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## Tectonic Drift, Climate, and Paleoenvironment of Angola Since the Cretaceous

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Africa is the only continent that now straddles arid zones located beneath the descending limbs of both the northern and southern Hadley cells, and it has done so since it became a distinct continent in the Early Cretaceous. Since that time, Africa has drifted tectonically some 12 degrees north and rotated approximately 45 degrees counterclockwise. This changing latitudinal setting and position of the landmass under the relatively stable Hadley Cells is manifested as southward migration of climatic zones over the past 132 million years. Data from kerogen, X-ray diffraction analysis of sedimentary matrix, carbon isotopes from shell samples and tooth enamel, new  $^{40}\text{Ar}/^{39}\text{Ar}$  radiometric dates, pollen and plant macrofossils, and fossil vertebrates indicate a productive upwelling system adjacent to a coastal desert since the opening of the South Atlantic Ocean; however, the position of the coastal desert has migrated southward as Africa drifted north, resulting in today's Skeleton Coast and Benguela Current. This migration has had a profound effect on the placement of the West African coast relative to areas of high marine productivity and resulting extensive hydrocarbon deposits, on the placement of arid zones relative to the continent especially the Skeleton Coast desert, on the climatic history of the Congo Basin (which shows a Late Cretaceous decrease in aridity based on the relative abundance of analcime in the Samba core), and in reducing the southern temperate region of Africa from 17% of continental area during the Cretaceous to 2% today. We show here that these related geographic and environmental changes drove ecological and evolutionary adjustments in southern African floras and faunas, specifically with respect to the distribution of anthropoid primates, the occurrence of modern relicts such as the gnetalean *Welwitschia mirabilis*, endemism as in the case of ice plants, and mammalian adaptation to an open environment as in springhares. Africa's tectonic drift through climate zones has been a first-order environmental determinant since the Early Cretaceous.

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