Geophysical Research Abstracts
Vol. 14, EGU2012-7590, 2012
EGU General Assembly 2012

Magma-induced oblique spreading in the rift zones of Iceland and Ethiopia

V. Acocella (1), A Gudmundsson (2), and G. Norini (3)

(1) Università Roma Tre, Dipartimento Scienze Geologiche, Roma, Italy (acocella@uniroma3.it, +39 06 5488 8201), (2) Royal Holloway, London, England, (3) Istituto per la Dinamica dei Processi Ambientali CNR Bergamo Italy

The axes of many ocean-ridges and rift zones are not perpendicular but rather oblique to the associated spreading axis. How this obliquity is reflected in the trends and opening directions of the tectonic fractures in the rift zones has, however, not received much attention. Here we present data on the trends and opening directions of several hundred extension fractures along the axis of the rift zones of the Reykjanes Peninsula (Iceland) and Afar (Ethiopia). For the Reykjanes Peninsula, results show, first, that the opening of the fractures is normal to their trends, indicating pure extension and, second, that the opening direction makes an angle of $\sim 30^{\circ}$ to the direction of the spreading vector at the sides of the rift, as deduced from global plate motions and GPS data. The difference between the extension direction along the rift axis and that at its sides suggests across-strike strain partitioning along the Reykjanes portion of the oceanic ridge of Iceland. A similar across-strike partitioning has been recently observed across the Main Ethiopian and Afar Rifts (Ethiopia), on continental and transitional crust, respectively. In this region the opening direction makes an angle to the direction of the spreading vector. Numerical models indicate that the along-strike growth and connection of spreading segments may generate stress fields that favour a significant obliquity of a portion of a rift zone with regard to the spreading direction. Numerical models also indicate that the local stresses around and between magma chambers (and associated volcanoes) may induce local stresses that may, to a degree, explain the observed strain partitioning processes during the growth of divergent plate boundaries.