

# MINERAL RESOURCES, METALLOGENESIS, AND TECTONICS OF NORTHEAST ASIA

## Project Summary, Publication List, and Web Sites

### INTRODUCTION

A multi-year project is conducted by the U.S. Geological Survey and collaborating resource agencies to provide a critical data base and companion geologic information on the Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia. Data from the project is benefiting participants and customers by: (1) providing a comprehensive international data base on the mineral resources of the region that will be the first, extensive knowledge available in English; (2) providing major new interpretations of the origin and crustal evolution of mineralizing systems and their host rocks, thereby enabling enhanced, broad-scale metallogenic and tectonic reconstructions; and (3) promoting trade and scientific and technical exchanges between North America and Eastern Asia.

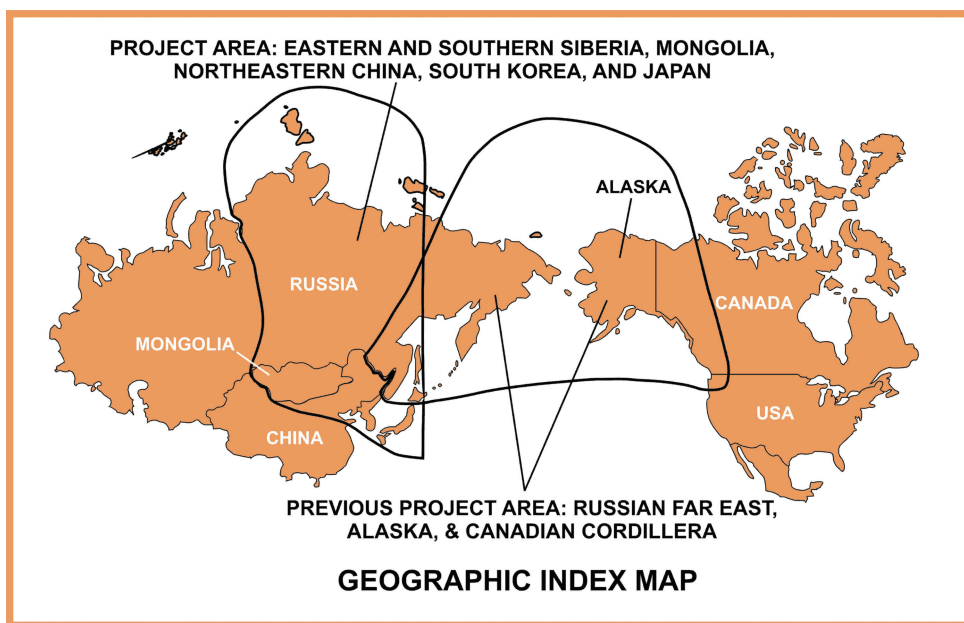
### COLLABORATING AGENCIES

The collaborating agencies for the project are the Russian Academy of Sciences, Academy of Sciences of the Sakha Republic (Yakutia), VNIIOkeangeologia and Ministry of Natural Resources of the Russian Federation, Mongolian Academy of Sciences, Mongolian University of Science and Technology,

Mongolian National University, Jilin University, Changchun, China, the China Geological Survey, the Korea Institute of Geosciences and Mineral Resources, the Geological Survey of Japan/AIST, University of Texas Arlington, and the U.S. Geological Survey. Western supporters are the Colorado School of Mines, Stanford University, University of Alaska Fairbanks, University of Pittsburgh, the Alaska Miners Association, the Northwest Mining Association, and the Society of Economic Geologists.

### CUSTOMERS

This project is providing vital data for a wide variety of customers for making sound economic planning and investment decisions and for increasing their geologic knowledge of this region. These customers include: (1) major mining, petroleum, environmental, construction, investment, and information companies; (2) federal and state government agencies in all countries; (3) professional organizations; (4) earth science departments at major universities; and (5) news media.





## STUDY AREA

The project study area consists of most of eastern Russia (most of the region of Siberia and the Russian Far East), Mongolia, Northern China, South Korea, Japan, and adjacent offshore areas (below figure). This area is approximately bounded by 30 to 82 N. latitude and 75 to 144 E. longitude.

## PREVIOUS PROJECT

The project extends and build on data and interpretations from a previous project on the Major Mineral Deposits, Metallogenesis, and Tectonics of the Russian Far East, Alaska, and the Canadian Cordillera (below figure) that is being completed by the USGS, the Russian Academy of Sciences, the Alaska Division of Geological and Geophysical Surveys, and the Geological Survey of Canada.

## PRODUCTS

Products for the project include: (a) detailed mineral resource tables and location maps with data on about 1,600 lode deposits and 75 placer districts for the project area, based on original, cited references; (b) regional geodynamics maps and detailed explanations that will provide the geologic setting for mineral deposits and metallogenic belts; (c) mineral deposit location and metallogenic belt maps; and (d) metallogenic and tectonic interpretations, including a four-dimensional time-space model depicting the crustal origin and evolution of mineral deposits and host rocks. Publications are being released in both paper format (USGS publications and scientific journals), and digital format (CD-ROM, and Internet/Web). Geodynamics maps, and mineral resource data and maps are being compiled and published as GIS spatial data. The various resource tables, maps, and interpretative materials will be authored by the international collaborators with the USGS project members serving mainly as co-editors.

## PRELIMINARY PUBLICATIONS BOOK 1 - 1999

Preliminary Publications Book 1 From Project on Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia, Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., 1999: U.S. Geological Survey Open-File Report 99-165 (CD-ROM)

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Introduction to preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia, by Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 6 p.

Geographic base map of Northeast Asia, by Miller, R.J., Koch, R.D., Nokleberg, W.J., Hwang, Duk-Hwan, Ogasawara, Masatsugu, Orolmaa, Demberel, Prokopiev, A.V., Sudo, Sadahisa, Vernikovskiy, V.A., and Ye, Mao, 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 1 sheet, scale 1:5,000,000, 3 p.

Preliminary description of mineral deposit models, by Gunchin, D., Dangindorjiin, D., Gerel, O., Gotovsuren, A., and Sodov, A., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 30 p.

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Preliminary table of lode and occurrences of Altay-Sayan region and adjacent areas, Eastern Siberia, Russia, by Obolenskiy, A.A., Distanov, E.G., and Sotnikov, V.I., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 13 p.

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Preliminary table of placer gold deposits and occurrences of Mongolia, by Dejidmaa, G., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 9 p.

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- Preliminary terrane and overlap assemblage map of Trans-Baikal and Eastern Sayan region, by Gordienko, I.V., and Bulgatov, A.N., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 1 sheet, scale 1:5,000,000.
- Summary of pre-accretionary and accretionary metallogenic belts of Mongolia, by Dejidmaa, G., and Badarch, G., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 10 p.
- Terrane map of Northeast Asia: Principles of compilation and major subdivisions of the legend, by Parfenov, L.M., Khanchuk, A.I., and Nokleberg, W.J., 1999, in Nokleberg, W.J., Naumova, V.V., Kuzmin, M.I., and Bounaeva, T.V., eds., Preliminary publications book 1 from project on mineral resources, metallogenesis, and tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 99-165 (CD-ROM), 11 p.
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- Preliminary Northeast Asia geodynamics map (Adobe Acrobat PDF version), by Parfenov, L.M., Khanchuk, A.I., Badarch, Gombosuren, Miller, R.J., Naumova, V.V., Nokleberg, W.J., Ogasawara, Masatsugu, Prokopiev, A.V., and Yan, Hongquan, with contributions on specific regions by Belichenko, Valentina, Berzin, N.A., Bulgatov, A.N., Byamba, Jamba, Deikunenko, A.V., Dong, Yongsheng, Dril, S.I., Gordienko, I.V., Hwang, Duk Hwan, Kim, B.I., Korago, E.A., Kos'ko, M.K., Kuzmin, M.I., Orolmaa, Demberel, Oxman, V.S., Popeko, L.I., Rudnev, S.N., Sklyarov, E.V., Smelov, A.P., Sudo, Sadahisa, Suprunenko, O.I., Sun, Fengyue, Sun, Jiapeng, Sun, Weizhi, Timofeev, V.F., Tret'yakov, F.F., Tomurtogoo, Onongin, Vernikovskiy, V.A., Vladimiro, A.G., Wakita, Koji, Ye, Mao, and Zedgenizov, A.N., 2003, in Nokleberg, W.J., and 10 others, eds.: Preliminary Publications Book 2 from Project on Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 03-203 (CD-ROM), 2 sheets, scale 1:5,000,000.
- Preliminary metallogenic belt and mineral deposit maps for Northeast Asia (Adobe Acrobat PDF versions), by Obolenskiy, A.A., Rodionov, S.M., Dejidmaa, Gunchin, Gerel, Ochir, Hwang, Duk Hwan, Miller, R.J., Nokleberg, W.J., Ogasawara, Masatsugu, Smelov, A.P., Yan, Hongquan, and Seminskiy, Z.V., with compilations on specific regions by Ariunbileg, Sodov, Biryul'kin, G.B., Byamba, Jamba, Davydov, Y.V., Distanov, E.G., Dorjgotov, Dangindorjiin, Gamyarin, G.N., Fridovskiy, V.Yu., Goryachev, N.A., Gotovsuren, Ayurzana, Khanchuk, A.I., Kochnev, A.P., Kostin, A.V., Kuzmin, M.I., Letunov, S.A., Li, Jiliang, Li, Xujun, Malceva, G.D., Melnikov, V.D., Nikitin, V.M., Parfenov, L.M., Popov, N.V., Prokopiev, A.V., Ratkin, V.V., Shpikerman, V.I., Sotnikov, V.I., Spiridonov, A.V., Stogniy, V.V., Sudo, Sadahisa, Sun, Fengyue, Sun, Jiapeng, Sun, Weizhi, Supletsov, V.M., Timofeev, V.F., Tyan, O.A., Vetluzhskikh, V.G., Wakt, Koji, Xi, Aihua, Yakovlev, Y.V., Zhizhin, V.I., Zinchuk, N.N., and Zorina, L.M., 2003, in Nokleberg, W.J., and 10 others, eds.: Preliminary Publications Book 2 from Project on Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 03-203 (CD-ROM), 1 sheet, scale 1:7,500,000, 3 sheets, scale 1:15,000,000, explanatory text, 62 p.
- Introduction to, and summary tables on significant metalliferous and selected non-metalliferous lode deposits, and selected placer districts of Northeast Asia (Adobe Acrobat PDF and Word versions), by Ariunbileg, Sodov, Biryul'kin, G.V., Byamba, Jamba, Davydov, Y.V., Dejidmaa, Gunchin, Distanov, E.G., Dorjgotov, Gamyarin, G.N., Gerel, Ochir, Fridovskiy, V.Yu., Gotovsuren, Ayurzana, Hwang, Duk Hwan, Kochnev, A.P., Kostin, A.V., Kuzmin, M.I., Letunov, S.A., Li, Jiliang, Li, Xujun, Malceva, G.D., Melnikov, V.D., Nikitin, V.M., Obolenskiy, A.A., Ogasawara, Masatsugu, Orolmaa, Demberel,

## PRELIMINARY PUBLICATIONS BOOK 2 – 2003

This publication provides preliminary versions of major compilations in Adobe Acrobat PDF format for maps, and Word and PDF format for articles and tables.

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Parfenov, L.M., Popov, N.V., Prokopiev, A.V., Ratkin, V.V., Rodionov, S.M., Seminskiy, Z.V., Shpikerman, V.I., Smelov, A.P., Sotnikov, V.I., Spiridonov, A.V., Stogniy, V.V., Sudo, Sadahisa, Sun, Fengyue, Sun, Jiapeng, Sun, Weizhi., Supletsov, V.M., Timofeev, V.F., Tyan, O.A., Vetluzhskikh, V.G., Xi, Aihua, Yakovlev, Y.V., Yan, Hongquan, Zhizhin, V.I., Zinchuk, N.N., and Zorina, L.M., 2003, in Nokleberg, W.J., and 10 others, eds.: Preliminary Publications Book 2 from Project on Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 03-203 (CD-ROM), 47 p.

Geographic base map of Northeast Asia (Adobe Acrobat PDF, Corel Draw, and Adobe Illustrator versions), by Miller, R.J., Koch, R.D., Nokleberg, W.J., Hwang, Duk-Hwan, Ogasawara, Masatsugu, Orolmaa, Demberel, Prokopiev, A.V., Sudo, Sadahisa, Vernikovskiy, V.A., and Ye, Mao, 2003, in Nokleberg, W.J., and 10 others, eds.: Preliminary Publications Book 2 from Project on Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 03-203 (CD-ROM), 1 sheet, scale 1:5,000,000, explanatory text, 3 p.

Mineral deposit models for Northeast Asia (Adobe Acrobat PDF and Word versions), by Obolenskiy, A.A., Rodionov, S.M., Ariunbileg, Sodov, Dejidmaa, Gunchin, Distanov, E.G., Dorjgotov, Dangindorjiin, Gerel, Ochir, Hwang, Duk Hwan, Sun, Fengyue, Gotovsuren, Ayurzana, Letunov, S.N., Li, Xujun, Nokleberg, W.J., Ogasawara, Masatsugu, Seminskiy, Z.V., Smelov, A.P., Sotnikov, V.I., Spiridonov, A.A., Zorina, L.V., and Yan, Hongquan, 2003, in Nokleberg, W.J., and 10 others, eds.: Preliminary Publications Book 2 from Project on Mineral Resources, Metallogenesis, and Tectonics of Northeast Asia: U.S. Geological Survey Open-File Report 03-203 (CD-ROM), 44 p.

### **SIGNIFICANT METALLIFEROUS AND SELECTED NON-METALLIFEROUS LODE DEPOSITS, AND SELECTED PLACER DISTRICTS OF NORTHEAST ASIA – 2003**

Significant metalliferous and selected non-metalliferous lode deposits, and selected placer districts of Northeast Asia (CD and Web versions), by Ariunbileg, Sodov, Biryul'kin, G.V., Byamba, Jamba, Davydov, Y.V., Dejidmaa, Gunchin, Distanov, E.G., Dorjgotov, Gamyarin, G.N., Gerel, Ochir, Fridovskiy, V.Yu., Gotovsuren, Ayurzana, Hwang, Duk Hwan, Kochnev, A.P., Kostin, A.V., Kuzmin, M.I., Letunov, S.A., Li, Jiliang, Li, Xujun, Malceva, G.D., Melnikov, V.D., Nikitin, V.M., Obolenskiy, A.A., Ogasawara, Masatsugu, Orolmaa, Demberel, Parfenov, L.M., Popov, N.V., Prokopiev, A.V., Ratkin, V.V., Rodionov, S.M., Seminskiy, Z.V., Shpikerman, V.I., Smelov, A.P., Sotnikov, V.I., Spiridonov, A.V., Stogniy, V.V., Sudo, Sadahisa, Sun, Fengyue, Sun, Jiapeng, Sun, Weizhi., Supletsov,

V.M., Timofeev, V.F., Tyan, O.A., Vetluzhskikh, V.G., Xi, Aihua, Yakovlev, Y.V., Yan, Hongquan, Zhizhin, V.I., Zinchuk, N.N., and Zorina, L.M., 2003: U.S. Geological Survey Open-File Report 03-220 (CD-ROM), 422 p. Web version available for free at: <http://pubs.usgs.gov/of/2003/of03-220/>

### **DIGITAL FILES FOR NORTHEAST ASIA GEODYNAMICS, MINERAL DEPOSIT LOCATION, AND METALLOGENIC BELT MAPS, STRATIGRAPHIC COLUMNS, DESCRIPTIONS OF MAP UNITS, AND DESCRIPTIONS OF METALLOGENIC BELTS – 2004**

Digital files for Northeast Asia geodynamics, mineral deposit location, and metallogenic belt maps, stratigraphic columns, descriptions of map units, and descriptions of metallogenic belts (CD and Web versions), edited by Nokleberg, W.J., Badarch, Gombosuren, Berzin, N.A., Diggles, M.F., Hwang, Duk Hwan, Khanchuk, A.I., Miller, R.J. Naumova, V.V., Obolenskiy, A.A., Ogasawara, Masatsugu, Parfenov, L.M., Prokopiev, A.V., Rodionov, S.M., and Hongquan, Yan, 2004: U.S. Geological Survey Open-File Report 2004-1252 (CD-ROM). Web version available for free at: <http://pubs.usgs.gov/of/2004/1252/>

Descriptions of metallogenic belts, methodology, and definitions for Northeast Asia mineral deposit location and metallogenic belt maps, compiled by Rodionov, S.M., Obolenskiy, A.A., Dejidmaa, G., Gerel, O., Hwang, D.H., Miller, R.J., Nokleberg, W.J., Ogasawara, M., Smelov, A.P., Yan, H., and Seminskiy, Z.V., 2004, U.S. Geological Survey Open-File Report 2004-1252 (CD-ROM), explanatory text, 442 p. Web version available for free at: <http://pubs.usgs.gov/of/2004/1252/>

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Metallogenic belt and mineral deposit maps for Northeast Asia, compiled by Obolenskiy, A.A. Rodionov, S.M. Dejidmaa, G., Gerel, O., Hwang, D.H., Miller, R.J., Nokleberg, W.J., Ogasawara, M., Smelov, A. P., Yan, H., and Seminskiy, Z.V. , 2004, U.S. Geological Survey Open-File Report 2004-1252 (CD-ROM), 1

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Stratigraphic columns for Northeast Asia geodynamics Map, compiled by Parfenov, L.M., Naumova, V.V., Khanchuk, A.I., Badarch, G., Ogasawara, M., Prokopiev, A.V., and Yan, H., 2004, U.S. Geological Survey Open-File Report 2004-1252 (CD-ROM), explanatory text and columns, 185 p. Web version available for free at: <http://pubs.usgs.gov/of/2004/1252/>

#### **NORTHEAST ASIA GEOGRAPHIC SYSTEMS (GIS) COMPILATION - 2006**

Geographic information systems (GIS) spatial data compilation of geodynamic, tectonic, metallogenic, mineral deposit, and geophysical maps and associated descriptive data for Northeast Asia., by Naumova, V.V., Miller, R.J., Patuk, M., Kapitanchuk, M.Y., Nokleberg, W.J., Khanchuk, A.I., Parfenov, L.M., and Rodionov, S.M., 2006: U.S. Geological Survey Open-File Report 2006-1150 (CD-ROM): Web version available for free at: <http://pubs.usgs.gov/of/2006/1150/>

#### **ADDITIONAL MAJOR PUBLICATIONS**

Preliminary Northeast Asia geodynamics map (Paper Maps on Demand, and Web versions), by Parfenov, L.M., Khanchuk, A.I., Badarch, Gombosuren, Miller, R.J., Naumova, V.V., Nokleberg, W.J., Ogasawara, Masatsugu, Prokopiev, A.V., and Yan, Hongquan, with contributions on specific regions by Belichenko, Valentina, Berzin, N.A., Bulgatov, A.N., Byamba, Jamba, Deikunenko, A.V., Dong, Yongsheng, Dril, S.I., Gordienko, I.V., Hwang, Duk Hwan, Kim, B.I., Korago, E.A., Kos'ko, M.K., Kuzmin, M.I., Orolmaa, Demberel, Oxman, V.S., Popeko, L.I., Rudnev, S.N., Sklyarov, E.V., Smelov, A.P., Sudo, Sadahisa, Suprunenko, O.I., Sun, Fengyue, Sun, Jiapeng, Sun, Weizhi, Timofeev, V.F., Tret'yakov, F.F., Tomurtogoo, Onongin, Vernikovskiy, V.A., Vladimiro, A.G., Wakita, Koji, Ye, Mao, and Zedgenizov, A.N., 2003: U.S. Geological Survey Open-File Report 03-205, 2 sheets, scale 1:5,000,000. Paper version available from USGS Maps on Demand Web site: <http://store.usgs.gov/mod/interest.html> (\$20.00 per sheet). Web version available for free at: <http://pubs.usgs.gov/of/2003/of03-205/>

Preliminary metallogenic belt and mineral deposit location maps for Northeast Asia (Paper Maps on Demand, and Web versions), by Obolenskiy, A.A., Rodionov, S.M., Dejidmaa, Gunchin, Gerel, Ochir, Hwang, Duk Hwan, Miller, R.J., Nokleberg, W.J., Ogasawara, Masatsugu, Smelov, A.P., Yan, Hongquan, and Seminskiy, Z.V., with compilations on specific regions by Ariunbileg, Sodov, Biryul'kin, G.B., Byamba, Jamba, Davydov, Y.V., Distanov, E.G., Dorjgotov, Dangindorjiin, Gamyaniin, G.N.,

Fridovskiy, V.Yu., Goryachev, N.A., Gotovsuren, Ayurzana, Khanchuk, A.I., Kochnev, A.P., Kostin, A.V., Kuzmin, M.I., Letunov, S.A., Li, Jiliang, Li, Xujun, Malceva, G.D., Melnikov, V.D., Nikitin, V.M., Parfenov, L.M., Popov, N.V., Prokopiev, A.V., Ratkin, V.V., Shpikerman, V.I., Sotnikov, V.I., Spiridonov, A.V., Stogniy, V.V., Sudo, Sadahisa, Sun, Fengyue, Sun, Jiapeng, Sun, Weizhi, Supletsov, V.M., Timofeev, V.F., Tyan, O.A., Vetluzhskikh, V.G., Wakta, Koji, Xi, Aihua, Yakovlev, Y.V., Zhizhin, V.I., Zinchuk, N.N., and Zorina, L.M., 2003: U.S. Geological Survey Open-File Report 03-203, 1 sheet, scale 1:7,500,000, 3 sheets, scale 1:15,000,000, explanatory text, 143 p. Paper version available from USGS Maps on Demand Web site: <http://store.usgs.gov/mod/interest.html> (\$20.00 per sheet). Web version available for free at: <http://pubs.usgs.gov/of/2003/of03-203/>

#### **SPECIAL ISSUE OF GEOLOGY AND GEOPHYSICS ON GEODYNAMICS, METALLOGENY AND PETROLEUM POTENTIAL OF THE NORTH-ASIAN CRATON AND FRAMING OROGENIC BELTS - 1999**

Biomarkers in crude oils of the eastern Siberian Platform as indicators of paleoenvironment of source-rock deposition., by Kashirtsev, V.A., Kontorovich, A.E., Philp, R.P., Chalaya, O.N., Zueva, I.N., and Memetova, N.P., 1999: *Geology and Geophysics*, v. 40, p. 1700-1710 (in Russian).

Comparative analysis of geodynamic settings of the Permo-Triassic magmatism in East and West Siberia, by Al'mukhamedov, A.I., Medvedev, A.Ya., and Kirda, N.P., 1999: *Geology and Geophysics*, v. 40, p. 1575-1587 (in Russian).

Compositional variations of gold metallization in relation to the geodynamic settings of formation, by Troshin, Yu. P., 1999: *Geology and Geophysics*, v. 40, p. 1668-1675 (in Russian).

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November 7-11, 1994: United Institute of Geology and Geophysics, Novosibirsk.

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August 27, 2001, Workshop on Tectonic and Metallogeny of North-Eastern Asia. Sixth Biennial SGA-SEG Meeting, Krakow, Poland.

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