CHAPTER VI

SUMMARY AND CONCLUSIONS

Gabal Gerf thrust sheets are allochthonous and apparently operated trains of N_1 and $I:_2$ folds and high strained rocks. The axial traces of F_1 folds trend WNW- ESE and sometimes NW-SE and E-W and plunge mostly at gentle angles towards the WNW, NW and locally SE and W. Occasionally, F2 fold axes are parallel to those of F_1 folds which are commonly oriented NNW-SSE and NW-SE and plunge at moderate angles towards the NNW and NW. Kinematically, F_1 and F2 folds are related to thrusting process. They are (the mesoscopic types, in particular) formed on the flat and ramp portions of the thrusts and basically recognized as fault-propagation folds and fault-bend folds. Determination of these kinematic folding terms is a function of two independent variables; the ramp angle (a) between the ramping fault and the horizontal position and the interlimb angle (8). In the area, the fold propagation folds have smaller values of 8 which range between 30° and 50°. Comparably, these values are smaller than those collected from the fault-bend folds where S angles are greater and reach up to 85°. The horizontal stress transported the ophiolites and arc volcanics and caused their tectonic alternation; causing shortening. Kinematically, the thrusts initiated and grew progressively in the front leading to a forward movement through a duplex of a piggyback sequence. The relationship between folding and thrusting (with the exception of whether the rocks are brittle or ductile) is still questioned, as folding is either a consequence or concurrent with thrusting. In the present study, as F_1 folds are extensively developed inside the thrust zones and some of them are intrafolial and transposed, the folding event (F, folding event, in particular) is the primary phenomenon and major thrusting is the secondary one or at least the folding event is concurrent with the early stage of thrusting.

Subsequent modification of the earlier structures exemplified by F, and $1^{7}7$ folds and thrusts occurred during D_3 phase of deformation. This caused overprinting of the traces of thrusts and the development of F_3 open folds and kinking on the limbs of F_1 and F_2 folds and elsewhere on S_1 and S_2 foliations. This is accompanied by the development of strike slip faults along WNW-ESE to NNW-SSE, NE-SW to NNE-SSW and E; W directions. These faults exhibit en echelon sigmoidal shapes, cataclasis and shearing as kinematic patterns for strain accommodation in response to the sense of right-and left-lateral displacements along these faults. Duplex structures are the first to deal with, further south in the South Eastern Desert by El Kazzaz (1995) and Noweir et al. (1996). Following these are the studies of El Kazzaz and Hamimi (2000) and El Amawy (2001) inside allochtonous rocks; the ophiolites and arc volcanic assemblages. Wherever, these authors suggested SW to WSW tectonic transport of these duplex structures, they have not explained: Are the sequence of the thrusts in the duplex of biggyback or overstep sequences?

In conclusion, the study area emphasizes an intimate relationship between D_1 and D2 ductile structures and thrusting. The kinematic analysis suggests a SW- tectonic transport which caused some slices of the ultramafic rocks to separate and move towards the S due to a combination of frontal and oblique thrusting. This is confirmed from the common presence of SW- and S-verging F_1 and F_2 folds, NE-SW and N-S stretching lineations and the association of both strike slip and compressive components. During the D_3 deformation, the area was subjected to a horizontal compressive stress (at) acting from SSE direction by which the axes of pre-existing Fi and F_2 folds, Si and S_2 foliations and the traces of thrusts are arcuated. Most probably, this stress is created from the movement along Hamisana Shear Zone present just to the south of Gabal Gerf area.