Alpine Conglomerate Sequences and Miocene Climates

Recent studies of Miocene Molasse fans on both sides of the Alps and of conglomerates on the Plateau Jura have led to new ideas on the genesis of these deposits and the climate during their accumulation. Sedimentary structures in many of these conglomeratic sequences suggest a temporarily rather cool climate, but fossils indicate a distinctly warmer climate during accumulation of the intercalated fine-grained sediments. The marl - fresh-water limestone - marl sequences overlying the conglomerates also suggest climatic fluctuations during the younger Middle Miocene.

The conglomerate fans of the Plateau Jura (Fig. 1) have often been considered fluvial deposits. However, cobble sizes of up to 60 cms and the absence of pebble imbrication typical of river deposits suggest an alternative interpretation. Pebbles of crystalline rocks, Buntsandstein, Muschelkalk, Dogger,

the existence of warmer pulses. Such climatic fluctuations in the southern Black Forest have implications for contemporaneous sediments of the Molasse fans in the northern and southern Alps. These fans usually display imbricated pebble fabrics of fluvial character only in their distal parts, and their proximal parts seem also to have been deposited in a chaotic, "torrential" way. Presumably these result from out-breaks from lakes in Alpine valleys, dammed by landslides. Blocking of mountain lakes and debris flows from them occurs mostly at low timberlines and during times of increased frost activity.

As with the Jura conglomerates, the deposition of the chaotic Alpine conglomerate beds started fairly abruptly, and graded upwards to fine-grained sediments. Among the latter fluvial sands, marls of ox bow lakes, and fresh-water limestones contain plant fossils that by comparison with modern species permit a rather precise definition of climatic environment. The remains of leaves, fruits and pollen indicate mean temperature variations of a few degrees centigrade even in a few meters of sediments. The fossil plants and molluscs of the Lower Marine Molasse indicate a subtropical-mediterranean climate during the Middle Oligocene. The fossil flora of later Oligocene deposits (Lower Freshwater Molasse) indicate a cooling to a temperate climate, followed by a warming during the transgressive phases of the Middle Miocene Upper Marine Molasse and then once again by a drop in temperature during the deposition of the Upper Fresh-Water Molasse. Thus the change from marine to fresh-water environments was associated with a decrease in temperature and moisture together with a reduction of subtropical flora and fauna.

These short warm and cooler phases within the larger scale climatic changes from the middle to the late Tertiary are similar to the glacial-interglacial fluctuations of the Quat-

Figure 1: Jura conglomerates in northern Switzerland and southern Germany.

Malm and Tertiary sediments suggest an origin from the Black Forest region, but the present topography gives no indication of rivers large enough to have produced anywhere these huge conglomerate sequences. Furthermore, the different altitudes of gravel deposits with "hollow" pebbles (hohle Gerölle), the presence of manganese oxide-coated pebbles in outwash gravel layers and "ashed" dolomites (veraschte Dolomite), known from cool or even cold Quaternary gravels, indicate that in the perpetual snow areas of the high Black Forest periodic outbursts of dammed moraine lakes spread out as debris flows over superficially frozen soils. Even in the southern Basle Jura, these meltwaters transported cobbles (Fig. 2) of crystalline rocks (to 20 cm) and of Buntsandstein and Muschelkalk (to 30 cm). The meltwaters appear to have followed east-west drainage channels or to have disappeared into karst crevasses.

In contrast to the cool climatic phases indicated by the Miocene conglomerate sequences, the presence within them of fine-grained sediments with fossil palms and laurels suggests

Figure 2: Conglomerates with crystalline cobbles in the Plateau Jura near Bennwil, 24 Kms southeast of Basle.

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ernary, and may have a similar cause. First, postulated in 1864 by James Croll, recognized again in this century and confirmed and elaborated in recent years by several investigators such climatic variations are now linked to changes in eccentricity, precession and tilt of the Earth's rotational axis.

In the middle to late Tertiary, the climatic pulses seem to have been smaller than those in the Quaternary, with temperatures relatively higher in both warm and cool phases.

Several species of fossil floras indicate that during warmer phases the Alpine timberline would have oscillated between 2,500 and 4,000 m and during cooler phases between 800 and 2,000 m. By comparison, the modern timberline in the Swiss Alps reaches up to 1,600 m on the northern border and above 2,300 m in the Central Alps.

R. Hantke
Zurich, Switzerland

New ICSU Press Established

The International Council of Scientific Unions (ICSU) is the ultimate umbrella of international non-governmental organizations in science to which a large proportion of the world's scientists belong - whether they know it or not. For example, members of the Society of Economic Geologists, those geologists working on IGCP projects, and hydrogeologists who are affiliated to IAHS, are all linked to ICSU through unions like IUGS and IUGG. ICSU operates at a fairly high level, serving as a link between scientific disciplines and as an initiator and sponsor of non-governmental activities like the International Lithosphere Program, a current study group working on the environmental consequences of nuclear war, and the major new international research effort now being developed on Global Change.

Perhaps because of its position at the top level of the hierarchy of international science, ICSU is not well known among working scientists. Partly to increase its "visibility" and partly to provide a service to its own family members, the Council set up in 1983 its own publications organization - ICSU Press - to engage in interdisciplinary publication activities beyond the scope of any one ICSU member. The activities of the Press include undertaking publication projects for ICSU unions, advising and providing guidelines on technical and contractual matters, acting as an expert negotiator on behalf of ICSU members, and studying new communication technologies.

In pursuit of these goals, ICSU Press has built up in a very short time an impressive track record of publications issued on behalf of members of the ICSU family. It has successfully launched a new interdisciplinary monthly "BioEssays" for a group of unions linking the biological sciences, and another journal on Tropical Ecology is about to appear. Five volumes of symposia proceedings have been published from international conferences sponsored by the ICSU family, and nine more are in press.

ICSU is also pioneering a new approach to conference reporting - its Short Reports. These replace the traditional abstract volume and to an increasing extent the full conference proceedings, which are often long delayed in their publication. Short Reports allocate to each author one or two pages in the printed volume, or what amounts to an extended ("executive") summary accompanied by a few small illustrations and a compact list of references. Each author prepares his/her own short report in camera-ready form to be submitted a month or two prior to the conference, much as abstracts are now generally prepared.

A major objective of the Short Report series, of which 3 volumes have now been issued, is to provide a record of the poster sessions, but papers read in regular technical sections

and key note talks may also be included. The volume is printed prior to the meeting in paperback form for registrants and at the same time in hardbound form for library and other later sales, thereby saving the costs of two print runs. These Short Reports are proving to be a welcome change, for conference speakers are assured of a readership for their summaries and are relieved from the often unwanted obligation to produce a full version of their paper for an eventual and unpopular conference proceedings. Indeed, some publishers have already decided not to invest in abstract volumes and conference proceedings any longer, so low is their popularity and so diminishing their market.

ICSU Press has also commissioned a series of semi-popular volumes on topics such as biotechnology, Antarctica and the environment. Although most of the titles published so far have been in the biological sciences, ICSU Press is now looking to other fields, including the earth sciences.

Most of ICSU Press publications are joint ventures with established academic or non-profit publishing houses, and many have been co-published with Cambridge University Press under both ICSU and CUP imprints. Distribution is normally handled by the co-publishers who pay royalties to ICSU Press, which distributes these between ICSU and the original member union from which the work originated.

One aim of ICSU Press is to "assist in the publication problems of developing countries." A practical, if modest, step in this direction is now being taken through the distribution of several hundred complimentary copies of *Global Change* to scientific institutions in Africa, Asia and Latin America. Funds for this have come from the Executive Committee of ICSU, and it is hoped that a similar distribution of future ICSU Press publications may be possible. In principle it should be possible to reduce the unit cost of these books by increasing the print run, using paper binding, and using a portion of the royalties to subsidize postage and handling costs.

Because ICSU Press draws on the experiences and expertise of member unions, it is in a unique position to negotiate with other publishers to secure the best terms for ICSU family publications. Many of these are now seeking advice from ICSU Press on contract negotiations, and to support this activity the Press is developing a series of guidelines to scientific publishing. Those on negotiating contracts for new journals and for "do-it-yourself" book publishing are now available. ICSU Press issues its own newsletter from time to time. This and further information may be obtained from the Chairman of the ICSU Press Board of Management, W.J. Whelan, Department of Biochemistry, Box 016129, Miami, Florida 33101, U.S.A.

Geotechnical Control in Hong Kong

With 5.3 million people crowded into an area of 1,067 km², two-thirds of which is too steep to be used for development, Hong Kong faces the continual threat of slope failure. Landslides are frequently triggered by seasonal downpours, which commonly reach 250 mm of rain in a 24-hour period; in June 1966, 157 mm of rain was recorded in one hour! When slopes fail in crowded residential areas, casualties can be high and damage extensive.

It was following hundreds of landslides that claimed 57 lives on August 25, 1976, that the government of Hong Kong established the Geotechnical Control Office (GCO) to monitor and rectify unsafe slopes and to control the design of new ones. The GCO now comprises an international team of 134 civil engineers, geologists, surveyors and other professionals from 15 countries, who are backed by a local staff of some 200 and headed by Dr. E.W. Brand. Since its inception in 1977, the GCO has spent U.S.\$70,000,000 on its slope stabilization program.

Figure 1: GCO staff members take measurements on one of the 10,000 slopes in the Territory listed as potentially hazardous.

Figure 2: A concrete retaining wall under construction to stabilize a slope near one of Hong Kong's high-rise housing developments.

The GCO has now catalogued in a computerized system more than 10,000 slopes and structures, assigning them priority levels. It uses a sophisticated array of 46 automatic rain gauges that telemeter data to a central computer system. GCO staff deal on a daily basis with a wide variety of geotechnical problems, ranging from major construction projects on hillsides to deep excavations on reclaimed land. During storms GCO operates an emergency service to provide advice on potentially dangerous situations.

Slopes still fail, of course, but casualties and damage due to major disasters appear to have decreased, and the GCO continues to improve its slope safety measures. Plans are now being made to hold a Landplan III Symposium on Geology and Urban Development in East and Southeast Asia, and the work of the GCO will certainly be featured at this important meeting to be held in Hong Kong in December 1986.

The Lusaka Program of Action for African Mining

Mining worldwide has fallen on hard times. Nowhere is this clearer than in Africa, where only the production of noble metals and precious and semi-precious stones is relatively healthy. Over the last two decades, exploration and mine development activities have shifted from Africa to other regions. From 1972 to 1982 the number of new mine projects in Sub-saharan Africa dropped from 27 to 11, while in North and Central America in the same period they rose from 80 to 114 and in South America from 21 to 51. Despite Africa's established reserves of high-grade bauxite, iron, copper, cobalt and gold, low productivity, high costs and low recovery levels have led to a concentration on higher grade deposits in

Africa than elsewhere in the world. The African mineral industry is characterized by poor performance related largely to problems of supply and maintenance, many of these difficulties being related directly to poor road, rail and river transport systems and to congested ports.

From an African perspective one bright spot is that appreciable steps have been taken to increase African activities in all stages of the mining system. In 1983, for example, 33% of its total mineral export value (\$6.8 million) was marketed by African national corporations established in recent years. However, efforts to increase intra-Africa mineral trade and

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to use mineral production to develop the local industrial sectors have not met with much success, no doubt because of the dire straits of African infrastructure. Another disappointment has been the progress of national and regional programs to provide the technical, scientific and financial inputs necessary for growth of a healthy mining industry. The supply of well-trained professional staff (geologists, mining engineers and management professionals) has increased markedly in the last 10-20 years, but at the technician level greater efforts are urgently needed.

Against this background presented to the Secondary Regional Conference on the Development and Utilization of Mineral Resources in Africa (Lusaka, Zambia, March 12-13, 1985), it is not surprising that interest is swinging to the medium and small-scale sector, especially in rural areas where mineral development could have a maximum impact on the provision of basic human needs. Another new direction recommended in the "Lusaka Program of Action," which emerged from the Conference, concerns the production and use of local deposits of phosphate, sulphur, potash and natural gas to substitute for more expensive conventional fertilizers, mostly imported. Recent experiments in several parts of Africa have met with considerable success in increasing agricultural yields using local fertilizers.

The Economic Commission for Africa (ECA), which organized the Conference, was "deeply disappointed" with the position of the Eastern and Southern African Mineral Resource Development Centre, a regional institution established to provide advisory and training services to member countries. Nevertheless, the ECA and the Organization of African Unity are proceeding with the establishment of a second regional

centre, the Central African Mineral Resource Development Centre (CAMRDC) based in Brazzaville, Congo. CAMRDC has as its members Burundi, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, and Zaire, with only two countries in its region (Rwanda and Sao Tome and Principe) not yet members.

Other regional programs in mineral development are also being established by the Southern African Development Co-ordination Conference (SADCC), with funds from the Commonwealth Fund for Technical Cooperation (for studies on processing and machinery facilities as well as the production of chemicals and explosives) and from the European Economic Community (for studies on small mining, mineral and geological inventories, as well as manpower). A proposal to set up an African council for mineral resource development was turned down in favour of improving the performance of existing regional organizations.

The Lusaka program urges the continuation of national resource assessment programs, orienting African mining to meet the basic needs of its people (for example, measures to promote greater local manufacturing and consumption of mineral products), and more cooperation and consultation between African suppliers and consumers. Capital projects such as re-processing of tailings and mine dumps should be promoted. Investment incentives are needed to restore confidence in African mining and to attract new investors, especially smaller (village cooperatives, private companies and individuals) and larger operators who strive to reduce costs and improve performance. The Lusaka Program also recommends that consideration be given to establishing a special mechanism for financing mineral programs in Africa.

ILP Reorganizes

Some fundamental changes in the organization of the International Lithosphere Program were made during the August 1984 meetings, in Moscow, of the Inter-Union Commission on the Lithosphere (ICL) and its Bureau. These changes, which have now taken effect, are aimed at achieving better integration of the Program, and reducing the number of independent Working Groups and Coordinating Committees that draw upon the meagre financial resources available.

A new Working Group (WG 2) on "The Nature and Evolution of the Continental Lithosphere" has been established by the amalgamation of old WG 2 (Phanerozoic Plate Motions and Orogenesis), WG 3 (Proterozoic Lithospheric Evolution), WG 4 (The Archean Lithosphere), WG 8 (Subduction, Collision, and Accretion) and Coordinating Committee 4 (Evolution of Magmatic and Metamorphic Processes). This new WG 2 will concentrate on studying the record of important phenomena and processes through the whole of geological time rather than on specific intervals. In recognition of the scope and magnitude of its mandate, it was decided that this new Working Group should consist of 27 members, rather than the normal complement of 15, and that it should be organized into separate task groups listed below. Each Task Group comprises eight members, including a Chairman and a Vice-Chairman appointed by the Bureau, who also appoint a Chairman, Vice-Chairman, and a Secretary, responsible for the overall coordination and integration of the activities of the whole Working Group.

A new Working Group (WG 6) on "The Structure, Physical Properties, Composition and Dynamics of the Lithosphere-Asthenosphere System" has been set up by joining WG 9 (Processes and Properties in the Earth that Govern Lithospheric Evolution) and Coordinating Committee 5 (Structure and Composition of the Lithosphere and Asthenosphere). The scope of its activities will be global, encompassing oceanic and continental areas as well as the lithosphere and asthenosphere. This new Working Group also has a larger than normal membership (25), and three Vice-Chairmen, as listed below. The other ICL working Groups and Co-ordinating Committees continue to operate within their previously established terms of reference and organizational structure.

R.A. Price (Canada) has now retired as ICL President and is succeeded by K. Fuchs (F.R.G.). E.A. Flinn (U.S.A.) remains as ICL Secretary-General but will transfer his duties in 1986 to H.J. Zwart (The Netherlands). The new structure of the Program and the proposed leaders of Working Groups and Coordinating Committees are as follows:

WG1 - Recent Plate Movements and Deformation
Chairman: K. Nakamura (Japan)
Vice-Chairman: E.A. Flinn (U.S.A.)

WG2 - The Nature and Evolution of the Continental Lithosphere

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Chairman: A.L. Yanshin (U.S.S.R.)
 Vice-Chairman: R. Rutland (Australia)
 Secretary: A. Beus (U.S.S.R.)

Physical Properties:
 Vice-Chairman: F. Stacey (Australia)

A) Variations in the Nature and Evolution of Mobile Belts

Chairman: P. Hoffman (Canada)
 Vice-Chairman: P. Tapponnier (France)

B) Plate Motions and Orogeny Through Time

Chairman: C. Scotese (U.S.A.)
 Vice-Chairman: L. Zonenshain (U.S.S.R.)

C) Thermal, Mechanical and Chemical Evolution of the Continental Lithosphere

Chairman: N. Arndt (F.R.G.)
 Vice-Chairman: G. Schubert (U.S.A.)

WG3 - Intraplate Phenomena

Chairman: P. Ziegler (Netherlands)
 Vice-Chairman: N. Logatchev (U.S.S.R.)

WG4 - Nature and Evolution of the Oceanic Lithosphere

Chairman: T.W.C. Hilde (U.S.A.)
 Vice-Chairman: S.M. Zverev (U.S.S.R.)

WG5 - Paleoenvironmental Evolution of the Oceans and the Atmosphere

Chairman: J. Thiede (F.R.G.)
 Vice-Chairman:

WG6 - Structure, Physical Properties, Composition and Dynamics of the Lithosphere-Asthenosphere System

Chairman: J. Oliver (U.S.A.)
 Dynamics:
 Vice-Chairman: R. Peltier (Canada)
 Composition:
 Vice-Chairman: N. Sobolev (U.S.S.R.)

Coordinating Committees

CC1 - Environmental Geology and Geophysics
 Chairman: M. Arnould (France)
 Vice-Chairman: I. Gubin (U.S.S.R.)

CC2 - Mineral and Energy Resources
 Chairman: R. Hutchinson (U.S.A.)
 Vice-Chairman: L. Montadert (France)

CC3 - Geosciences within Developing Countries
 Chairman: H. Gupta (India)
 Vice-Chairman:

CC4 - Continental Drilling
 Chairman: F. Stehli (U.S.A.)
 Vice-Chairman: Y. Kuznetsov (U.S.S.R.)
 Secretary: R. Andrews (U.S.A.)

CC5 - Data Centres and Data Exchange
 Chairman: A. Gvishiani (U.S.S.R.)
 Vice-Chairman: O. Dottin (France)

CC6 - National Representatives
 Chairman: A. Boriani (Italy)
 Vice-Chairman: K.S. Valdiya (India)
 Secretary: R. Carimati (Italy)

Sub-Committee 1- Himalayan Region

Chairman: H. Gupta (India)
 Vice-Chairman: Ma Xing-Yuan (China)

Sub-Committee 2- Arctic Region

Chairman: G.L. Johnson (U.S.A.)
 Vice-Chairman: C.E. Keen (Canada)

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