

MELANGE STRUCTURE OF THE SIERRA BERMEJA, PUERTO RICO

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ABSTRACT

The Sierra Bermeja is a range of hills located in southwestern Puerto Rico that expose mafic rocks and cherts ranging in age from Early Jurassic through Early Cretaceous. These rocks are considered to comprise dismembered and metamorphosed oceanic crust whose origins lie at higher latitudes in the Pacific realm. The oceanic rocks were intruded by Late Cretaceous, intermediate to felsic igneous rocks that mark the inception of island arc volcanic activity. The Sierra Bermeja is about 10 km long and up to 3 km wide and reaches a maximum elevation of 300 meters. It is bound on the north by a Neogene half graben and to the south by a large syncline composed of Late Cretaceous volcanic rocks and limestone.

Recent mapping shows that the Jurassic and Early Cretaceous oceanic rocks occur in a melange as steep sided blocks ranging in size from a few kilometers to a little as a meter. The matrix of the melange is serpentinite that is invariably accompanied by meter-size amphibolite inclusions that are usually rounded and wrapped in foliated serpentinite. Exposures of contacts between the serpentinite and the larger blocks are mostly planar and steeply dipping with sub-parallel foliations in the adjacent serpentinite matrix. Deeper exposures of the melange show that intermediate size blocks float within the serpentinite matrix suggesting that the entire complex is allochthonous. The northern and central portions of the range are dominated by larger blocks of mafic rocks while others are mostly composed of chert. Some blocks are dominated by the mafic rocks while others are mostly composed of chert. The larger blocks are usually separated by the serpentinite matrix but are also in direct fault contact. Radiolarian ages of the cherts indicate that the blocks are younger from north to south but maintain a consistent age from east to west. The southern portion of the range is composed of varied size blocks of amphibolite, greenstone and hydrothermally altered meta-volcanic rocks. The larger of the southern blocks extends about a kilometer from east to west and is about one half of a kilometer wide measured north to south. The serpentinite matrix dominates the southeastern portion of the range as the included blocks diminish in size.

At least partial continuity of rock types from the larger blocks in the southwest can be recognized in the much smaller blocks that are strung out in the matrix towards the east. Strong foliations occur throughout the largest amphibolite block and in phyllitic cherts and greenstones at the margin of the adjacent large greenstone block. These deformation structures suggest overthrusting of the amphibolite on the greenstones and isoclinal folding of chert in the northern blocks are probably also related to pre-melange deformation. Melange formation must have preceded the intermediate volcanism at 85 Ma as the serpentinite matrix is intruded by these rocks. The later deformation that folded the overlying Late Cretaceous volcanic and sedimentary rocks may have been caused by domal uplift of the melange complex due to diapiric protrusion of serpentinite.