New IGCP Projects Accepted and Starting in 2012

Project No.589. Development of the Asian Tethyan Realm

Countries involved: Australia, France, India, Indonesia, Iran, Italy, Japan, Malaysia, Mongolia, Myanmar, People's Republic of China, Philippines, Poland, Republic of Korea, Russia, Taiwan (of China), Thailand, United Kingdom

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Duration: 2012-2016

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The development of the Tethyan Realm is such a complicated problem that it remains far from being clarified. Anyhow, execution of successive IGCP projects (321, 411, 516) targeted at geological evolution of (mainly East and South) Asia and other related researches have contributed much in working out more constraints on the evolution of the Tethys and to provide more data for interpretation. Continued study is the only way to find out more appropriate explanations and to approach gradually the truth.

At the business meeting of IGCP-516 (Geological Anatomy of East and South Asia) held on 26 September 2009 during the 5th International Symposium of IGCP-516 in Kunming, China, the participants decided unanimously that a new IGCP project be applied, which might be a successor of IGCP-516. In this way the investigation into the complicated problems related to the geological evolution of Asia can continue.

The proposed new IGCP project "Development of Asian Tethyan Realm: Genesis, Process and Outcomes" is aimed to maintain the existing team and possibly to mobilize more participants (mainly from Asian developing countries), to carry out

multi-disciplinary investigations in related areas, to find out more constraints on the interpretation of the development of the Asian Tethyan Realm, and to contribute to elucidate the history of the Tethys. In specific, participants of the project are advised to carry out their work with emphasis on problems related to one or more of the following topics:

- Regional extension and property of suture zones and other structural lineaments
- Stratigraphic successions and magmatic series on continental blocks
- Paleobiogeographic evolution of the Tethyan Realm
- Timing and process of continental blocks rifting from large cratons
- Sizes of oceanic basins and the positions of continental blocks at different times
- Timing and process of the suturing of continental blocks
- Validity of the one Tethys model, the Paleo-Tethys + Neo-Tethys model, and the Paleo-Tethys + Meso-Tethys + Neo-Tethys model
- Recent analogues of tectonic environments in the Tethyan Realm
- Geological background for hydrocarbon and mineral resource formations

In doing so, participants from different countries will carry out their investigations in well selected places which are either geologically critical or lacking of proper data. Scientific approaches and techniques of different disciplines are to be employed, such as tectonics, paleogeography, paleontology, stratigraphy, sedimentology, structural geology, petrology, geochemistry, paleomagnetism, and geophysics.

Cooperation with other IGCP projects that deal with geological or evolutionary problems of a limited time range or certain region is planned, for example IGCP-572: Restoration of Marine Ecosystems following the Permian-Triassic Mass Extinction; IGCP-597: Amalgamation and Breakup Pangaea: the Type Example of the Supercontinent Cycle. Cooperation with the CGMW (Commission for Geological Map of the World) project "International Geological Map of Asia (IGMA)" is assured. The proposed project is also going to cooperate with IESO (International Earth Science Olympiad), which is

supported by COGE (Commission on Geoscience Education, Training and Technology Transfer) of IUGS.

Project No.592. Continental construction in Central Asia

Countries involved: Australia, Belgium, France, Germany, Japan, Kazakhstan, Mongolia, People's Republic of China, Russia, South Korea, Taiwan (of China), Turkey, United Kingdom, USA

Project leaders: Inna Safonova (Russia), Reimar Seltmann (UK), Min Sun (China)

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Understanding how does continental crust form, overgrow and evolve is a highly important Earth Science problem. The focus of the newly proposed IGCP project is continental crust construction in Central and East Asia and its desktop comparison with Western Pacific. The project is planned as a successor to IGCP 480 (Tectonics of Central Asia), 420 (Phanerozoic Crustal Growth) and, to some extent, 283 (Evolution of the Paleo-Asian Ocean). The complementary projects could be regarded IGCP 574 (Bending and Bent Orogens and Continental Ribbons), 516 (Geological Anatomy of East and South East Asia), 473 (GIS Metallogeny of Central Asia), 436 (Pacific Gondwana Margin), 321 (Gondwana Dispersion and Asian Accretion), and 224 (Pre-Jurassic Evolution of Eastern Asia) and a separate USGS-Russia project on "Metallogenesis and Tectonics of Northeast Asia".

However, none of those previous and current IGCP and other projects addressed key goals, objectives, questions and tasks of this proposal in their interrelationships, whereas we will build upon those precursor data, fill the remained gaps, solve the unanswered questions and introduce all previous and new data into a single holistic pattern of continental construction.

The main goal is to undertake a broad-scale and multi-method investigation of continental construction in the *Central Asian Orogenic Belt* (hereinafter CAOB) in order to prove that the Phanerozoic was an important period of juvenile continental crust formation versus an idea of its dominantly Archean origin.

The specific goals are linked with distinguishing main stages of continental construction:

- 1 crustal growth (juvenile crust) and
- 2 crustal formation (recycled crust);
- 3 continental growth (accretion minus tectonic erosion),
- 4 continental formation (collisional processes). All these stages will be carefully reconstructed within each individual orogenic belt and across them within the whole orogenic belt: Altai-Sayan and Transbaikalia (Russia), Eastern and Central Kazakhstan, Kyrgyz Tianshan, Chinese Altai and Tianshan, Russian Far East.

Four geological transects crossing these areas will be studied:

- 1 Russian Altai-Chinese Altai-Mongolian Altai;
- 2 Kazakhstan-Kyrgyz-Chinese Tianshan;
- 3 Transbaikalia (Russia) - northern Mongolia-Southern Mongolia - Inner Mongolia (China);
- 4 Primorje-Japan-Korea.

The reconstruction will be based on the currently available and expected future data (mainly geochronological, geochemical and geophysical).

The inferred processes, events and mechanisms of continental construction will be carefully compared in relative aspects (geochronological isotopic ages, geochemistry, structural styles, tectonic patterns, lithology, etc.) with the present-day or recent/Quaternary examples from the Western Pacific (north to south: Japan, Korea, East China). These regions have been better studied than the Central Asian Orogenic Belt and will be used for comparison, i.e. for desktop studies.

Another important specific goal to be reached is which social benefits or geohazards are related to the formation of huge orogenic belts, such as the Altaiids including formation of minerals deposits and surface/environmental impact through volcanism and seismicity.

All this would finally allow us to reconstruct a whole evolutionary pattern of this huge orogenic system. During previous

projects many questions have been solved, however, much more new appeared and their solution requires truly integrative activity of a multi-country team with leaders directly from the countries within the region of investigation (Russia, China) and those who have obtained a great experience in organizing and performing scientific research in that region during many years (UK, France). Undoubtedly, such a team will be capable not only to organize scientific meetings, but to accomplish the whole regional and methodological spectrum of field and analytical works and thus will guarantee the successful performance of the Project.

The Project will be based on an interdisciplinary approach including U-Pb and Ar-Ar isotope geochronology, igneous and metamorphic petrology, isotope (Hf-Sm-Os-O) and major/trace element geochemistry, lithology, sedimentology, micropalaeontology, tectonics, structural analysis, palaeomagnetism, geophysics, metallogeny and environmental geology.

Project No. 616. Tectonic, Paleoclimatic, Landscape evolution of Central Africa

(Sponsored by the Swedish International Development Cooperation Agency)

Countries involved: Brazil, Cameroon, Central Africa Republic, Chad, Germany, Nigeria

Project leaders: Boniface Kankeu (Cameroon), R.O. Greiling (Germany), Jurgen Runge (Germany)

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The project aim at understanding the crustal architecture and regional geology of west central Africa whose geology is poorly known and yet to be mapped in detail into a regional Gondwana context and to integrate basement studies with paleoclimate, neotectonics, geomorphology and landscape evolution. The framework of geodynamic processes has being establish in previous studies but, the deformation mechanism of the major tectonic units and tectonic boundaries and the interpretation of the orogenic evolution of the Neoproterozoic belt

north of the Congo craton are still controversial. Reactivation of early formed shear zones may have controlled the pattern of Mesozoic continental rifting and breakup and associated basin formation and thus be of interest to geologists on both sides of the Atlantic, and more importantly lead to better integration of the onshore and offshore geology. When deep Precambrian structures do reactivate, the manner of the reactivation and its precise influence on later structural development is poorly defined. Moreover, fundamental knowledge on paleoclimate, neotectonics and their importance for the making of present-day landscape is scarce. The project therefore involves an interdisciplinary approach including tectonics, petrology, geophysics, paleoclimatology, geomorphology and physical geography in the sub-region embracing Cameroon, Chad, Central Africa Republic, Sudan, Nigeria and Brazil.

Project No. 618. Paleoclimate information obtained from past-recharged groundwater

Countries involved: Algeria, Argentina, Australia, Benin, Brazil, Canada, Denmark, Estonia, Ethiopia, Ghana, Italy, Israel, Japan, Morocco, Mozambique, Namibia, Norway, People's Republic of China, Switzerland, Thailand, The Netherlands, Tunisia, United Kingdom, Uruguay, USA

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Human civilizations have for millennia depended on the stability of groundwater resources to survive dry or unreliable climates. While groundwater supplies are buffered against short-term effects of climate variability, they can be impacted over longer time frames through changes in rainfall, temperature, snowfall, melting of glaciers/permafrost, vegetation and land-use changes. Groundwater provides a low-resolution archive of past climate variation by recording changes in recharge amount or the chemical and isotopic evolutionary history of a groundwater system. The recharge history of a given groundwater resource is then vital to forecast its vulnerability under future and potentially adverse climatic changes.

This global project based on existing information and fostering new investigations aims to:

- A Compare and potentially correlate major climatic events derived from groundwater with those obtained from higher resolution continental proxy records. This will be done at a continental scale (individual basins) and global scale (between different basins).
- B Apply this approach to large aquifers or regions where pre-existing research can be accessed and/or small number of additional analysis could add substantial value. The project will initially target emblematic aquifers “flag basins” in most continents but expects to increase the number of basins targeted as new collaborations and research projects are developed.

North West Sahara Aquifer System (NWSAS).

America: (North America) we will target the High Plains Aquifer (HPA). (South America) we will target the Guaraní Aquifer System (GAS)

Asia: The North China Plains Aquifer (NCPA)

Europe: The Baltic Artesian Basin (BAB)

Oceania: Great Artesian Basin (GAB) and the coastal Sydney Basin aquifers (SBa)

These basins contain vast groundwater resources and it is estimated that tens (if not 100s) of millions of people rely on them either directly or indirectly. Uncontrolled groundwater extraction in some of those aquifers has caused irreversible depletion. Understanding the recharge history of these aquifers will provide solid scientific data that are essential for modelers to predict future

impacts, and hence for water managers who rely on such predictions.

- C To assess potential future climatic effects in the studied basins based on the understanding of their recharge history. Several conceptualizations of basin response from the palaeo groundwater record will be modeled and compared. Provided data, the model's response will be calibrated against data. Calculated response of modeled basins will also be used to identify data needs.
- D To improve groundwater chronological frameworks past the 14C dating range (>30 ka in groundwater) and contribute to the use of novel “age or palaeo climatic tracers” (i.e. 81Kr, noble gasses, 35S etc.).
- E To establish a network of palaeo groundwater scientist that accelerates the transferring of knowledge to developing countries and junior scientists, development of research directions and systematic comparison of palaeo groundwater systems. For this purpose a seminar/workshop is to be held annually. Their methodology in brief:

Data collation and data management will be aided with geographical information system (GIS). Palaeo climatic signals will be derived from geochemical characteristics and features of stable isotopes and noble gases, while groundwater dating from naturally occurring radioactive isotopes of varied half-lives (35S, 3H, 3H/3He, 14C, 32Si, 39Ar, 85Kr, 81Kr and 36Cl) will constitute the chronological framework. Published data sets will be checked following a standard approach and compared to higher resolution regional records or other records from ice cores or speleo themes. Additional samples are to be collected from the selected larger aquifers to fit the record gap or extrapolate the archives in the region. Simulation approach is to be used based on varied scenarios regarding climate change and climate variability.

Project No.619. Contourites: processes and products

Countries involved: Argentina, Australia, Belgium, Brazil, Canada, Denmark, France, Germany, Ireland, Italy, Japan, Mexico, Morocco, Norway, People's Republic of China, Poland, Portugal, Russia, Spain, South Africa, Sweden, United Kingdom, USA

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Based upon the success of the first Deep-Water Circulation congress in Baiona (16-18 June 2010), an initiative has been developed to start an International Geoscience Programme (IGCP) on Contourites. The fundamental role of bottom currents in the construction of continental margins has now been well documented and the sediments deposited or significantly affected by these bottom currents are known as contourites. Significant technical and scientific advancements have been made in this field since the previous IGCP from 1998 to 2002 (IGCP 432 “Contourite Watch”), with many diverse scientists involved and a major buzz of activity. Consequently, this broad but complex research topic has evolved from “adolescence” to “maturity”. However, both economically as well as for the large scientific and public community, the processes and products of deep-water circulation remain poorly known. We aim to completely change their lack of visibility, to harness existing interest and activity, and especially work to involve more isolated scientists and teams, and to draw in new young scientists as well as those from developing countries. This IGCP will focus on 7 broad objectives, closely fitting to IGCP priorities:

- 1 Paleooceanography and global change: deep and shallow water circulation is driven by climate. Hence, the contourite deposits are useful recorders of past climate change and assist in better

- understanding the modulating role of the deep ocean in our climate's system
- 2 Geohazards: contourite deposits are observed all over the Earth's continental margin, predominantly as vast sheets of fine-grained material. They may lie at the origin of major slope instabilities (such as the Storegga slide), creating Tsunami dangers and may be critical if the hydrocarbon industry moves to deeper slopes.
 - 3 Earth resources: next to turbidite systems, also contourites may generate well-sorted deep-water sands. They occur in nearly any complex environment and may be acting as source rock, reservoir or cap rock. Moreover, the role of deep-water circulation on the growth and distribution of ferromanganese nodules is still under debate.
 - 4 Ecosystems and environmental change: over the past decade it has become clear that most of the deep-water ecosystems (cold-water corals) are highly influenced by the presence of deep-water circulation.

Any change in circulation may affect the "health status" of these reefs, which are also nurseries for our future fish stocks.

- 5 Hydrographic processes: although the contourite paradigm has existed for over 40 years, there still seems to be a missing dialogue between physical oceanography and sedimentary observations. It is the aim of this IGCP to unify both disciplines to enhance our process-driven knowledge.
- 6 Geological products: diagnostic features and ancient contourites: the increasing observation of contourites in all environments calls for more unambiguous diagnostic criteria, based upon a better integration of geophysical, sedimentological and geochemical observations. They may assist in better recognizing land sections, which are poorly documented.
- 7 Outreach and public awareness: we are firmly committed to the importance of outreach activities at many different levels, including geoscience education, and of thereby promoting global geoscience visibility. This element will be built in to

all of our planned activities as and where appropriate, and show-cased in accessible form on our project website. Knowledge transfer is inherent in our wide international participation and research cooperation. We plan to start a post-graduate student chapter and to train young scientists at sea in order to create a new generation of highly motivated marine scientists.

Finally, we aim to increase scientific visibility for contourites by stimulating the use and development of new technologies and methodologies and fostering the publication of books and special issues in peer reviewed journals.

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