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# S.C.R.E.A.M.

## Seismic Cooperative Research in the Erdenet Area, Mongolia

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Czech Republic



Mongolia



Department of Seismology  
Institute of Rock Structure  
and Mechanics  
Academy of Sciences of the Czech Republic



Seismological Department  
Research Centre  
of Astronomy and Geophysics  
Mongolian Academy of Sciences

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## The Agreement

(1)

This Agreement is concluded between the

Institute of Rock Structure and Mechanics,  
Academy of Sciences of the Czech Republic,  
V Holešovičkách 41, 182 09 Prague 8, Czech Republic  
herein referred to as “IRSM”

and the

Research Centre of Astronomy and Geophysics,  
Mongolian Academy of Sciences,  
Bayanzurh district – Maahuur tolgoi, Bulding No. 7, Ulaanbaatar, Mongolia  
herein referred to as “RCAG”

The above organizations have accepted a solution to conclude the mutual Agreement, by taking for a basis the following conditions:

(2)

### **General overview**

The project “Seismic Cooperative Research in the Erdenet Area, Mongolia”, herein referred to as “SCREAM”, has been developed thanks to the interest of Czech researchers to study the Mongolian seismicity and thanks to the interest of Mongolian researchers in seismic hazard assessment of the populated areas of Mongolia. The basic idea of the mutual cooperation follows the fact, that there are unexplored regions in Mongolia to be studied by RCAG and that the IRSM can provide the funding, equipment and data procession methods for seismic measurements.

In order to ensure the funding, the IRSM has proposed a grant project to the Grant Agency of Academy of Sciences of the Czech Republic, herein referred to as “GAAV”, called “Induced seismicity research in Erdenet, Mongolia”, herein referred to as “ISREM”. A justification of the proposal is kept as an inseparable attachment of this Agreement. This justification involves the basics of the field works and data processing to be done during the SCREAM. The RCAG carries out the seismic hazard assessment project concerning populated areas of Mongolia. The SCREAM supposes to joint the effort of Czech and Mongolian scientists to provide a complex seismicity research around Erdenet city.

The Agreement provides the basics for the planned measurement and data interpretation. The SCREAM will last from the beginning of the year 2007 till the end of the year 2009.

(3)

### **Main objectives of the SCREAM project**

The main objectives of the project are specified in the justification of the ISREM project, proposed to the GAAV. This justification is kept as an inseparable attachment of this Agreement. This justification also specifies the basics of the seismic field works and data processing. These are especially:

- induced seismicity measurements
- natural events recording
- fault mapping
- quarry blast recording and origin time and coordinates measurement

In addition, the IRSM can provide also other geophysical measurement mentioned in the proposed ISREM project. The other objectives concerning SCREAM and not included in the ISREM proposal justification are as follows:

- measured data will be freely at hand to Mongolian researchers for complementation of their seismic hazard assessment studies
- structural studies will be provided using the measured data

(4)

### **Funding of the project**

The proposal of the ISREM project was submitted by the Czech researches to the GAAV in April 2006. If the proposal will be accepted, the GAAV would cover the transport costs of the Czech researchers to Mongolia and back and the building of the Czech temporary stations in Mongolia. There is also a possibility to cover costs concerning visits of Mongolian researchers to the Czech Republic. It is supposed, that the main funding of the Mongolian researcher visits will be covered by an International Academic Agreement between the Mongolian and Czech Academies. The acceptance of the proposed project by the GAAV is an essential condition for this agreement to be valid. This funding will cover most of the cost of the SCREAM project.

(5)

### **Obligations of the IRSM**

The IRSM will offer accommodation facilities for the members of the RCAG investigation team in the Czech Republic during the stays connected with the SCREAM project.

The IRSM will provide help in any bureaucratic problems of the members of the RCAG investigation team during their stays in the Czech Republic connected with the SCREAM project. It will also help to obtain a necessary visa to the Czech Republic.

The IRSM will provide the office equipment (e.g. the computers, internet connection, scanner, printers, copy machines etc.) to the members of the RCAG investigation team during their stay in the Czech Republic.

The IRSM will provide funding of the measurement activities in Erdenet Area, the costs of travelling of the Czech researches to Mongolia, the cost of their accommodation.

The IRSM will provide seismic sensors and recording equipment necessary for installing the seismic stations. It will consist of at least 12 short-period sensors deployed in 4 small aperture arrays consisting each of 3 sensors in the year 2007 and the same number of short-period sensors and four broadband Guralp sensors during the measurement in the year 2008. The measurement will be carried out according to the justification of the ISREM project proposal.

The IRSM will provide the methods needed for data processing and interpretation according to the ISREM proposal justification.

The data measured by IRSM stations will be freely available to Mongolian researchers. The IRSM will provide data format conversions, especially to obtain the ASCII format data files.

The IRSM will inform all scientific and non-scientific institutions in the Czech Republic which might be interested in (e.g. the Faculty of Science, Charles University; Faculty of Mathematics and Physics, Charles University; Czech Geological Survey; Institute of Geophysics, Academy of Sciences of the Czech Republic; head office of Academy of Sciences of the Czech Republic) about the project. The IRSM will also inform the Czech Embassy in Ulaanbaatar about this project and about the stays of the Czech researchers in Mongolia.

The IRSM will inform members of the RCAG investigation team about any changes concerning the project, which might affect the works on the project.

(6)

### **Obligations of the RCAG**

The RCAG will offer accommodation facilities for the members of the IRSM investigation team in the Mongolia during the stays connected with the SCREAM project. It concerns accommodation both in Ulaanbaatar and in Erdenet.

The RCAG will provide help in any bureaucratic problems (such as visa extension and others) of the members of the IRSM investigation team during their stays in the Mongolia connected with the SCREAM project. It will also help to obtain a necessary visa to Mongolia.

The RCAG will provide the office equipment (e.g. computers, internet connection, scanner, printers, copy machines etc.) to the members of the IRSM investigation team during their stay in Mongolia.

The RCAG will inform the IRSM about all projects concerning the Erdnet area or concerning the project carried out in the RCAG (e.g. the Seismic Hazard Assessment project, shallow seismicity research project and others). The RCAG will also inform the IRSM about any works carried out by other scientific institutions and commercial companies in Erdenet Area concerning the SCREAM project.

The RCAG will inform all scientific and non-scientific institutions in Mongolia which might be interested in (e.g. the Department of Geology, Mongolian University of Science and Technology; Department of Geophysics, Mongolian University of Science and Technology; Mongolian Mineral and Petroleum Resources Authority; Erdenet Copper Mine; Institute of Geology and Mineral Resources, Mongolian Academy of Sciences; head office of Mongolian Academy of Sciences) about the SCREAM project.

The RCAG will also inform the Mongolian Embassy in Prague about this project and about the stay of the Czech researchers in Mongolia.

The RCAG will use its contacts with the Erdenet copper mine to discuss the possibilities of visits in the mine connected with the project (e.g. obtaining coordinates of the blasts, to enable access the archive of the mine, possibilities of origin time measurements etc.).

The RCAG will arrange a 4x4 off road car for the members of the IRSM research team during their whole stay in Mongolia in years 2007 and 2008. The cost will be covered by the IRSM and the RCAG will ensure that the cost and conditions will be reliable as usual in Mongolia. The details concerning the car are to be discussed later.

The data of selected events recorded by the RCAG stations:

- BLG (Bulgan)
- ULN (Ulaanbaatar)
- ALF (Alfa)
- HTG (Khatgal)
- and possibly also others

will be freely available to Czech researchers.

The RCAG will inform the IRSM about any changes concerning the project, which might affect the works on the project.

(7)

### **Joint works**

The IRSM and RCAG will together build the stations in Erdenet area according to the statements mentioned above. It is supposed that some of the necessary material equipment such as accumulators, solar cells, computers and notebooks, wires, cables, seismic station housing, cars, small repairing tools, etc. will be bought or rent in Mongolia. The RCAG will manage this equipment and the IRSM will cover the cost of it. The IRSM and RCAG will together maintain the stations. The IRSM and RCAG will together share the data recorded and will help each other to provide the results according to the objectives specified above.

(8)

### **People involved in the SCREAM project**

The IRSM will provide following investigation team for the SCREAM project:

<b>Mgr. Petr Kolínský</b>	main investigator of the proposed ISREM project, Ph.D. student, surface waves studies
<b>Ing. Milan Brož, CSc.</b>	deputy head of the Department of Seismology, IRSM, engineering seismology, instrumental equipment
<b>RNDr. Jiří Málek, Ph.D.</b>	head of the Department of Seismology, IRSM, seismology, inverse problems, small aperture arrays, tomography
<b>Mgr. Jan Valenta</b>	Ph.D. student, geology, exploration geophysics, shallow seismic, anisotropy
<b>Mgr. Vladimír Stejskal</b>	Ph.D. student, hydrogeology, seismology
<b>Mgr. Hana Kampfová-Exnerová</b>	Ph.D. student, seismology, geology
<b>Ing. Petr Zetocha</b>	Ph.D. student, engineering, instrumental equipment

The RCAG investigation team consists of:

<b>Ch. Odonbaatar</b>	Ph.D student, seismologist, seismic hazard assessment, site effects
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<b>M. Ulziibat, Ph.D.</b>	seismology, geology
<b>Ch. Bayarsaikhan</b>	Ph.D. student, explosion studies using seismology & infrasound
<b>Ts. Baasanbat, MSc.</b>	receiver function
<b>Ts. Nyambayar</b>	engineer

(9)

### **Mutual exchange of scientists**

It is supposed that some of the Mongolian young researchers or students will visit Czech Republic. Such visits could be arranged immediately before the main project measurement campaign starts. It is supposed that some visits will be held also while working on the measured data and preparing results for publications at the end of the project.

Within the framework of this agreement each institute may send its representative to visit other party.

(10)

### **Final provisions**

This Agreement is executed in two [2] original copies and each of the parties hereto shall receive one [1] copy.

This Agreement is open to anyone who may be interested in it. It can be copied and transmitted by any means of communication. It does not affect the fact that only two original copies are kept by the IRSM and the RCAG respectively.

This Agreement can be modified and amended only in writing and only subject to the consent of both parties hereto. The technical details specified above are to be elaborated by means of electronic communication between respective persons at the IRSM and the RCAG and no additional agreement concerning final technical arrangements is to be signed, if not otherwise specified.

The essential condition of this Agreement to be valid is the acceptance of the ISREM project by the GAAV. In case the ISREM project will not be accepted this Agreement becomes invalid.

This Agreement becomes valid and enters into force on the day of signing by the parties hereto and by conditions mentioned above.

This agreement shall terminate at the end of year 2009. This agreement can be prolonged only upon the written approval of both parties hereto.

Any documents relating to subject of this Agreement are to be sent by e-mail to the Petr Kolinsky's address:

[kolinsky@irsm.cas.cz](mailto:kolinsky@irsm.cas.cz)

or to the Odonbaatar Chimed's address

[odon@rcag.url.mn](mailto:odon@rcag.url.mn) .

The e-mail addresses of other persons involved in the SCREAM are also to be used if the documents need their interest. While sending a hard copy documents, following addresses are to be used:

Petr Kolínský  
Institute of Rock Structure and Mechanics  
V Holešovičkách 41, 182 09 Praha 8, Czech Republic

and

Odonbaatar Chimed  
Research Centre of Astronomy and Geophysics

Bayanzurh district – Maahuur tolgoi, Bulding No. 7, Ulaanbaatar, Mongolia.

Any documents exchanged between the RCAG and IRSM, or between any employees of the RCAG and IRSM should be written in English.

The results of the SCREAM will be presented in the form of the papers and reports published by journals in English.

This Agreement is signed in order to prepare the final signature of a Contract between the IRSM and RCAG. This Contract will be added to this Agreement in case the ISREM proposal will be accepted by the GAAV and should be signed by the directors of IRSM and RCAG, respectively. Without this Contract this Agreement will lost its validity.

The parties hereto mutually declare that this Agreement is written according to their free will and in witness thereof they attach their signatures.

Ulaanbaatar, 15<sup>th</sup> June 2006

Mgr. Petr Kolínský

prof. Tundev Dugarmaa, Ph.D.

main investigator of the ISREM project  
proposed to the GAAV  
on behalf of Jiří Málek  
head of the Department of Seismology  
Institute of Rock Structure and Mechanics

head of the Seismological Department  
Research Centre of Astronomy and Geophysics