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The area of this study within the Guri quadrangle and the southern part of the Tucupita quadrangle is located in Bolivar State, Venezuela (see index map) between long 63° W. and the Guyana border and lat 6° N. and the Río Orinoco. The map area is situated in the northeastern part of the Precambrian Guayana Shield of Venezuela and contains an important part of the iron resources and most of the gold deposits of the region (Locher, 1974; Rodriguez, 1986). The Archean and (or) Early Proterozoic Imataca

Fault—Dashed where concealed

..... Banded iron formation and quartzite

of the Imataca Complex

---- Contact

Complex contains Algoma-type iron deposits (Cannon, 1986) and associated manganese deposits. Gold may be present in veins and derivative placers in Early Proterozoic greenstone belts and eugeosynclinal metavolcanic and metasedimentary rocks. Placer deposits of diamond and gold are found in streams that drain areas underlain by the Early and Middle Proterozoic sandstones of the Roraima Group.

Method of Study

CORRELATION OF MAP UNITS

Orogenic episodes from Sidder and Mendoza (1991)

Xm2 Xf2 Xs2

Xg1 Xu1

MAZONIAN TECTONIC EVENT (about 2,800

to 2,700 Ma)

DESCRIPTION OF MAP UNITS

SEDIMENTARY, VOLCANIC, AND METAMORPHIC ROCKS

Sedimentary Supracrustal Rocks

Mesa Formation (Pleistocene and Pliocene)—Siltstone and

sandy siltstone, generally reddish color, massive to

Auyantepuy Formation-Mainly quartz arenite and minor

Guaiquinima Formation—Fine-grained quartz arenite and

and graywacke; red, green, and greenish-gray jasper

composed of devitrified and (or) silicified ash and small

crystals of quartz and feldspar. Weathers to form flat or

gently sloping topography. Upper part largely covered

with debris from overlying Auyantepuy Formation.

Several hundred meters thick. Equivalent to all but the

lowermost part of the Uaimapué Formation of Reid

conglomeratic arenite, conglomerate, siltstone, and shale.

intervals. Weathers to form cliffs of resistant arenite,

arkose, and conglomerate and forms slopes of relatively nonresistant siltstone, shale, and silty arenite. About

1,100 to 2,000 m thick (Yánez, 1985). Equivalent to

Uairén and Cuquenán Formations and lowermost part of

Pre-Roraima Group sedimentary rocks of Briceño M. (1982)

Maracapra Formation (Early Proterozoic)—Weakly

Los Caribes Formation (Early Proterozoic)—Weakly

metamorphosed sequence of reddish arkose, polymict

conglomerate, and finely laminated phyllite with minor felsic

metamorphosed red beds and felsic volcanic rocks

Eugeosynclinal Terrane

weather to ferruginous schist and phyllite

Xm2 Mafic to intermediate metalava and metatuff (Early

Greenstone Belt Rocks of the

Guasipati-El Callao Areas

Xcb Caballape Formation (Early Proterozoic)—Mainly felsic metatuff

Pastora Supergroup (Early Proterozoic)—Divided into:

and felsic metatuff and breccia

uppermost part. Minor chert

ferruginous schist and phyllite

amphibolite. Minor chert

Greenstone Belt Rocks of Other Areas

Amphibolite (Early Proterozoic)—Mainly highly deformed

Mica schist and phyllite (Early Proterozoic)—Quartz+

Felsic metatuff and flows (Early Proterozoic)—Ouartz+

Mafic to intermediate metalava and metatuff (Early

Imataca Complex (Early Proterozoic and (or)

Diabase (Mesozoic to Early Proterozoic)—Dark-gray to

Granitic rocks (Early Proterozoic)—Mostly granite, porphyritic,

medium- to coarse-grained; as mapped, also includes

and metapyroxenite, serpentinite, and talc schist. Cumulus

Supamo Complex (Early Proterozoic)—Sodic granodiorite and

Metagabbro (Early Proterozoic)—Saussuritized and, locally,

Ultramafic rocks (Early Proterozoic)—Mainly metaperidotite

Granitic rocks (Early Proterozoic and (or) Archean)—Granite

intrusive into gneiss and granulite of the Imataca Complex.

Contain plagioclase, microcline, quartz, biotite, and

amphibolitized metagabbro. Cumulus texture locally

trondhjemite, paragneiss, and migmatite commonly in dome-

shaped intrusions. Sparse pegmatite. Age is about 2230 to

greenish-gray, fine- to coarse-grained, tholeitic dikes, sills,

and laccoliths. Based on isotopic dating throughout the

Guayana Shield, the diabase consists of rocks about 1850 to

1650 Ma in age, as well as rocks about 210 Ma in age

Archean)—Granulite- to amphibolite-facies, commonly

garnet-bearing quartz-feldspar gneiss, felsic granulite, and

subordinate pyroxene granulite. Banded iron formation and

metamorphism is 2150 to 2000 Ma; age of the protolith is

quartzite shown by dotted lines on map. Age of

partially resorbed quartz and broken feldspar

Oldest Crystalline Terrane

3700 to 3400 Ma (Montgomery, 1979)

(Sidder and Mendoza, 1991)

Xg2 Metagabbro (Early Proterozoic)

texture locally preserved

INTRUSIVE ROCKS

Mafic and Ultramafic Rocks of

the Eugeosynclinal Terrane

Xu2 Ultramafic rocks (Early Proterozoic)—Mainly metaperidotite

Granite-Greenstone Terrane

2050 Ma (Sidder and Mendoza, 1991)

Mafic and Ultramafic Rocks of the

Greenstone Belts

and metapyroxenite, serpentinite, and talc schist

Oldest Crystalline Terrane

EXPLANATION

INTRODUCTION

hornblende schist containing plagioclase (An₁₇). Locally

shows outlines of original phenocrysts replaced by

muscovite±chlorite±ankerite schist and phyllite and

subordinate quartzite or metachert derived from sedimentary

and felsic volcanic rocks. Ankeritic rocks weather to

muscovite±chlorite semischist with relict phenocrysts of

Proterozoic)—Chlorite+albite+epidote±actinolite schist,

semischist, and greenstone, locally amygdaloidal.

Subordinate albite-epidote amphibolite and minor

relict lapilli locally abundant

Mica schist and phyllite (Early Proterozoic)—Quartz+

Felsic metatuff and flows (Early Proterozoic)—Quartz+

muscovite±chlorite±chloritoid±ankerite schist and phyllite,

and subordinate quartzite or metachert derived from

sedimentary and felsic volcanic rocks. Ankeritic rocks

muscovite±chloritoid semischist with relict phenocrysts of

partially resorbed quartz and broken plagioclase replaced by

albite. Groundmass mainly devitrified glass. Traces of

Proterozoic)—Chlorite+epidote±actinolite schist and

semischist, and greenstone, commonly with relict pyroxene

phenocrysts. Relict textures suggest protoliths were

and phyllite derived from laminated volcaniclastic siltstone

and graywacke. Metatuff contains plagioclase phenocrysts,

resorbed phenocrysts of quartz, wisps of pumice, and minor

Felsic metatuff—Quartz±muscovite±calcite semischist.

Mica schist and phyllite—Finely laminated

schist. Locally contains volcaniclastic metasandstone

Cicapra Formation—Mafic to intermediate metatuff.

Mainly albite+epidote±biotite amphibolite. Relict

textures suggest interlayering of tuff and volcaniclastic

El Callao Formation—Greenstone, greenschist, and minor

talc schist and amphibolite. Relict pillow structure is

common. Flows are commonly intercalated with flow

breccias. Fine-grained quartz-hematite rocks in

of lapilli and breccia clasts. Minor greenstone

Contains relict quartz and feldspar phenocrysts and traces

amygdaloidal flows and lithic- and crystal-rich tuffs

(Early Proterozoic)—Fine- to very fine grained, clay-rich

sandstone, locally containing granule-size quartz grains,

interbedded with red shale and sandy shale. Probably lie

Uaimapué Formation of Reid (1974)

unconformably below Roraima Group

Abundant crossbedded strata in arenite and arkose

Canaima Formation—Quartz arenite and arkose,

laminated. Unconsolidated gravel and sand in upper part

Roraima Group (Middle and Early Proterozoic)—Divided into:

arkose. Forms steep cliffs and flat-topped mesas

Qal Alluvial deposits (Quaternary)—Sand, gravel, and silt

- QUATERNARY

MESOZOIC, > PALEOZOIC AND

LATE PROTEROZOIO

Pleistocene QUATERNARY and Pliocene SAND TERTIARY

> This 1:500,000-scale compilation is part of a cooperative study by the U.S. Geological Survey (USGS) and the Corporación Venezolana de Guayana (CVG). Data from reconnaissance geologic mapping aided by interpretation of side-looking radar produced by the Inventory Group of the Companía Técnica Minera (TECMIN) of CVG is presented with results of detailed studies by the Prospecting Group of TECMIN for 15 separate areas in the quadrangle. The map was compiled during a 6-week period in 1991 in which USGS staff interviewed TECMIN geologists, studied their maps, and examined rock samples petrographically and in hand specimen. The USGS team visited roadcut exposures of the Imataca Complex and outcrops in the Guasipati-El Callao-Tumeremo-Bochinche areas, and the Gran Sabana, as well as mining operations in the El Callao and Kilometro 88

Beginning in the 1930's, many geologists have contributed to the present geologic understanding of this complex region. As shown on the index to sources of geologic mapping (fig. 1), our compilation depends mainly on maps of the Imataca Complex by Kalliokoski (1965), stratigraphy of the greenstone belt in the El Callao-Guasipati area by Menéndez (1972), extension of this work to the southeast by Benaim (1974), geologic mapping in contiguous parts of Guyana by Gibbs (1980), and maps showing the subdivision of the Roraima Group by Yánez (1984). Other maps used for this compilation are indicated in figure 1. Where more recent geologic data are unavailable, the compilation relied heavily on unpublished 1:500,000-scale geologic maps that were based on radar image interpretation by the Inventory Group. A review of the geochronology and tectonic development of the Guayana Shield of Venezuela by Sidder and Mendoza (1991) helped to place our compilation in its regional context.

GEOLOGIC SYNOPSIS

The southern part of the Tucupita quadrangle and the northwestern

Oldest Crystalline Terrane

Early Proterozoic granulite-facies metamorphic rocks of the Imataca Complex (XAi), originally named by Newhouse and Zuloaga (1929), that include quartz-feldspar gneiss, pyroxene granulite, quartzite, and banded iron formation (Chase, 1965; Kalliokoski, 1965; De Ratmiroff, 1965; Dougan, 1977, Martín F., 1979). In the Upata area, De Ratmiroff (1965) estimated 80 percent of the section to be felsic granulite composed of quartz, plagioclase (An₃₀), minor microcline (locally exceeding plagioclase in abundance), and rare pyroxene and biotite; 15 percent of the section to be mafic gneiss containing equal proportions of plagioclase (more calcic than An₄₀) and pyroxene+amphibole; and 5 percent of the section to be iron formation. Kalliokoski (1965) noted a close association between the mafic gneiss and iron formation. The iron formation is composed of thin-layered magnetite interbedded with quartzite and ferruginous quartzite. Variable amounts of manganese are commonly associated with the iron formation. A layered sequence of dolomite marble (locally containing forsterite and tremolite), ferruginous quartzite, and manganiferous schist, not shown on the geologic map, is located in a northeast-trending band of outcrops northeast of Upata (the Guacuripia Formation of Morrison, 1953; Drovenik and others, 1967). The age of the Imataca protolith, according to Montgomery (1979), is 3700 to 3400 Ma, and its age of metamorphism, according to Onstott and others (1989), is 2150 to 2000 Ma. In this report, we consider the Imataca to be Archean and (or) Early Proterozoic in age. that contain plagioclase and microcline in equal amounts, quartz, biotite, and hornblende. Quartz-feldspar pegmatite forms small bodies in these rocks. Geochronologic studies are lacking for these granites; we consider them to

be Archean and (or) Early Proterozoic in age. The Guri fault, one of the most prominent geologic features of the Guayana Shield, forms the southern boundary of the Imataca Complex, but local outliers mapped as Imataca are present south of this structure; these outliers generally consist of amphibolite-grade rocks. A fault that is inferred from gravity profiles (J.C. Wynn, unpub. data, 1991) forms part of the northern boundary of the Imataca Complex west of the map area.

Granite-Greenstone Terrane

To the south of the Imataca Complex is a broad area underlain by Early Proterozoic granitic plutons and greenstone belts of the Supamo Complex (Menéndez, 1968) and the Pastora Supergroup (Korol, 1965; Menendez, 1968). Dome-like batholiths composed of trondhjemite gneiss (Chase, 1965; Dougan, 1976) are commonly found in the Supamo Complex (Xsp). This biotite-quartz-oligoclase gneiss and subordinate hornblendequartz-andesine gneiss of this unit are weathered to form monotonous plains in which rock exposures are rare. Dougan (1976) mapped a small area of quartz-oligoclase gneiss near the town of Guri, just west of the map boundary. These rocks were included with the Supamo Complex in maps by Martín F. (1979) and by CVG-TECMIN, Inventory Group (unpub. map at scale 1:500,000 of the northeastern quarter of the Guri quadrangle, 1988). Dougan (1976), on the basis of analytical results for 37 samples, concluded that their composition is compatible with a derivation from partial melting of oceanic tholeiite, or alternatively, deep crustal melting of

The volcanic rocks of the Pastora Supergroup are regionally metamorphosed to greenschist facies and to the north, within 30 km of the Guri fault, to amphibolite facies. That these volcanic areas are greenstone belts is evidenced by their elongate form, greenschist-facies metamorphism, and flanking batholiths of the Supamo Complex. In the Guasipati-El Callao area, the Pastora Supergroup was subdivided (Menéndez, 1968, 1972) into the Carichapo Group that contains a lower pillow basalt (El Callao Formation, Xce) and an upper andesitic metatuff (Cicapra Formation, Xcc). Overlying the Cicapra is an extensive unit of mica schist and phyllite (Xys) and felsic metatuff (Xyf) that together make up the Yuruari Formation. Also in the El Callao area, rocks of the Pastora Supergroup are

metamorphosed felsic tuff that is less folded than the Pastora rocks (Menéndez, 1968). Samples of Caballape collected along the El Callao-Tumeremo road contain abundant relict phenocrysts of feldspar and embayed and rounded quartz. Its contacts with the Pastora Supergroup and granites of the Supamo Complex (Xsp) are obscured by deep weathering. But at one locality, 5.1 km west of the Supamo contact, the tuff is metamorphosed to a medium-grained quartz-muscovite sillimanite rock that contains irregular veinlets of muscovite. The random orientation of the mica and sillimanite indicates thermal metamorphism. A diabase dike crops out within 200 m of this locality, but we do not consider it to be large enough to have caused this mineral transformation. We infer that the Caballape Formation in this locality was metamorphosed by granites of the Supamo

found in other greenstone areas to the east, south, and southwest of El Callao, separated by wide areas underlain by the Supamo Complex. In these belts, topography is more subdued and jungle cover is more dense than that at El Callao. As a result, stratigraphic relations among rock types are difficult to determine. It is likely that cycles of mafic and felsic volcanism of several different ages have contributed to the various greenstone belts in the quadrangle as proposed by Gibbs (1980) in adjacent Guyana. In addition to these volcanic rocks, extensive intrusions of gabbro and peridotite make up most of a greenstone belt that extends south from the Guasipati-El Callao area. In our compilation, formation names are retained in the Guasipati-El Callao area, but in other belts, the rocks are divided lithologically (Xm1, mafic to intermediate metavolcanic rocks; Xf1, felsic metavolcanic rocks; Xs1, schist and phyllite; Xg1, gabbro; and Xu1, ultramafic rocks). A "1" in the map-unit symbol indicates that these rocks are older than the Supamo Complex

unpub. data, 1992).

Eugeosynclinal Terrane

the Río Botanamo. Subsequently, the Inventory Group and other TECMIN areas. For this reason, only lithologic terms are used for these rocks. Guri quadrangle.

Rocks of the eugeosynclinal terrane are intruded by gabbro (Xg2) and ultramafic rocks (Xu2) that are lithologically similar to the mafic and ultramafic intrusions of the greenstone belts, but because they may be younger, they are mapped separately. Samples of sheared gabbro and talcose serpentinite, as well as pyroxenite showing well-preserved cumulus texture, were observed in samples from the eugeosynclinal area.

and Eugeosynclinal Terranes

The greenstone belts and eugeosynclinal metavolcanic terrane

contain similar assemblages of metavolcanic rocks. Regional metamorphism precluded assignment of precise compositional names to metavolcanic" applies to rocks (Xm1 and Xm2), that were presumably derived from basalt and andesite in which chlorite and actinolite predominate. The term "felsic metavolcanic" applies to rocks that contain abundant muscovite and quartz (Xf1 and Xf2) and were presumably derived from dacite or rhyolite. Flows and pyroclastic rocks are lumped together. In our petrographic examination of over 100 rock samples, no rocks of clear sedimentary origin were seen. This was surprising in that both the Yuruari and Caballape Formations were originally described as consisting of epiclastic sedimentary rocks including siltstone and graywacke (Menéndez, 1972). Based on the common occurrence of subhedral feldspar and rounded, embayed quartz as relict phenocrysts in these rocks, our impression was that most rocks classed as metasedimentary phyllite and schist by earlier workers (and shown on the geologic map as units Xs1 and Xs2) were originally felsic volcanic rocks (see especially descriptions of

Previous Work

corner of the Guri quadrangle are underlain in part by Archean and (or)

apparently overlain by the Caballape Formation (Xcb), a weakly

Rocks lithologically similar to those of the Pastora Supergroup are

Amphibolite (Xa) of Early Proterozoic age is a strongly foliated hornblende-andesine schist that was derived from mafic volcanic rocks and is found in two settings. It is abundant within 30 km of the Guri fault and may have formed as a result of the same tectonic event that formed the fault. (Xm1) are in contact with the Supamo Complex (Xsp). The amphibolite weathers to form hills that are prominent in the radar images even in the southern areas of dense vegetation

Gabbro and peridotite (Xg1 and Xu1, respectively) of Early Proterozoic age intrude rocks of the greenstone belts. Some gabbro and peridotite are penetratively deformed and metamorphosed to greenschist facies, but in other places they are unaltered. In the Sierra Verdun, Floyd Gray (unpub. data, 1992) reports the presence of fresh, zoned calcic plagioclase in the unaltered interior parts of large gabbro and plagioclasebearing pyroxenite intrusions that have well-preserved cumulus textures. These rocks have narrow zones of shearing and greenschist-facies metamorphism along their faulted contacts suggesting intrusion during the waning stages of regional metamorphism. At the southern end of the Sierra Verdun, auriferous quartz veins were noted cutting the gabbro intrusions (J.C.Wynn, N.J Page, R.J. Contreras, R.J. Moring, and R.L. Oscarson,

In the east-central part of the Guri quadrangle, a broad area underlain by metavolcanic and metasedimentary rocks has features more similar to eugeosynclinal sequences of Phanerozoic orogenic belts than to greenstone belts. These rocks are referred to as the eugeosynclinal terrane and are shown by map units Xm2, Xf2, Xs2, Xg2, and Xu2. They differ from the greenstone belts in that their area of exposure is broad, rather than beltlike. Limited petrochemical data from the Anacoco (Day and others, 1989) indicate that these volcanic rocks belong to a calc-alkaline suite rather than to a bimodal assemblage such as that described by Gibbs (1980) for greenstone belt rocks in adjacent Guyana. Mafic to intermediate metavolcanic rocks of the eugeosynclinal terrane typically contain phenocrysts of pyroxene or actinolite that has replaced previously crystallized pyroxene. Such phenocrysts are not commonly observed in the greenstone belt rocks. Benaim (1972, 1974) expanded the use of the name "Caballape" to

include the mafic and felsic metavolcanic rocks and phyllites in the basin of

geologists applied this name to metavolcanic rocks underlying a large area south of Kilometro 88 and east to the Marwani fault. This lithologic correlation is difficult to support because of the distance from the type area and the differences in rock types between the type locality and the eastern The contact between the eugeosynclinal terrane and the Supamo Complex is rarely exposed. But the eugeosynclinal rocks are believed to be younger than the Supamo Complex because of the absence of amphibolitefacies metamorphism where granites of the Supamo are adjacent to mafic and intermediate metavolcanic rocks (Xm2). The contact is not marked by hills such as characterize areas underlain by amphibolite elsewhere. Unfortunately, the contact between the Supamo Complex and volcanic rocks of felsic composition (Xf2) is likely to show only minor metamorphic effects, easily obscured by weathering. In these places, evidence about the nature of the contact would be missing. Thus, age relations with the Supamo Complex are unclear for large areas, but for the purpose of our map, we assume that these rocks are younger than the Supamo Complex. Map units Xm2, Xf2, and Xs2 are uniformly metamorphosed to greenschist facies and are strongly folded, judging from the steeply dipping bedding and schistosity shown in maps by Benaim (1974) and the northeast-trending grain in the radar image. They are faulted against northwest-striking greenstone belt rocks along the Marwani fault in the east-central part of the

Petrographic Character of the Metavolcanic and Metasedimentary Rocks of the Greenstone-Granite

rocks of the Yuruari Formation near the Río Caroní by Espejo, 1974).

MISCELLANEOUS FIELD STUDIES

MAP MF-2242

Younger Granitic Rocks

A suite of granitic rocks (Xgr) intrudes both of the metavolcanic terranes as well as the Supamo Complex in many areas across the Guri quadrangle. The characteristic rugged radar image of these granites suggests randomly oriented joint sets. No isotopic ages are available, but the lack of metamorphism or penetrative deformation indicates that they are younger than the Transamazonian Orogeny. They have a wide range of compositions, characteristically more potassium rich than granites of the

Suprajacent Rocks In the east-central part of the Guri quadrangle, the greenstonegranite and eugeosynclinal terranes are overlain unconformably by the Los Caribes Formation (XIc) (Benaim, 1972), a weakly- to unmetamorphosed sequence of red arkose and polymict conglomerate intercalated with felsic tuff. Clasts in the conglomerate are composed predominantly of unmetamorphosed felsic volcanic rocks. Fragments of metavolcanic rocks typical of the underlying greenstone belts and eugeosynclinal terrane are

absent. South of the Río Caroní in Guyana, the Los Caribes Formation (XIc) is overlain by the Roraima Group (Gibbs, 1980). Red beds associated with felsic volcanic rocks referred to as the Maracapra Formation (Xma) by Martín F. (1979) are exposed in a small area on the western edge of the Guri quadrangle. They are similar in lithology to the Los Caribes Formation, isoclinally folded, but weakly metamorphosed. Formation, have been called the pre-Roraima Group sedimentary rocks (Xpr) by Briceño M. (1982). These unmetamorphosed Early Proterozoic rocks underlie the basal part of the Roraima Group (YXrc) along the Río Caroní near Canaima in the southwestern corner of the map area. They

Rocks, less deformed and presumably younger than the Los Caribes include fine- to very fine grained, clay-rich sandstone, locally containing granule-size quartz grains, interbedded with red shale and sandy shale (Briceño M., 1982). They are gently folded and are commonly cut by quartz veins. They weather to low-relief terrane broken by low cuestas (Briceño M., 1982; Ghosh, 1985). Outside the map area, these rocks are mildly discordant with the overlying beds of the Roraima Group. In the south-central part of the map area, in the headwaters of the

Río Chicanán, the Roraima Group is underlain by the Early Proterozoic Urico Formation of Alberdi and Contreras (1989). The Urico is composed of volcaniclastic and quartz-rich sandstone, shale, mudstone, and breccia; some of these strata are pyritic, indicating that their environment of deposition was chemically different from the more oxidized rocks typical of the pre-Roraima Group sedimentary rocks elsewhere. The area underlain by the Urico Formation is too small to be shown on the geologic map. The Roraima Group was divided regionally by Yánez (1985) into three formational units, the Canaima, Guaiquinima, and Auyantepuy Formations. Reid (1974) had earlier subdivided the group into four formations. However, the Yánez units were used to compile this geologic map because their areal distribution was presented in map form by Yánez

The Canaima Formation (YXrc) of Early and Middle Proterozoic age is composed of quartz arenite and arkose, conglomeratic arenite, conglomerate, siltstone, and shale. Abundant crossbedding is seen in the arenite and arkose intervals. It weathers to form cliffs of resistant arenite, arkose, and conglomerate and slopes underlain by relatively nonresistant siltstone, shale, and silty arenite. About 1,100 to 2,000 m thick, it is equivalent to the Uairén and Cuquenán Formations and to the lowermost part of the Uaimapué Formation of Reid (1974).

The Canaima Formation is overlain conformably by the Guaiquinima Formation (YXrg) of Early and Middle Proterozoic age. The Guaiquinima is composed of fine-grained quartz arenite and arkose (which is cross-stratified, laminated, and, in places, massive), siltstone and graywacke, and red, green, and greenish-gray jasper composed of evitrified and (or) silicified volcanic ash and small crystals of quartz and feldspar. These rocks weather to form flat or gently sloping topographic forms. The upper part of the formation is largely covered by debris from the overlying Auyantepuy Formation. The Guaiquinima is several hundred Formation of Reid (1974). The Auyantepuy Formation (YXra) is the youngest part of the Roraima Group. Composed mainly of quartz arenite and minor arkose, it forms 300- to 700-m-high steep cliffs and flat-topped mesas. It is equivalent to the Matauí Formation of Reid (1974). The Roraima Group and older units are intruded by mafic rocks variously described as diabase, gabbro, and norite. Limited geochronologic data indicate that these intrusions have a wide range in age from Proterozoic to Mesozoic (see Sidder and Mendoza, 1991). A K-Ar age of 200±7 Ma

Cenozoic Rocks and Sediments

Near Puerto Ordaz and westward, the Imataca Complex is overlain

was given by Teggin and others (1985) for the N. 70° E.-striking dike in the

by sedimentary rocks that correlate with the Pliocene and Pleistocene Mesa

Formation (Tm) of Hedberg and Pyre (1944). This unit is composed of

massive to laminated siltstone and sandy siltstone, generally reddish in

El Callao area.

color, and light-tan to gray clay beds. The unit grades upward into unconsolidated gravel and sand. Petrified wood is present. The formation may represent a remnant of extensive delta deposits of the Río Orinoco (Gonzales de Juana, 1946). Deposits of Quaternary sand, gravel, and silt cover wide areas near the lower Río Orinoco and are present locally along rivers and small streams throughout the shield. This unit includes terrace gravels with rounded peasize clasts at localities along the Río Caroní.

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