Dykes are primarily extensional fractures that form perpendicular to the minimum principal compressive stress, which have been extensively studied in the world during the past decades for various reasons including the reconstruction of supercontinents/paleocontinents. Deccan Large Igneous Province (DLIP) of India is the product of fissure eruptions with vast lava fields and dyke-sill networks. The DLIP is associated with some rift zones of peninsular India, which reflect the pre-existing weaknesses in the Indian lithosphere (Fig. 1). In rift-zone eruptions, magma is normally transported to the surface via dykes. However, some injected dykes do not reach the surface but are arrested at certain depths in the rift zone due to the mechanical heterogeneity and anisotropy, or

Dyke Emplacement in the Narmada Rift Zone and Implications for the Evolution of Deccan Traps

JU Wei1,2, HOU Guiting2, * and K.R. HARI3

1 School of Resources and Geoscience, China University of Mining and Technology, Xuzhou 221116, China
2 Key Laboratory of Orogenic Belts and Crustal Evolution, Ministry of Education; School of Earth and Space Science, Peking University, Beijing 100871, China
3 School of Studies in Geology and Water Resource Management, Pt. Ravishankar Shukla University, Raipur 492010, India

Dyke Emplacement in the Narmada Rift Zone and Implications for the Evolution of Deccan Traps

JU Wei1,2, HOU Guiting2, * and K.R. HARI3

1 School of Resources and Geoscience, China University of Mining and Technology, Xuzhou 221116, China
2 Key Laboratory of Orogenic Belts and Crustal Evolution, Ministry of Education; School of Earth and Space Science, Peking University, Beijing 100871, China
3 School of Studies in Geology and Water Resource Management, Pt. Ravishankar Shukla University, Raipur 492010, India

Dykes are primarily extensional fractures that form perpendicular to the minimum principal compressive stress, which have been extensively studied in the world during the past decades for various reasons including the reconstruction of supercontinents/paleocontinents. Deccan Large Igneous Province (DLIP) of India is the product of fissure eruptions with vast lava fields and dyke-sill networks. The DLIP is associated with some rift zones of peninsular India, which reflect the pre-existing weaknesses in the Indian lithosphere (Fig. 1). In rift-zone eruptions, magma is normally transported to the surface via dykes. However, some injected dykes do not reach the surface but are arrested at certain depths in the rift zone due to the mechanical heterogeneity and anisotropy, or

Dyke Emplacement in the Narmada Rift Zone and Implications for the Evolution of Deccan Traps

JU Wei1,2, HOU Guiting2, * and K.R. HARI3

1 School of Resources and Geoscience, China University of Mining and Technology, Xuzhou 221116, China
2 Key Laboratory of Orogenic Belts and Crustal Evolution, Ministry of Education; School of Earth and Space Science, Peking University, Beijing 100871, China
3 School of Studies in Geology and Water Resource Management, Pt. Ravishankar Shukla University, Raipur 492010, India

Dykes are primarily extensional fractures that form perpendicular to the minimum principal compressive stress, which have been extensively studied in the world during the past decades for various reasons including the reconstruction of supercontinents/paleocontinents. Deccan Large Igneous Province (DLIP) of India is the product of fissure eruptions with vast lava fields and dyke-sill networks. The DLIP is associated with some rift zones of peninsular India, which reflect the pre-existing weaknesses in the Indian lithosphere (Fig. 1). In rift-zone eruptions, magma is normally transported to the surface via dykes. However, some injected dykes do not reach the surface but are arrested at certain depths in the rift zone due to the mechanical heterogeneity and anisotropy, or
insufficient magma pressure.

In the present study, the effects of mechanical layering and regional tension on dyke emplacement in the Narmada rift zone were studied with geomechanical models and the results indicated that the distribution of the maximum principal tensile stresses was changed by the mechanical layering and/or regional tension, which led to the variations in the potential pathways of dyke propagation. In addition, the studies on dyke evolution and emplacement processes in the Narmada rift zone of India indicated four evolutionary stages as follows (Fig. 2): stage I – the arrival of plume and pre-volcanic extension, stage II – the formation of shallow magma chambers, stage III – vertical dyke injection and fissure eruption, and stage IV – the “blanket effect” and the generation of lateral dyke propagation.