

Regional Scholar Exchange Program (RSEP) – January 2003

Research Results

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Research Topic:

Development of the method for avalanche-prone zone determination

Kazakhstan and USA have very similar avalanche problems. In these countries avalanche-prone mountain terrains are very widespread, sparsely populated and do not have permanent inhabitants. Avalanche study records exist only at ski areas and along mountain highways. Historical data are not available for determination of avalanche hazardous zones in new developed regions. Terrain and climate analysis have to be used in this case. These methods are highly developed in Kazakhstan by specialists of the Institute of Geography. The main goals of my research were:

- Study the methods of avalanche hazard zoning used in USA;
- Presentation of the methods used in Kazakhstan;
- Development of the method for avalanche hazard zone determination for a mountain range in Montana.

The cartographical, climatological, and mathematical methods were used. The software “All Topo Maps” with 1:24,000 topographic maps was bought. The data on weather and avalanches from Bridger Bowl ski area during 1968 – 1995 years were obtained. The study area in Bridger Range near Bozeman with high level of avalanche hazard was chosen. The avalanche paths map and the avalanche path atlas containing data on 67 avalanche paths were developed. Avalanche starting zones, tracks, and runout zones were marked on the map. Downslope profiles were drawn up for all avalanche paths. The area of avalanche starting zone, length and inclination of the down slope sections were measured using “All Topo Maps” software. The borders of maximum avalanches were determined during field investigations and the index of maximum runout distance was calculated for all avalanche paths. The dependencies of this index on the avalanche path shape, starting zone area, mean inclination, and vertical drop height were developed. These dependencies were used for determination of avalanche hazardous zones in the Bridger Range and in the Bridger Bowl ski area.

For the study of the US approaches and achievements of avalanche studies I have met and interviewed a number of specialists: Don Bachman, former Executive Director of the American Avalanche Association; Ed LaChapelle, avalanche expert; Jimmie Dent, Ed Adams, professors at MSU; Karl Birkeland, Director of the Gallatin Avalanche Information Center; Knox Williams, Director of the Colorado Avalanche Information Center; Bruce Tremper, Director of the Utah Avalanche Center; Chris Landry, Executive Director of the CSAS; Jerry Roberts, CAIC Avalanche Forecaster. I visited the Gallatin Avalanche Information Center in Bozeman, the Colorado Avalanche Information Center

in Boulder, the Utah Avalanche Center in Salt Lake City, and the Ouray Avalanche Forecast Center in Silverton, CO.

I had field work at the Silverton Branch of the Colorado Avalanche Information Center and have been trained in snow cover and avalanche investigations. I studied the procedure of an avalanche forecast preparation and the system of the weather data collection in mountains.

I worked at the MSU library, where I studied a lot of scientific books and papers, that are not available in Kazakhstan, in particular the Proceedings of the International Snow Science Workshops (1990 – 2002), the Avalanche Handbooks (1976, 1993), the Guidelines for avalanche hazard assessment and mapping, and for snow and avalanche observations (1992 - 2002).

Besides a study of the problem of my research topic I was interested in other fields of geography sciences: natural hazards, recreation, and education. I had conversation with professor of the Institute of Arctic and Alpine Research in Boulder Mark Dyurgerov and we arranged to exchange by publications and data on a glacier retreat between our institutes. I visited the Department of Natural Resources of the Colorado Geological Survey in Denver, the Gallatin National Forest Office in Bozeman, and Yellowstone National Park. I collected scientific literature and visited websites. I also visited the sites dedicated to great landslide events in Utah and Montana.

I made 3 presentations about avalanche investigation in Kazakhstan at seminars for MSU students and Montana professional avalanchers. I prepared 2 articles: “Avalanche Hazard in Kazakhstan” and “Avalanche Hazard Mapping in Kazakhstan”, that were submitted to the journal of the American Avalanche Association “The Avalanche Review” and will be published in fall 2003.

I visited selective lectures of courses “Snow dynamics” and “Geographical Information Systems” at the Earth Science Department of MSU to study the geography teaching methodology.

I joined the American Avalanche Association and will obtain its materials in Kazakhstan. Karl Birkeland and I will prepare a joint scientific paper on avalanche hazard mapping in Bridger Range and will present it at the next International Snow Science Workshops in Wyoming in 2004.

I prepared an English-Russian snow and avalanche terminology dictionary on about 1000 terms. I will translate into Russian the Avalanche Handbooks and the Guidelines for snow and avalanche observation, and prepare a paper about avalanche investigation in USA for the journal “Meteorology and Ecology”.

I learned some new approaches in avalanche hazard investigation and mapping. My knowledge and experience obtained during RSEP research will be disseminated across geographers and avalanchers in Kazakhstan. I will use the materials in my work in

the Institute of Geography on avalanche and other natural hazards and in teaching students at the Turan University. I will develop the guidelines for avalanche hazard zoning and land use planning for Kazakhstan mountain regions. My collaboration work with American avalanchers will continue through in the information and ideas exchange, joint scientific publications, and participation in scientific conferences and workshops.