N86-23104

TECTONICS OF SOME AMAZONIAN GREENSTONE BELTS; Allan K. Gibbs, Institute for the Study of the Continents, and Dept. Geol. Sci., Cornell University, Ithaca, New York, 14853

Greenstone belts exposed amid gneisses, granitoid rocks, and less abundant granulites along the northern and eastern margins of the Amazonian Craton yield Trans-Amazonican metamorphic ages of 2.0-2.1 Ga. (Regional geology: 1-13). Early Proterozoic belts in the northern region probably originated as ensimatic island arc complexes. The Archean Carajas belt in the southeeastern craton probably formed in an extensional basin on older continental basement. That basement contains older Archean belts with pillow basalts and komatiites. Belts of ultramafic rocks warrant investigation as possible ophiolites.

NORTHERN.BELTS - Volcanic rocks of the northern belts were erupted in the Early Proterozoic (2.3-2.1 Ga)(14-17). The contiguous belts of Guyana (18,19) and Venezuela (20,21) closely resemble those of Suriname (7-9,22) and French Guiana (1,4,16,23), though the two regions are separated by the Central Guiana Granulite Belt. Typical sections consist of a lower flow and pillowed low-K basalt-gabbro unit, overlain by interbedded mafic, intermediate, and felsic volcanics of both tholeiitic and calc-alkaline suites; overlain by and interstratified with volcaniclastic greywackes, pelites, and chemical sedimentary rocks. Basalts with pronounced iron-enrichment and others with high magnesium contents are both present, as are both tholeiitic and calc-alkaline andesites and felsic volcanics (18,19,22,24). Generally conformable tuffaceous and epiclastic conglomerates, greywackes, lithic arenites, and shales appear petrographically and geochemically to have been derived from the associated volcanic rocks, without significant contributions from continental sources (18,25). The relative abundances and types of volcanic and sedimentary rocks vary: felsic volcanics are irregularly distributed, and magnesian basalts and possible komatiites are particularly common in central French Guiana (22). Ultramafic, mafic, and anorthositic intrusive complexes may be genetically associated with some of the volcanic rocks (1,18,23). Some belts are overlain by quartz-rich epiclastic sedimentary rocks that were folded and metamorphosed with the belts but appear to be unconformable (1,13).

The northern belts have randomly-branching synclinal map patterns. Prominent metamorphic foliations generally correlate with the regional folds, with foliations locally crenulated or destroyed by younger shear deformation, which elongated (WNW-ESE) both the belts and associated granitoid rocks. Metamorphic grades range from amphibolite on the belts' peripheries to lower greenschist and zeolite in the interiors. Diverse local mineral assemblages indicate high, intermediate, and low-pressure metamorphic series. Anatectic, two-mica granites intrude metapelitic schists along the northern periphery.

No evidence has been reported of basement-cover relations between the northern belts and adjacent gneisses. Field observations and geochemical similarities suggest that the greenstones pass into the intervening gneisses by increase in metamorphic grade (14,15,17,26-28). The associated granulites also appear to represent Early Proterozoic, rather than Archean crust (16,27,29). Sm-Nd and Rb-Sr isotopic systematics indicate that little if any older continental crust was involved in this greenstone-belt volcanism.

The northern belts are thought to have been originally contiguous with the Birimmian belts of west Africa. Mature sedimentary rocks overlying the greenstone belts have much in common with the Tarkwaian of West Africa.

EASTERN BELTS - Belts of the east-central craton (30,31) have not been adequately dated. Most lithostratigraphic sections have not yet been resolved, in part due to intense deformation and common medium grade metamorphism. Prominent banded iron formations, ultramafic schists, and current-bedded, fuchsite-bearing quartz arenites and conglomerates are present: these lithologies are uncommon in the northern belts. Small enclaves of iron formations and chromite-bearing ultramafic rocks occur in south and central Suriname, and might correlate with the east-central belts.

Archean greenstone belts with pillow basalts and komatiites, and belts of serpentinite occur amid granitoid rocks and gneisses in the southeastern craton, apparently forming a basement to the Serra dos Carajas belt (32). The latter has a dominantly mafic bimodal volcanic suite, roughly 4-6 km thick and dated at 2.75 Ga, overlain by 100-300 m of iron formation, and a 1-2 km thick fine clastic and chemical sedimentary complex (33,34). The mafic rocks are unlike typical Archean basalts and basaltic andesites, but have chemical and isotopic evidence of contamination with older continental crust, like many basalts of modern contiental extensional settings.

ACKNOWLEDGMENTS - Research in the Amazonian Craton has been substantially supported by the Guyana Geological Survey, the U.S. National Science Foundation (under Grants No. EAR-7617026, 8207422, and 8410379), and Utah International, Ltd. Generous institutional cooperation of DOCEGEO, the United Nations Revolving Fund for Mineral Exploration, COGEMA; the BRGM, the Suriname Geology and Mining Service, and ICOMI are also gratefully acknowledged.

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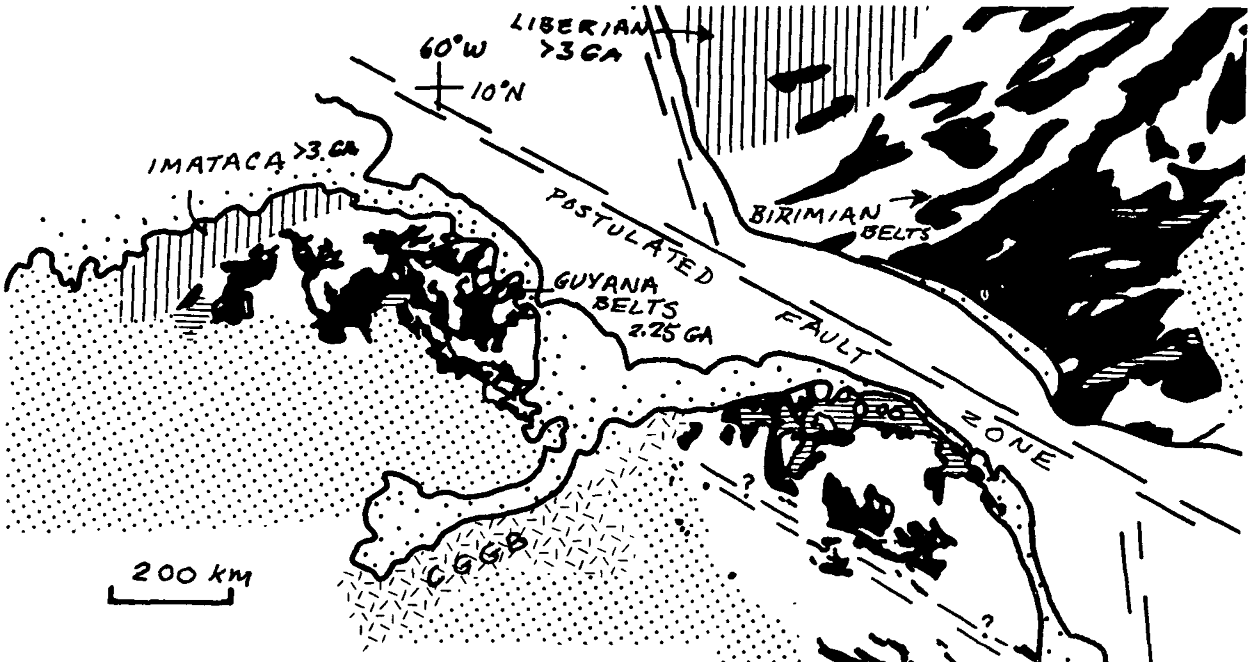
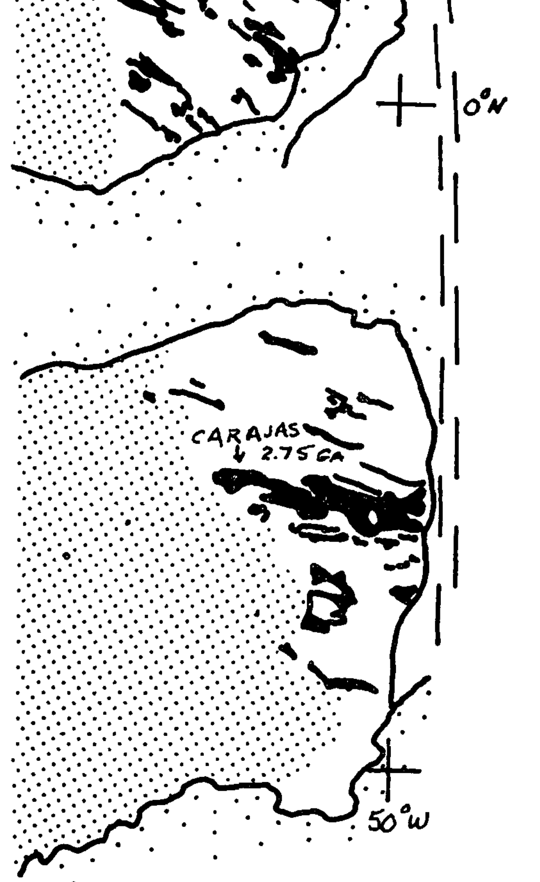
Institute for the Study of the Continents, Contribution No. 38



Portions of the Amazonian and west African cratons adjusted for postulated displacements along Pan-African and older fault zones.

- Archean Imataca and Liberian terranes
- Central Guiana Granulite Belt <2.5 Ga
- greenstone belts (sensu lato)
- quartz-rich metasedimentary rocks considered unconformable on the greenstone belts
- granitoid rocks and gneisses
- areas with abundant continental igneous and sedimentary cover <1.9 Ga



Postions of the cratons (13, based in part on 35) is compatable with paleomagnetic data (36), and juxtaposes geolgical features in the two cratons. A major geological province boundary must be present in the Amazonian craton between the Carajas belt and the northern belts (17,37,12): one possible position is shown.