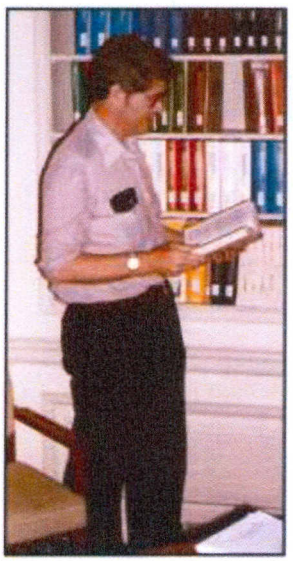
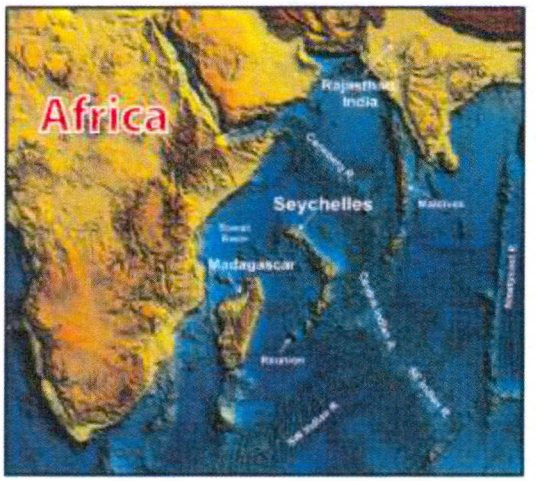
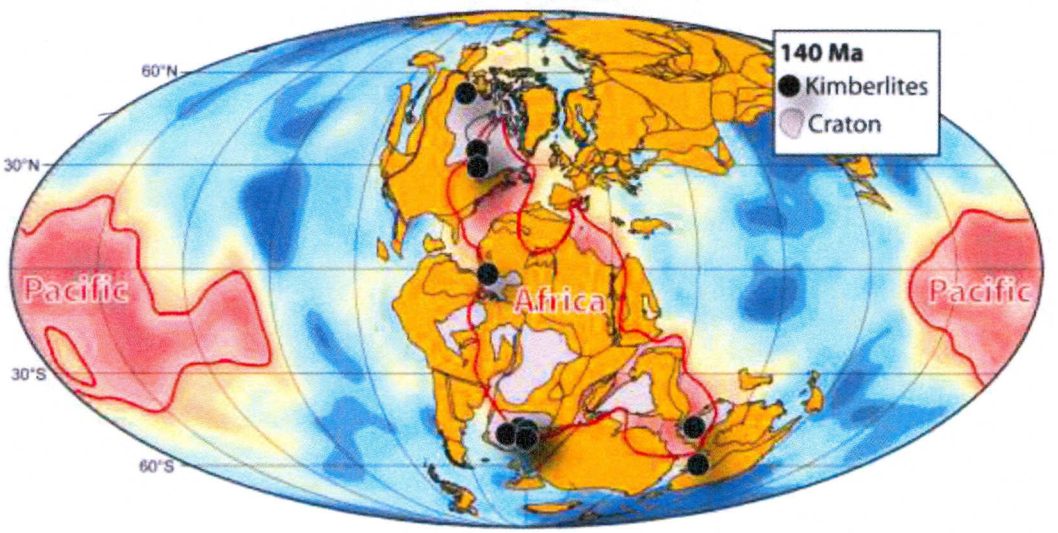
# Out of Africa:
# 140 years with Kevin Burke and Lew Ashwal

15-18 November 2009, University of the Witwatersrand, Johannesburg, South Africa





# Gravity-gradient fields in mapping unknown structures of the African plate

C. Braitenberg (1), A. Russian (1), J. Ebbing (2)

1) Department of Earth Sciences, University of Trieste, Via Weiss 1, 34100 Trieste, Italy. berg@units.it
2) Geological Survey of Norway (NGU), 7491 Trondheim, Norway, also at: Department for Petroleum Technology and Applied Geophysics, NTNU, 7491 Trondheim, Norway. Joerg.Ebbing@NGU.NO

The gradient tensor can be derived from the expansion of the gravity potential field in spherical harmonics. The recent release of the potential field up to degree and order N=2159 (Pavlis et al., 2008) allows to have sufficient spatial resolution to detect single structures as volcanic edifices and the density variations accompanying them. In remote areas this is a valuable tool to identify structures which are concealed below the surface. Areas involving magmatic products are of particular interest as they are generally denser than the surrounding rocks. One example is the Tibesti massif and the adjacent region, which includes several volcanoes and calderas and a series of structures which are assumed to be impact craters. Due to the inaccessibility of the region the extent of the magmatic areas in and beyond the massif. is very uncertain.

We discuss which gradient components and derived quantities are most advantageous to enhance the near-surface geology. In a second step we calculate the field components and correct for the effect of topography. We find in general a good match between the known single volcanic edifices and our field analysis. In addition, our analysis indicates that some of the volcanoes are not isolated structures but connected by sub-surface high density masses. These might relate to magmatic products which extend to a greater area than the mere topographic expression. We furthermore compare the gradient fields with the present knowledge from geology and with satellite images of the region.

*Reference*

Pavlis, N.K., S.A. Holmes, S.C. Kenyon, and J.K. Factor, An Earth Gravitational Model to Degree2160: EGM2008, presented at the 2008 General Assembly of the European Geosciences Union, Vienna, Austria, April 13-18, 2008.