THE PRECAMBRIAN BASEMENT OF SRI LANKA: ANCIENT SEGMENT OF THE DEEP CONTINENTAL CRUST

German—Sri Lankan Consortium

We report on first results of a joint West German-Sri Lankan research project to elucidate the evolution of deep crustal Proterozoic gneisses and adjacent granitoids in the basement of Sri Lanka. The Highland and Southwest Group supracrustal assemblages are the oldest rocks of the Island and consist predominantly of clastic metasediments that are derived from a 2.0-3.2 Ga old continental source terrain and are interlayered with carbonate beds and subordinate basaltic to rhyolitic metavolcanic rocks (now mafic and felsic granulite, enderbite and charnockite). The mafic rocks may be derived from Fe-Ti basalts, and the entire metavolcanic suite suggests a tholeiitic differentation trend. These rocks as well as voluminous syntectonic granitoid intrusives were multiply deformed and now largely occur in upper ampnibolite to granulite grade.

An early phase of granulite metamorphism is recognized in gt-cpx-opx-plag-qtz-hbl assemblages that record P-T conditions of 760-930° C and 7-8.5 kb. Severe Pb-loss in zircons of these and lower grade metasediments suggest an age of 1100 Ma for this event that has otherwise not led to significant depletion in incompatible elements such as reported for other ancient granulite terrains of the world. O- and C-isotopic data show distinct groupings that correlate with the primary geochemistry of individual rock types and thus argue against large-scale isotopic homogenization during high-grade metamorphism through a fluid phase

The oldest of the pre- to syntectonic granitic intrusives so far dated has a minimum 207 Pb/206Pb age of 1830±8 Ma and may set a younger limit for the age of sedimentation that is in line with published data for detrital zircons from the Highland Group. The deformation history of the supracrustal and igneous rocks is characterized by at least 2 phases of tight isoclinal folding and significant thrusting that is preserved in several large ductile shear-zones with characteristic stretching lineations. These structures are post- 1830 Ma but seem to predate the first high-grade event at 1100 Ma. However, isoclinal folds and subsequent broad, open folding as observed in the "arena" terrain near Kandy are also developed in 768±100 Ma old granitoid gneisses so that large-scale structural correlations of individual deformation phases remain uncertain at present.

The second phase of granulite formation may be represented by retrograde growth of opx-plag symplectites along former gt-cpx grain contacts and at P-T of 630° C and 5.5 kb and may be coeval with the spectacular in-situ charnockitization phenomena in the Kurunegala region for which our data indicate an age of 746±25 Ma. Retrograde shear zones cut across all older structures and record massive fluid transport. associated with widespread post-tectonic granite intrusion 550 Ma ago.

The 1100 Ma old and predominantly granitoid Eastern Vijayan Complex appears to represent a distinct crustal entity of juvenile origin and calcalkaline are character. We do not understand the tectonic processes at present that brought the Highland/Southwest and Eastern Vijayan terrains together, but we recognize that the two entitis shared a common structural history after about 1100 Ma ago.The interpretation of the Highland/Vijayan contact as a thrust and the Kataragama and Buttala outliers asHighland rock klippes is not supported by all members of our Consortium but would be compatible with the available Nd isotopic data. The "western Vijayan" terrian is unlike the eastern Vijayan Complex and contains prograde as well as retrograde ortho- and paragneisses that are often indistinguishable from those in the Highland Group. There are no sharp contacts, and we suggest to separate the two entities on account of their distinct compositional dissimilarities and only apply the name "Vijayan" to the eastern domain.

We conclude from our preliminary data that the high-grade terrian of Sri Lanka is not a direct continuation of the Archaean granulite region of Kanataka, India, but has similarities with the late Proterozoic granulite belt of southern India and the Mozambique belt in Malagasy and Tanzania, Africa. The basement onto which the Highland and Southwest Group supracrustals were deposited remains unknown. The structural and metamorphic history was polyphase and recorded the passage of the rocks from the surface to crustal depths of some 20 km and back to the surface during the period 1830 Ma to 550 Ma ago. Identification of Vijayan-type terrains in other Gondwana fragments is required to evaluate the importance of the Vijayan Ma crust-forming episode in the evolution of the Gondwana supercontinent during the late Precambrian, and Sri Lanka may also play a key role in the understanding of crustal evolution within the Pan-African belt system of Eastern Gondwana.