Interrelationship of the terranes in western and central Cuba — Comment

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K. Piotrowska's paper (Piotrowska, 1993) addresses some of the fundamental problems of Cuban and western Caribbean geology. These include the definition, original position and later displacement of suspect terranes in the area. Problems that have been controversial for many years.

The model presented by K. Piotrowska (her Fig. 4) is extremely simple. In her model, tectonic terranes such as Los Organos and Escambray originally formed part of the Yucatan borderland, from which they were detached and transported northward. During the Cretaceous, the Farallon plate pushed the Escambray Terrane until it reached its present position. Finally, the Escambray Terrane was overthrust and pressed into the Zaza zone (ophiolites and Cretaceous volcanic arc suites). Later, during the Middle Eocene, the Los Organos Terrane detached from the Yucatan and overthrust the Farallon plate (Zaza zone in this case).

In order to support this scenario, Piotrowska (1993) relies on opinions rather than observations. As a consequence, her model contradicts several geological and geophysical observations:

1. In her definition of terranes in western and central Cuba, Piotrowska (1993), without any explanation, ignores the Pinos Terrane (Fig. 11, although it is mapped as 'metamorphic rocks' (her Fig. 2). This is a very common mistake in papers discussing the tectonics of the western Caribbean. However, it is a fact that the Pinos Terrane is composed of Mesozoic metasedimentary rocks that strongly resemble the equivalent Jurassic sequences in Guaniguanico and Escambray (Fig. 1) (Somin and Millán, 1981; Iturralde-Vinent, 1988, 1994; Millán, 1992a,b). To the northwest, in the Isle of Youth (Pines terrane), a typical Mesozoic island arc section outcrops, which is also ignored by Piotrowska (Sabana Grande area in Fig. 1). This terrane has to be considered in any western Caribbean tectonic model.

2. Piotrowska defines 'Sierra de los Organos' as an independent terrane, following the interpretation of Pushcharovski et al. (1989), which contradicts geological and geophysical observations. Within the Guaniguanico mountain range, several stratigraphic sequences have been recognized: Los Organos, Southern Rosario, Northern Rosario, Quínones and Felicidades (Pszczolkow-
Fig. 1. Geological interpretation of western and central Cuba.
ski, 1978, 1987; Iturralde-Vinent, 1988, 1989, 1994). It is true that the Northern Rosario sequence is somewhat similar to the age-equivalent sections along the southernmost slope of the Bahamas platform (the Placetas sequence). However, it is also true that the Northern Rosario, Southern Rosario and Los Organos sequences have strong similarities in lithological composition, facies development and geological evolution because they belong to a unique paleogeographic realm (Pszczolkowski, 1978, 1987). Therefore, there is no justification for separating Los Organos-Southern Rosario and Northern Rosario into two distinct terranes without a full discussion of the subject. Pszczolkowski (1978) considered Guaniguanico as a single tectonic unit and Iturralde-Vinent (1994) named this unit the Guaniguanico Terrane.

(3) Interpretation of the tectonic position of the 'Sierra de los Organos Terrane' (Piotrowska's fig. 3a,b) is also questionable. In her cross-section, the Sierra de los Organos units tectonically rest on top of the Bahia Honda-Cajalbana units (Cretaceous volcanics and ophiolites), while both units overlay the 'Florida-Bahamas platform margin sequences' (or Northern Rosario sequences sensu Piotrowska, 1993). This interpretation contradicts the following data:

(a) As was discussed above, the Northern Rosario, Southern Rosario and Los Organos Mesozoic sequences are stratigraphically similar and spatially related, because they were deposited in the same basin. During the lower to middle Eocene orogenic phase they were deformed as a single unit (Pszczolkowski, 1978; Iturralde-Vinent, 1994). Therefore, they cannot be treated as unrelated tectonic units and independent terranes.

(b) Geophysical investigations (gravity, magnetic and onshore and offshore seismics) (Shein et al., 1985; Bush and Sherbacova, 1986) and evidence from deep wells (Segura Soto et al., 1985) clearly demonstrate that the Bahia Honda-Cajalbana volcanics and ophiolites are rootless. They rest as a tectonic allochthonous sheet on top of the Guaniguanico Terrane (Pszczolkowski and Albear, 1982), a fact originally discovered by Hatten (1957).

(c) South of the Pinar Fault, in the San Diego de los Baños area, K. Piotrowska (her Fig. 3a,b) indicates Cretaceous volcanics and ophiolites filling the basin. However, surface mapping and several deep wells in this area found only sedimentary rocks of Albian to Holocene age (García Sanchez, 1978). The Cretaceous section in the basin is similar to that of the Guaniguanico terrane. Only the deep well Guanal 1A, drilled on the Guanal II High (Fig. 1), recovered serpentinites and some mafic rocks under 1000 m of Miocene limestones. Due to the poor core quality, it is difficult to establish the real characteristics of the rock section. One possibility is that the serpentinites and mafic rocks are clastic material in a conglomerate. Alternatively, they may be blocks of ophiolites and mafic rocks similar to those found along thrust faults in the Guaniguanico Terrane. The third possibility is that these rocks are ophiolites and volcanic arc section similar to those found along thrust faults in the Guaniguanico Terrane. None of these data and interpretations can be reconciled with the cross-sections presented by Piotrowska (Figs. 2 and 3).

(d) The general structure of the Guaniguanico Terrane, taking into account known data, is illustrated in Fig. 1. This interpretation is further discussed by Iturralde-Vinent (1994). The structural style can be described as a succession of northwestward-thrust tectonic nappes. In this framework the structurally highest unit is the Bahia Honda allochthon and the Los Organos unit is the lowest (Hatten, 1957). The autochthonous section in this area is probably a Gulf of Mexico type passive margin sequence (Iturralde-Vinent, 1994).

(4) The Escambray Terrane, according to Piotrowska (her Fig. 3c) is tectonically "pressed and thrusted" within Zaza volcanics and ophiolites, an interpretation which is not supported by geological observations. Somin and Millan (1976; 1981), Pushcharovski et al. (1989), Millán (1990) and many others, have demonstrated that the Escambray Terrane is tectonically covered by meta-ophiolites and Cretaceous volcanic arc rocks (Mabujina complex, Fig. 1) (Haydoutov et al., 1989; Iturralde-Vinent, 1989). Seismic, gravity and magnetic observations indicate that the Escam-
bray Terrane is underlain by sialic basement (Shein et al., 1985; Bush and Sherbacova, 1986). This data suggests that the Escambray Terrane is a tectonic window surrounded by meta-ophiolites and Cretaceous volcanics (Fig. 1), not a tectonic body embedded within the volcanics and ophiolites as Piotrowska claimed.

In conclusion, it is demonstrated that the main interpretations of K. Piotrowska concerning the definition, relationships, evolution and later emplacement of western and central Cuban ‘terranes’ are strongly controversial, and that her model for the evolution of the western Caribbean ignores major geological constraints. More detailed geological information and the author’s opinions regarding these subjects have recently been published (Iturralde-Vinent, 1994).

References


