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CHRONICLES

NATO Advanced Research Workshop on Historical and Prehistorical Earthquakes in the Caucasus

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An international meeting devoted to historical and prehistorical earthquakes in the Caucasus was held July 11–15, 1996, in Tsakhkadzor, Armenia, within the framework of NATO Advanced Research Workshop (ARW). It was attended by about 30 seismologists from 13 countries (Armenia, the Czech Republic, France, Germany, Georgia, Great Britain, Iran, Italy, Russia, Switzerland, Turkmenistan, Ukraine, and the United States). Financial support for conducting the workshop and publishing its proceedings came from NATO's Science and Environment Department. The Caucasus and tectonically associated regions of the Crimea, Kopet Dagh, northern Turkey, and Iran provide a test area for the Global Seismic Hazard Assessment Program (GSHAP) and are being studied at two of GSHAP's regional centers: in Moscow at the Joint Institute of Physics of the Earth (OIFZ) and in Teheran at the International Institute of Earthquake Engineering and Seismology. Comprehensive seismological investigations conducted in the region comprising the Crimea, Caucasus, and Kopet Dagh—the site of active geodynamic interaction between the Eurasian and Arabian lithospheric plates—are supported by a number of international scientific organizations, including the International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union (INTAS Program 94-1644). Referring to NATO's interest in this meeting, the GSHAP director, Professor Domenico Giardini of the Instituto Nazionale di Geofisica, Italy, said that this organization actively promotes cooperation with countries that are not members of the military alliance.

In keeping with the workshop program and the current research plan under GSHAP–INTAS, the meeting consisted of four sessions: *(1) Seismotectonics, (2) active faulting, (3) historical earthquakes and macroseismic data, and (4) modern seismicity.*

An idea of the range of issues discussed at the meeting can be gathered from the titles of the papers, which are given below in order of presentation:

Session 1. Seismogenesis and Destructive Earthquakes in the Caucasus (S. Balasanyan, Armenia); Seismotectonics in the Mediterranean and Alpine Belt (A. Cisternas, France); On the Identification and Seismological Parametrization of Earthquake Source Zones in the Caucasus and Surrounding Area (V. Ulomov, Russia); Seismotectonics of the Caucasus (S. Nazaretyan et al., Armenia); Seismotectonics of the Kopet Dagh Range (T. Ashirov, Turkmenistan); Slip Movements in the Middle East and the Caucasus (J. Jackson, Great Britain); GPS Constraints on Crustal Deformation in the Arabia–Eurasia Collision (R. Reilinger, United States).

Session 2. The World Map of Active Faults (V. Trifonov, Russia); Modern Approaches in Paleoseismology (D. Pantosti, Italy); Active Faults and Strong Earthquakes in the Caucasus (A. Karakhanyan et al., Armenia); An Investigation of Historical Earthquakes and Paleoseismic Sources in Iran (Kh. Hessami, Iran); Seismic Activity in Iran (M. Ghafory-Ashtiany, Iran); Block Structure of the Caucasus and Seismogenic Faults (D. Sikharulidze, Georgia); Active Faulting in Iran (M. Berberian, United States); and Active Faulting in the Kopet Dagh Range (B. Karryev, Turkmenistan).

Session 3. Historical Earthquake Records in the Caucasus: the Case of Armenia (V–XVII Centuries) (E. Guidoboni, Italy); Catalog of Historical Earthquakes in Armenia (S. Piruzyan et al., Armenia); Catalog of Historical Earthquakes in Europe: BEECD Project (M. Stucchi, Italy); Analysis and Improvement of Initial Data on the December 31, 1899, Akhalkalaki Earthquake (R. Tatevosyan, Russia); Seismic Catalog of the GSHAP Test Area (N. Kondorskaya, Russia); Seismic Catalogs of the Euro-Mediterranean Area (V. Schenk, Czech Republic); Seismicity of the Black Sea (B. Pustovitenko, Ukraine); Seismicity Patterns in the Armenian Upland (A. Arakelyan et al., Armenia); and Reconstruction of Strong Earthquakes in the Caucasus from Historical Records (O. Varazanashvili, Georgia).

Session 4. Modern Large Earthquakes in the Caucasus (L. Dorbath, France); Modern Seismicity of the Caucasus (E. Dzhibladze, Georgia); A Seismicity Model of the Caucasus Test Area (T. Kronrod, Russia); Seismic Hazard Assessment in the Mediterranean (D. Giardini, Italy); and Seismic Hazard in Switzerland (E. Ruettener, Switzerland).

In addition to these 40-minute oral presentations, each of the four major topics was also covered in a few posters.

Two GSHAP–INTAS working groups met during the workshop: on Earthquake Catalogs (scientific coordinator N.V. Kondorskaya) and Seismic Source Zoning (scientific coordinator V.I. Ulomov) of the Crimea–Caucasus–Kopet Dagh test area. The latter group worked out a generalized model of earthquake source zones in the Crimea–Caucasus–Kopet Dagh region and adjacent areas in Iran and Turkey, which was accepted as the basis for subsequent estimates of seismic hazard in this territory. The following is an extract from the minutes of the meeting of the Working Group on Seismic Source Zoning, which were approved by the GSHAP–INTAS Steering Committee.

1. The Working Group on Seismic Source Zoning discussed and approved the following main results of its activities in the period 1994–1995 within the GSHAP–INTAS program "Test Area for Seismic Hazard Assessment in the Caucasus":

—collection of new data on active faults of Armenia, Iran, and northwestern Turkmenistan and creating a database and map;

compilation of the map of source seismicity, with the use of a new legend of extended sources;

—compilation of a schematic map of seismic faulting in earthquake sources;

—development of models of earthquake source zones of two types: domain (D) and lineament–domain (LD) models;

—development of methods for seismological parametrization of earthquake source zones, represented as an LD model;

—development of new software for seismic hazard assessment, including the extent of the sources of large earthquakes; and

—creation of a database for identification and seismological parametrization of earthquake source zones.

2. The working group discussed, corrected, and approved the following maps for the test area:

—a map of active faults;

—a map of source seismicity;

—a map of lineament earthquake source zones (for the LD model) based on data submitted by the participants in the GSHAP–INTAS project (Azerbaijan, Armenia, Georgia, Russia, Turkmenistan, and Ukraine) as well as a representative of Iran; and

—a map of seismotectonic domains as one of the two test models of earthquake source zones.

3. The working group discussed and approved the following plan of work for 1996–1997:

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(1) Optimization and adjustment of models of earthquake source zones (D and LD models) of the GSHAP–INTAS Caucasus test area; a meeting in Tsakhkadzor, Armenia, July 1996, to be attended by scientists from Armenia, Georgia, Iran, Russia, Turkmenistan, and Ukraine.

(2) Seismological parametrization of models of earthquake source zones with the use of the earthquake catalog of the GSHAP–INTAS Caucasus test area (to be completed in September) and sending the data to all members of the working group for comparative study; this task will be performed by OIFZ, Moscow, Russia, October 1996.

1997

(3) Seismic hazard assessment of the test area with the application of new software and two models of source zones (D and LD models); this task will be performed by OIFZ, Moscow, Russia, January 1997.

(4) Seismic hazard assessment of the GSHAP–INTAS test area on the basis of the new models and comparative study of the results of different methods applied to seismic effect calculation; a meeting in Georgia, May 1997.

(5) Organization of an international school for young scientists in the field of seismotectonics and seismic hazard assessment; Crimea, Ukraine, September 1997.

A parallel international workshop that was devoted to the construction of a map of source zones of Central Asian earthquakes was held September 25–30, 1995, in Bishkek, Kyrgyzstan. The meeting was organized by OIFZ and the Institute of Seismology, Kyrgyz Academy of Sciences, with financial support of the Ministry of Science, Russia (projects "Seismicity and Seismic Zoning of Northern Eurasia" and "Seismic Hazard Assessment in Central Asian Countries"). The workshop was attended by scientists from Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan.