CARIBBEAN REGION: PERSPECTIVES ON PETROLEUM

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ABSTRACT

The Caribbean region unambiguously illustrates several principles of petroleum geology, the most important of which is that tectonic stability in the continental platform environment is essential to the generation, accumulation, and preservation of petroleum. Platform blocks account for 99.99 percent of the region’s cumulative production and proved oil and gas reserves, 95 percent of its oil resources (oil still to be discovered), and 87 percent of its gas resources (gas still to be discovered). However, a platform can be too stable, as illustrated by large parts of the Yucatan and Florida-Bahamas platforms where production and reserves are nil. In contrast, the mobile-belt environment ultimately leads to the destruction of generated petroleum, unless the mobile belt becomes stabilized by accretion to an already-existing platform. Use of these principles in the Caribbean suggests that future exploration should be concentrated almost entirely in stable blocks. However, the search for future reserves should not be limited to rocks of Late Jurassic through Pleistocene ages, as it has been in the past, but expanded to include a concerted search in late Paleozoic rocks whose platform facies are well developed in at least two large areas of the Caribbean region.

INTRODUCTION

The volume of generated and trapped petroleum that is preserved in a region is related closely to that region’s tectonic stability. However, a long-stable region is not destined automatically to become a petroleum province, because the potential to generate, accumulate, and trap commercial volumes of petroleum also must be present. Nevertheless, it is a fact that the preferred habitat of the commercial petroleum field is the stable foreland platform.

In sharp contrast to the stable platform, its antithesis, the mobile belt, provides an environment intrinsically hostile to petroleum preservation. In fact, many mobile belts are totally unsuited even for the generation of petroleum. However, if a mobile belt stabilizes by accretion to a platform, it gradually will acquire the characteristics of the stable platform, and the petroleum potential of the post-accretionary sedimentary section will increase accordingly.

The Caribbean region (Figure 1) provides clear examples of these broad principles. This region—with an area of 8.5 million km²—is essentially an assemblage of two mobile belts with their branches sandwiched between two large cratons, North America in the northwest and South America in the southeast. The important petroleum accumulations are on the platform blocks. They account for 99.99 percent of the region’s cumulative oil and gas production, 99.99 percent of the region’s proved oil and gas reserves, 95 percent of its oil resources (oil still to be discovered), and 87 percent of its gas resources (gas still to be discovered). Table 1, based on tables 2 and 3 in Morris et al., 1989b, shows that not only is the platform environment the Caribbean region’s preferred petroleum habitat, but also the platform areas of
Figure 1. Index map, Caribbean region, showing major physiographic features mentioned in text, together with all basins used in the compilation of Tables 1, 2, 3, and 4.