

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

FIELD EXCURSION FROM BELO HORIZONTE TO OURO PRETO--

SIDE EXCURSION ALONG THE ROAD TO MOEDA

MINAS GERAIS, BRAZIL

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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**FIGURE**

1. Geologic map of the field excursion area showing the locations of Stops 1-3. 2

## **INTRODUCTION**

This paper is one of several that are being prepared for publication as chapters in a U.S. Geological Survey Bulletin reporting on a workshop held in Belo Horizonte, Brazil, from December 1-10, 1986. The workshop was sponsored by the IUGS/UNESCO Deposit Modeling Program, which is designed to advance geoscientific knowledge and expertise in mineral deposit modeling for use in exploration, assessment, and development of resources. The topic of this workshop was "Gold in Precambrian greenstone belts and base metals associated with volcanogenic rocks." The host agency in Brazil was the Instituto Brasileiro de Mineração (IBRAM). Workshop leaders and coordinators were: Charles H. Thorman (U.S. Geological Survey), workshop coordinator and leader; Charles G. Cunningham (U.S. Geological Survey), IUGS/UNESCO coordinator and leader; Katherine Dorr Abreu (IBRAM), coordinator for all logistical functions and support for the workshop; Eduardo A. Ladeira (Universidade Federal de Minas Gerais), field trip coordinator and leader; Carl R. Anhaeusser (University of Witwatersrand), leader; Stanton W. Caddey (Homestake Mining Company), leader; and John A. Kerswill (Geological Survey of Canada), leader.

This side excursion is an appendage to the "Geological field excursion from Belo Horizonte to Ouro Preto..." by E.A. Ladeira (1988) and is to be used in conjunction with it. The zero kilometer mark for this side excursion begins at the junction of Highway BR-040 and the Rodovia dos Inconfidentes (kilometer 27 in the above-mentioned excursion). Figure 1 shows the location of the stops and the geology of the area for the side excursion (Wallace, 1965).

## **SCOPE OF THE EXCURSION**

The purpose of this side excursion is twofold--structural and stratigraphic. The geology to be seen is extremely critical to the overall geologic setting of the Quadrilátero Ferrífero. This locale was chosen because relationships are more clearly displayed here than at almost any other place in the region and the access is excellent.

### **Structural Setting**

One purpose of the excursion is to examine and discuss the nature of the contact between the metasedimentary Moeda Formation of the Minas Supergroup and the Moeda Complex, a granitic-gneissic unit. Briefly, the problem is whether the contact between the Moeda Formation, at the base of the section observed in this immediate area, and the underlying granitic rocks of the Moeda Complex is depositional or tectonic. The presence of mylonitic rocks along the contact and for more than 100 m down section into the complex plus the presence of this same relationship all along the western side of the Quadrilátero Ferrífero strongly suggests that the contact is faulted.

### **Stratigraphic Setting**

The second purpose of the excursion is to gain an insight into the stratigraphy of the Caraça and Itabira Groups and to examine the type section of the Moeda Formation, which is made up of three members (Wallace, 1965):

1. The lowermost member, Moeda 1, starts at the base with local metaconglomerates and coarse quartzites, with clasts of bluish quartz grains, and grades upward to light-gray to light-reddish-brown, medium to fine cross-bedded and parallel-bedded quartzites.

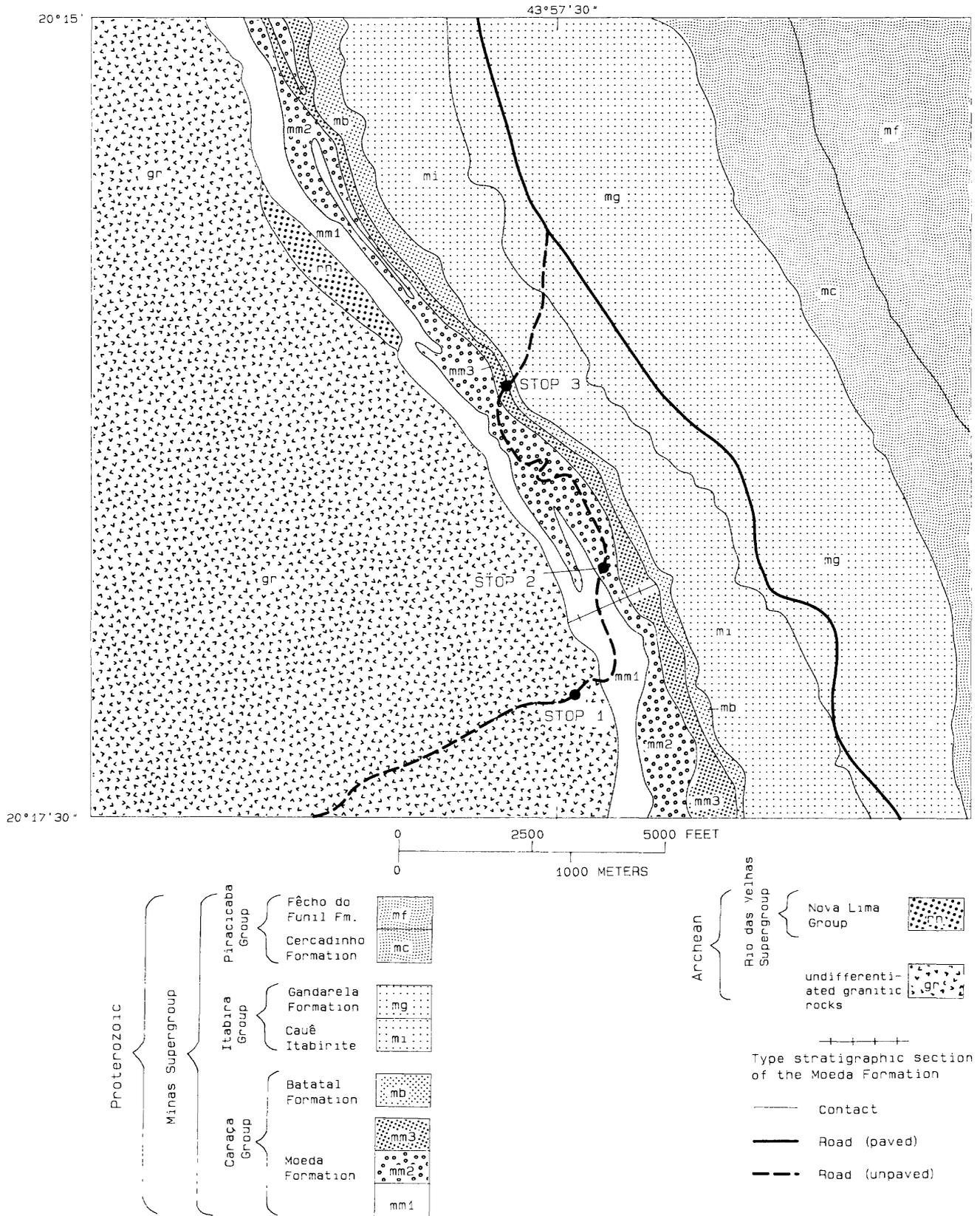


Figure 1. Geologic map (from Wallace, 1965) of the field excursion area showing the locations of stops 1-3.

2. The middle member, Moeda 2, is constituted mainly of varicolored sandy phyllites that grade upward to thin intercalations of fine-grained quartzites.
3. The upper member, Moeda 3, consists of light-gray to light-reddish-brown medium to very coarse grained cross-bedded quartzites.

#### ROADLOG

As noted above, the zero kilometer mark for this side excursion begins at the junction of Highway BR-040 and the Rodovia dos Inconfidentes.

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- |   |      |   |
|---|------|---|
| 0 | 0    | BR-040 and Inconfidentes Highway junction. Continue south on BR-040, under the highway overpass.  |
| - | 1.8  | To the right, gravel road to Piedade do Paraopeba. Continue along BR-040.   |
| - | 4.9  | To the right, road to Retiro do Chalé. From here, if the weather is not cloudy, one can see Itabirito Peak at 40 to 50 degrees to the left on the overturned limb of the Moeda synform; to the right, one can see the normal limb, which will be crossed in a few minutes. At about zero degrees (straight ahead), one can observe the narrowing of the synform.  |
| - | 11.3 | Highway Police and Truck Weighing Station.  |
| - | 12.5 | Drive to right on the gravel road which leads to the town of Moeda. For practical reasons, drive directly to the base of the Minas Supergroup, down the foothills of the Moeda Plateau, because most of the route is winding and steep. Begin Stop 1 at the base of the foothills.  |
| - | 16.1 | <b>STOP 1</b><br>Leave the vehicle, and walk about 100 m eastwards. Exposure of the granitic rocks of the Moeda Complex. Many types of granitic rocks can be seen here in the foothills. At this stop our objective is to examine a series of easterly-dipping shear zones in the granitic rocks and the relationship of the zones to the overlying metasedimentary sequence. Along the shear zones, some of the granitic rocks have been transformed, through cataclasis and accompanying recrystallization, into tremolite-actinolite-tourmaline schist. Up the hill towards the northeast (upwards structurally and stratigraphically, also), the sheared rock changes somewhat abruptly into a mylonitic augen gneiss; at least one of its foliations trends N. 60° E to N. 80° E., discordant to the contact of the overlying quartzitic sequence. The cataclasites, mylonites, and phyllonites here have bluish quartz crystals, 0.3 mm to 10 mm in size, which led Ferrari (in Loczy and Ladeira, 1976) to consider them as quartz of volcanic origin. Cataclastic |

foliation is N. 10° E., 80° SE. S<sub>0</sub>/S<sub>1</sub> of overlying quartzite is N. 10° W. to N. 15° W., 55° NE. S fracture cleavage is N. 30° E., 70° SE. The quartzite sequence begins with a fragmental rock whose fragments are made up of the same bluish quartz, but here, grains are rounded and angular in a sericitic quartzose matrix; this rock was termed "metaconglomerate" by Wallace (1965). This "metaconglomerate" changes to medium- to fine-grained quartzites and, farther up section, grades into cross-bedded quartzites. Both the foliation-bedding relation and the cross-bedding indicate a normal, rightside-up sequence. Walk down the hill to a small waterfall on the granitic-gneissic complex. Note that the complex has several small shear zones in which it is transformed either to a mylonitic augen gneiss, cataclasite or, in some instances, a phyllonite. These zones are a few centimeters to a few meters thick. Older foliation in the augen gneiss is N. 60° E., 65° SE. Lineation crenulation is S. 60° E., 55°. Return to vehicle and drive back up section.

- 17.8 **STOP 2**  
Outcrop of Moeda 2. This member is made up of fine-grained schists and phyllites; facies changes are normal to bedding. It is mostly a quartz-mica schist with subordinate intercalation of rhythmic phyllites that weather green. Here and there are thin intercalations (10-50 cm) of sericite quartzites, which locally have very micaceous laminae. Continue up section.
  
- 18.8 **STOP 3**  
Contact between the Moeda 3 (medium to very coarse grained quartzites) and the overlying, locally graphitic phyllites of the Batatal Formation (about 20 m thick). The Batatal is conformably overlain by itabirites of the Cauê Formation. Return to the BR-040-Inconfidentes junction where the excursion will continue on a traverse through the Moeda synform.

#### REFERENCES CITED

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