but connected with different kinds of technogeneous activity of a man. The phenomena of induced seismicity related to the construction and infilling of large reservoirs have been known since the early 30s. In favourable conditions these phenomena occur at a dam height of several tens of meters, a total parcel of water and a total area of water surface being there of considerable importance. Seismic hazards are the most probable when a total parcel of water in the reservoir exceeds 10 cub. km, and the maximum depth is 90m and more.

Angara's reservoirs of Irkutsk, Bratsk, Ust-Ilimsk have big dimensions. It can create conditions for induced seismicity as it is shown by world statistics. From 1964 to 1992 network of seismic stations registered 64 seismic events in the region of Irkutsk reservoir, 25 seismic events in the region of Bratsk reservior and 10 seismic events in the region of Ust-Ilimsk reservoir. Registrered seismic events have 6-10 energy class. These events and tectonic-geological situation of all three reservoirs are the objects of high probability of occurence of induced seismicity. This fact is confirmed by the last earthquake within the Brutsk reservoir. The parametres of earthquake are: date 96.02.26, M=4,2, intensity in Bratsk 2-3 grades at a distance of 125 km from the epicenter. Intencity in Syansk 3-4 grades at a distance of 132 km from epicenter. These events have been associated by authors with induced seismity. Special seismic investigations are to be carried out for final decision of this problem.