

BANGUI ANOMALY

Bangui anomaly is the name given to one of the Earth's largest crustal magnetic anomalies and the largest over the African continent. It covers two-thirds of the Central African Republic and therefore the name derives from the capitol city-Bangui that is also near the center of this feature. From surface magnetic survey data Godivier and Le Donche (1962) were the first to describe this anomaly. Subsequently high-altitude world magnetic surveying by the U.S. Naval Oceanographic Office (Project Magnet) recorded a greater than 1000 nT dipolar, peak-to-trough anomaly with the major portion being negative (figure 1). Satellite observations (Cosmos 49) were first reported in 1964 (Benkova et al., 1973) these revealed a -40nT anomaly at 350 km altitude. Subsequently the higher altitude (417-499km) POGO (Polar Orbiting Geomagnetic Observatory) satellite data recorded peak-to-trough anomalies of 20 nT these data were added to Cosmos 49 measurements by Regan et al. (1975) for a regional satellite altitude map. In October 1979, with the launch of Magsat, a satellite designed to measure crustal magnetic anomalies, a more uniform satellite altitude magnetic map was obtained. These data, computed at 375 km altitude recorded a -22 nT anomaly (figure 2). This elliptically shaped anomaly is approximately 760 by 1000 km and is centered at 6°N , 18°E . The Bangui anomaly is composed of three segments; there are two positive anomalies lobes north and south of a large central negative field. This displays the classic pattern of a magnetic anomalous body being magnetized by induction in a zero inclination field. This is not surprising since the magnetic equator passes near the center of this body.

While the existence and description of the Bangui anomaly is well known what is less established and controversial is the origin or cause ^{which} produced this large magnetic feature. α

It is not possible to discuss its origin without mentioning the other associated geophysical and geologic information. There is a -120 mGal Bouguer gravity anomaly coincident with the magnetic anomaly (Boukeke, 1994) and there is a putative topographic ring some 810 km diameter also coincident with this feature (Girdler et al., 1992). In Rollin's (1995) recently compiled a tectonic/geologic map of the Central African Republic Late Archean and Early Proterozoic rocks are exposed beneath the central part of this anomaly. Lithologically the area is dominated by granulites and charnockites (a high temperature/pressure granite believed to be part of the lower crust) there are, in addition, significant exposures of greenstone belts and metamorphosed basalts with itabrite (a metamorphosed iron formation). There are several theories for the origin of this anomaly, Regan and Marsh (1982) proposed that a large igneous intrusion into the upper crust became more denser on cooling and sunk into the lower crust with the resulting flexure producing the overlying large basins of this region with the intrusion the source of the magnetic anomaly and the sedimentary basin fill that of the gravity. Another hypothesis is that it is the result of a large extra-terrestrial impact (Green, 1977; Girdler et al., 1992). Ravat et al. (2002) applied a modified Euler-deconvolution techniques to the Magsat data and their analysis supported the impact model of Girdler et al. (1992). Unfortunately, it is not possible to discriminate between these theories based solely on geophysical data however; the key to the solution may lie in the origin of carbonados (micro-crystalline diamond aggregates). Carbonados are restricted to the Bahia Province, Brazil and the Central African Republic, with the latter having a greater number. Smith

and Dawson (1985) proposed these micro-diamonds were produced by a meteor impact into carbon-rich sediment. More recently De et al., 1998 and MaGee (2001) have not confirmed this hypothesis. The origin of this large crustal anomaly remains uncertain.

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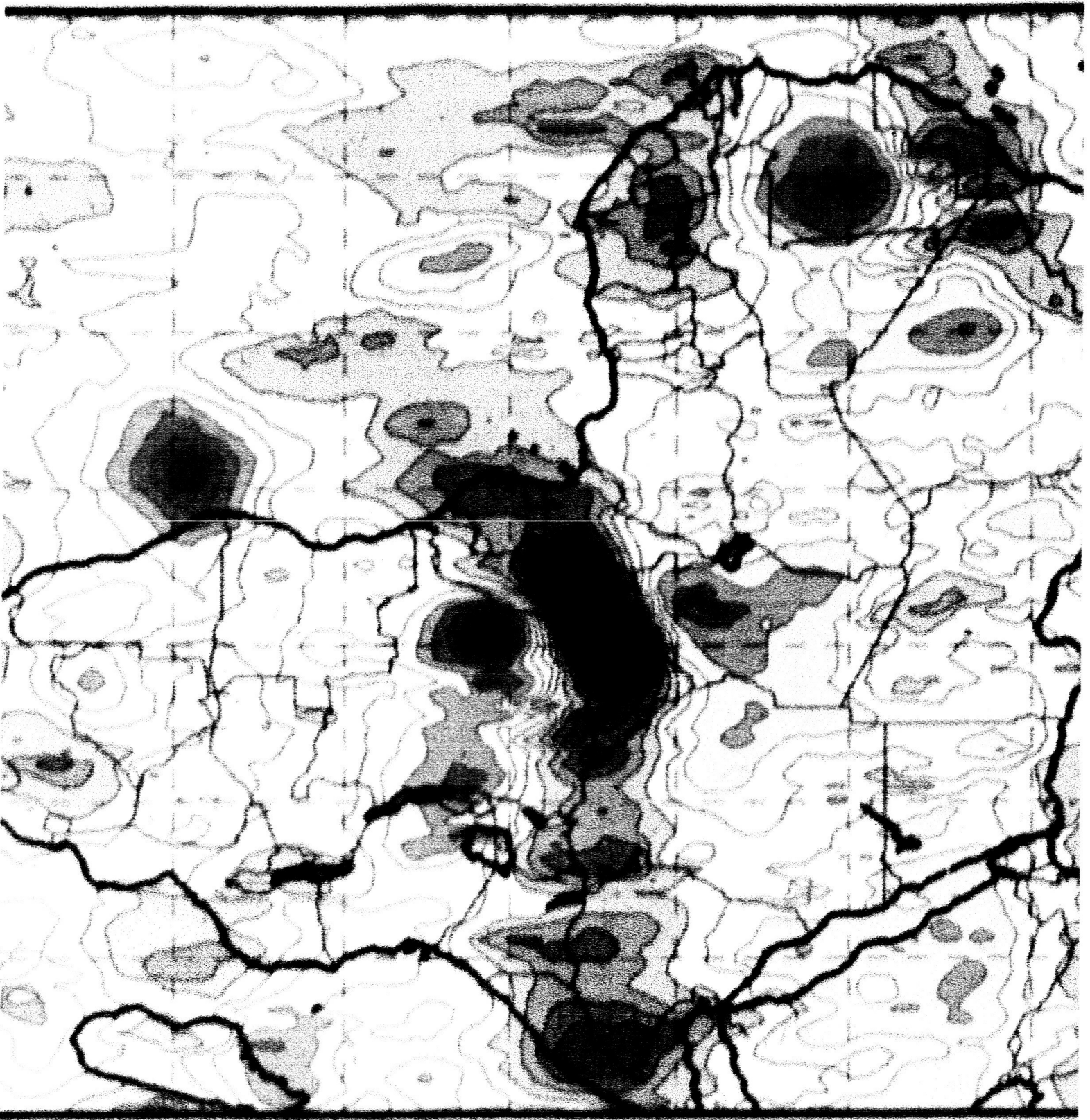
Patrick T. Taylor

Figure Captions.

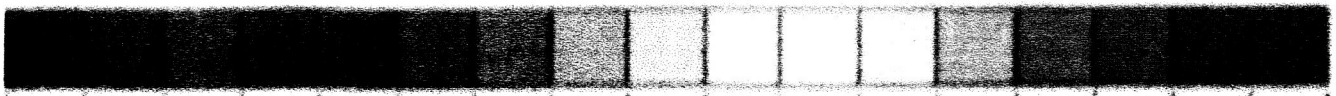
Figure 1. Satellite altitude (375 km) anomaly map of Africa from the Magsat mission. Anomaly scale is given at the right (Reproduced by permission of American Geophysical Union.)

Figure 2. Total field aeromagnetic anomaly profile data over the Central African Republic from Project MAGNET, U.S. Naval Oceanographic Office (from Regan and Marsh, 1982, their figure 3).

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BANGUI ANOMALY-POPULAR SUMMARY.

The Bangui anomaly is one of the largest crustal magnetic anomalies on Earth its name derives from the capitol city of the Central African Republic-Bangui. Aeromagnetic surveying recorded a greater than 1000 nT anomaly with the major portion being negative (figure 1). Magsat satellite altitude magnetic map recorded a -22 nT anomaly (figure 2). The Bangui anomaly is composed of three segments; there are two positives anomalies lobes north and south of a large central negative field. This displays the classic pattern of a magnetic anomalous body being magnetized by induction in a zero inclination field. While the Bangui anomaly is well known what is less established and controversial is the origin or cause that caused this large magnetic feature. It is not possible to discuss its origin without mentioning the other associated geophysical and geologic information. There is a -120 mGal Bouguer gravity anomaly coincident with the magnetic anomaly (Boukeke, 1994) that means lower density material is beneath this anomaly and there is a topographic ring some 810 km diameter also coincident with this feature (Girdler et al., 1992). In a recently compiled a tectonic/geologic map of the Central African Republic very old Late Archean and Early Proterozoic rocks are exposed beneath the central part of this anomaly. Regan and Marsh (1982) proposed that a large igneous intrusion into the upper crust became more denser on cooling and sunk into the lower crust with the resulting flexure producing the overlying large basins of this region with the intrusion the source of the magnetic anomaly and the sedimentary basin fill that of the gravity. Another hypothesis is that it is the result of a large extra-terrestrial impact (Girdler et al., 1992). The origin of this large crustal anomaly, however, remains uncertain.

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February 13, 2004

Katrice,

Would you please send this through the system for approval. It is a short encyclopedia article for the Encyclopedia of Geomagnetism and Paleomagnetism to be published by Kluwer Academic Publishers and edited by D. Gubbins and E. Herrero-Bervera.

Attached is the short popular summary

A handwritten signature in black ink, appearing to be 'Patrick', is written over the text 'Attached is the short popular summary'. The signature is somewhat stylized and includes a large loop at the end.

Patrick