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Structure and segmentation of sheeted dykes of Oman Ophiolite - Sohar area, northern Oman Mountains -.

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The sheeted dyke swarm (SDS) of the northern Oman Ophiolite generally strike N-S and dip steeply west. 64% of 1844 dykes is <1 m thick and 27% is < 20 cm. Average thickness of dykes tends to increase both upward in the stratigraphic level and northward to the north of Wadi Jizi. The SDS is divided into 10-15 km long segments by NW-trending brittle shear zones, which change into ductile shear zones in the lower gabbro and the tectonised mantle peridotite with a strong linear fabric. The segmentation occurred in the vicinity of the spreading axis. In addition to this, the SDS in the southern segment generally strikes NNE, intervened by 1-2 km wide NNW-trending dike zones. The dyke trend changes gradually from NNE in the main segment to NNW in the intervening zone, and then to NNE again.

The sheeted dyke swarm (SDS) of the northern Oman Ophiolite generally strike N-S and dip steeply west. They either intrude into the lavas above or in fault contact with the latter in the SDS-lava transition zone. The SDS changes into gabbro within 30 m from 100 % dolerite dykes through an assimilation zone to gabbros with a coarse doleritic texture, below which laminated gabbro may appear at some places. Coarsening of the groundmass are conspicuous in the SDS/gabbro transition, consistent to a steep geotherm above the magma chamber.

60.4 % of 2509 dykes have margins on both sides (two-sided dykes), while 26.2 % have only one margin with the other one being lost by intrusion of neibouring dykes (one-sided dykes). If we exclude no-sided dykes and count 2 one-sided dykes as one dyke, the corrected number of dykes is reduced to be 1844, among which 99.2 % is simple, 0.5 % is multiple and 0.3 % has banding along margins. Composite dykes are rarely present. The average thickness of two-sided dykes is 71.3 cm, which is thinner than the estimated average thickness of 97.2 cm by doubling the thickness of one-sided dykes. The average thickness of the SDS tends to increase upward in the stratigraphic level. It also increases northward from 42 to 144 cm in 20 km long dyke segments. This is consistent with the model that this dyke segments belong to the tip of a propagating rift migrating northward from the locus of magma upwelling situated just to the south of the segments (Miyashita, 1998; Arai, 1998). Near the locus of magma upwelling higher rates of magma supply resulted in higher abundance of dyke intrusion, which increased the local compressive stress field and made it difficult for a dyke to thicken. On the contrary, the lower supply rate of magma at the propagating tip yielded lower frequency of magma intrusion, and hence no compressive stress field.

The SDS is divided into 10-15 km long segments by NW-trending brittle shear zones, which change into ductile shear zones in the lower gabbro and the tectonised mantle peridotite with a strong linear fabric. Thinner crust, vesiculation of dykes, large fault blocks near the segment boundaries, together with the distribution of the subduction-related lavas (Alley Unit) suggests that the segment boundaries were formed in the vicinity of the spreading axis. In addition to this, the SDS in the southern segment generally strikes NNE, intervened by 1-2 km wide NNW-trending dike zones. The dyke trend changes gradually from NNE in the main segment to NNW in the intervening zone, and then to NNE again. Unlike the segment boundaries, no apparent shear zone was observed through the intervening zone. This suggests that the variation in the dyke trend is the original feature produced at the spreading axis such as devals and intervolcanic gaps.

Ti and P have a nearly constant ratio and well correlate Mg#, which indicates these values were barely affected by hydrothermal alteration. Dykes in the north of the study area have a wide range of compositions, while those in the south tend to be undifferentiated. This is consistent with the above model of rift propagation.