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Tectono-magmatic evolution of the Main Ethiopian Rift

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The Main Ethiopian Rift is a natural laboratory for the understanding of of rift evolution. Photogrammetric and stereogrammetric Digital Elevation Models with metric resolutions were generated. Recent volcanic and tectonic activity has been mapped on high resolution remote sensing data. Volcanic and tectonic activity focus in narrow, en échelon, segments. This tight interaction between volcanism and tectonics determines the dynamic of rifting. The mainly silicic volcanic centers are located in the middle of segments, precursors of the tectonic deformation and are now intensely cut by faults. Recent volcanic activity is characterized by MORB like fissural eruptions. Faulting is atypical. Flexural brittle deformation occurs outside the Tectono-Magmatic Segments (TMS) only. Faults located in the TMS develop from monoclines, then opening of fissures on the hinges and block collapses of the foot-walls. These faults are syn-magmatic. In several places the fissural basalts were ductilely deformed along faults and showed kinematic indicators, in accordance with the geodetic results. Locally, crater rows are geometrically connected to fissures and faults. We propose that they are dyke-induced. Tomographic analysis shows that mafic intrusions are located below the magmatic centers. The localization, the repartition and the type of magmatic and tectonic activity indicate that dykes originating from the centers propagate along the TMS and generate most of the extension. The MER is therefore very similar to slow and ultra slow spreading ridges.