NEWSLETTER GEOBRASIL
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- **RECENT DEVELOPMENTS IN GEOSCIENCES: INTERNATIONAL RESEARCH PROGRAMS**

Sospeter Muhongo

1. INTERNATIONAL YEAR OF PLANET EARTH (2006)

International Union of Geosciences (IUGS, based in Oslo), in collaboration with the International Geoscience Programme (IGCP, based in Paris, UNESCO Office) and UNESCO (Division of Earth Sciences), has decided to launch IYPE in 2006. However, activities within the framework of the Year will run for a period of at least three years (2005-2007), and an estimated budget of US$ 20 million (besides other sources) is earmarked for the selected 8 broad research themes (groundwater, hazards, health, climate, resources, magacities, deep earth and ocean). IUGS, representing about 250.000 geoscientists across 117 countries, has taken this initiative on the Earth System and its resources and sustainable management within the realm of the UN-proclaimed international years. Consequently, we are all involved and African geoscientists have to be proactive and participate in this ambitious and prestigious year. Our countries (governments) have to support China's submission to the UN general assembly. For more details visit, www.esfs.org.

2. NEW GEOLOGICAL MAPS

The Commission of the Geological Map of the World (CGMW), in collaboration with UNESCO, will soon (by August 2004) produce new maps on the geology, hydrogeology, etc of the world, including separate sheets for Africa, Europe etc. The biggest display of these maps will be in Florence, Italy, in August 2004, during the 32nd International Geological Congress. More details may be obtained from the website of CGMW.

A 10 million-scale map on the geology and major ore deposits of Africa is now printed. The work for this was undertaken by geologists from the Geological Survey of France (BRGM, 33 geologists under the leadership of Jean-Pierre Milesi) and African geologists (Kampunzu-Botswana/DR Congo, Toteu-Cameroon, Tadesse-Ethiopia and Muhongo-Tanzania). The first edition of this map will be displayed and sold (low price) in Orleans, France, in June 2004 during the 20th Colloquium of Africa Geology (CAG20). Do not forget attending this meeting: http://cag20.brgm.fr

The second draft of the geological map of Tanzania (1:2.000.000) is in the final stages of preparation by geologists from BRGM (France) and Tanzania (University of Dar Es Salaam & Geological Survey). A working meeting on this map will be held on coming Friday (20 February) at 14 hrs. We intend to produce two sheets- (i) map showing tectonic domains, major structures and all reliable isotopic ages, and (ii) map showing all major mineral deposits. The first editions of these maps will be displayed in June 2004 in Orleans (France) during the CAG20.

3. NEW ACCEPTED IGCP PROJECTS

The 32nd Scientific Board of IGCP-IUGS-UNESCO was recently held in Paris to evaluate new project proposals and ongoing ones (42). Africa did not succeed to get a new IGCP project. This means that we remain with only 5-African-led projects (3 for Sub-Saharan Africa). We need better project proposals from Africa. Please note that there two types of IGCP projects – (i) the normal ones and (ii) the newly introduced young geoscientists projects. We might get more projects through the second type, especially from those who have just completed their PhDs. More details on this issue may be obtained directly from me. As you might know my 4-year term in the board came to end in this February but IUGS-UNESCO requested me to continue serving the board and I was elected as a Vice Chairman of this board during the recent IGCP scientific board meeting. Thus, we have to push hard for projects from Africa. Young scientists should be highly encouraged and assisted to come up project proposals.

4. GEOLOGICAL HERITAGE PROGRAM

These are the geoparks and geosites. They are unique geological features of spectacular importance to earth science (global scientific importance) and the surrounding community. A good example here is the Tanzania's Oldonyo Lengai (The God for the Maasai people and unique active felsic magmatism). UNESCO has decided to support all world-wide initiatives aiming at preservations of such unique natural features for the future generations. China is leading with 44 spectacular geoparks and we recently (UNESCO's International Advisory Group of Experts on Geoparks/Geosites) evaluated and endorsed 8 of them for UNESCO's assistance. Europe got endorsement of their 17 geoparks. Africa is lagging behind and drastic measures have to be taken.

We are planning to hold an international meeting (plus field excursion) on Africa's potential geoparks/geosites in Arusha in September 2004. I will keep you informed this issue.

Please forward this message to your colleagues – information dissemination is a chronic problem in Africa – we have to stamp off this hindrance of our scientific achievement.

- **NATURE**

HIGH-LATITUDE INFLUENCE ON THE EASTERN EQUATORIAL PACIFIC CLIMATE IN THE EARLY PLEISTOCENE EPOCH

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Many records of tropical sea surface temperature and marine productivity exhibit cycles of 23 kyr (orbital precession) and 100 kyr during the past 0.5 Myr (refs 1–5), whereas high-latitude sea surface temperature records display much more pronounced obliquity cycles at a period of about 41 kyr (ref. 6). Little is known, however, about tropical climate variability before the mid-Pleistocene transition about 900 kyr ago, which marks the change from a climate dominated by 41-kyr cycles (when ice-age cycles and high-latitude sea surface temperature variations were dictated by changes in the Earth's obliquity) to the more recent 100-kyr cycles of ice ages. Here we analyse alkenones from marine sediments in the eastern equatorial Pacific Ocean to reconstruct sea surface temperatures and marine productivity over the past 1.8 Myr. We find that both records are dominated by the 41-kyr obliquity cycles between 1.8 and 1.2 Myr ago, with a relatively small contribution from orbital precession, and that early Pleistocene sea surface temperatures varied in the opposite sense to local annual insolation in the eastern equatorial Pacific Ocean. We conclude that during the early Pleistocene epoch, climate variability at our study site must have been determined by high-latitude processes that were driven by orbital obliquity forcing.
Nature 427, 720 - 723 (19 February 2004); doi:10.1038/nature02338

AFTERSHOCKS DRIVEN BY A HIGH-PRESSURE CO2 SOURCE AT DEPTH

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In northern Italy in 1997, two earthquakes of magnitudes 5.7 and 6 (separated by nine hours) marked the beginning of a sequence that lasted more than 30 days, with thousands of aftershocks including four additional events with magnitudes between 5 and 6. This normal-faulting sequence is not well explained with models of elastic stress transfer, particularly the persistence of hanging-wall seismicity that included two events with magnitudes greater than 5. Here we show that this sequence may have been driven by a fluid pressure pulse generated from the coseismic release of a known deep source of trapped high-pressure carbon dioxide (CO_2). We find a strong correlation between the high-pressure front and the aftershock hypocentres over a two-week period, using precise hypocentre locations and a simple model of nonlinear diffusion. The triggering amplitude (10–20 MPa) of the pressure pulse overwhelms the typical (0.1–0.2 MPa) range from stress changes in the usual stress triggering models. We propose that aftershocks of large earthquakes in such geologic environments may be driven by the coseismic release of trapped, high-pressure fluids propagating through damaged zones created by the mainshock. This may provide a link between earthquakes, aftershocks, crust/mantle degassing and earthquake-triggered large-scale fluid flow.
Nature 427, 724 - 727 (19 February 2004); doi:10.1038/nature02251

GRAIN BOUNDARIES AS RESERVOIRS OF INCOMPATIBLE ELEMENTS IN THE EARTH'S MANTLE

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The concentrations and locations of elements that strongly partition into the fluid phase in rocks provide essential constraints on geochemical and geodynamical processes in Earth's interior. A fundamental question remains, however, as to where these incompatible elements reside before formation of the fluid phase. Here we show that partitioning of calcium between the grain interiors and grain boundaries of olivine in natural and synthetic olivine-rich aggregates follows a thermodynamic model for equilibrium grain-boundary segregation. The model predicts that grain boundaries can be the primary storage sites for elements with large ionic radius—that is, incompatible elements in the Earth's mantle. This observation provides a mechanism for the selective extraction of these elements and gives a framework for interpreting geochemical signatures in mantle rocks.
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- **SCIENCE**

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- **IAPC**

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