The area of intersection of the African, Anatolian, and Arabian plates in southeastern Turkey is an active area of research. Due to the complexity of the convergence and intersection of the three plates, many questions concerning the region still remain. This report concerns a data set from this complex area built of both existing and new data that include regional fault-plane solutions, structural maps, topographic maps, event-depth cross sections, and Moho depths.

This study involves the systematic application of the results of analysis of this data set to the region in order to better constrain and assess knowledge of faults, topographic structures, and crustal thickness. Results of this study suggest that plate-boundary fault triple junctions are inherently unstable, diffuse, and complex, and therefore are unable to be uniquely located. This study identifies an actively extending wedge within the Anatolian plate whose kinematic nature closely resembles that of Anatolia itself. This study also identifies the Iskenderun block as a large promontory of the African Plate which is being torn off to produce a plate fragment roughly the size of Delaware. The northern convergence of Africa and the northern convergence of Anatolia are determined to both play a role in the kinematics of the Iskenderun block.

Submitted as a Senior Thesis

Northern Arizona University

May 2004

Approved:

[Signature]
The area of intersection of the African, Anatolian, and Arabian plates in southeastern Turkey is an active area of research. Due to the complexity of the convergence and intersection of the three plates many questions concerning the region still remain. This report concerns a data set from this complex area built of both existing and new data that include regional fault-plane solutions, structural maps, topographic maps, event-depth cross sections, and moho depths.

This study involves the systematic application of the results of analysis of this data set to the region in order to better constrain and assess knowledge of faults, topographic structures, and crustal thickness. Results of this study suggest that plate-boundary fault triple junctions are inherently unstable, diffuse, and complex, and therefore are unable to be uniquely located. This study identifies an actively extruding wedge within the Anatolian plate whose kinematic nature closely resembles that of Anatolia itself. This study also identifies the Iskenderun block as a large promontory of the African Plate which is being torn off to produce a plate fragment roughly the size of Delaware. The northern convergence of Africa and the northern convergence of Anatolia are determined to both play a role in the kinematics of the Iskenderun block.
# TABLE OF CONTENTS

List of Tables  iv
List of Figures  iv

## Introduction
- Setting
- Purpose of Study  1

## Background  2

## Data/Methods
- Regional Maps  9
- Focal mechanisms and fault-plane solutions  10
- Fault-plane solution data  11
- Software used in the determination of fault-plane solutions  13
- Fault-plane solution evaluation criteria  14
- Centroid moment tensors and non-double-couple solutions  15

## Analysis of Seismicity and Tectonics
- Depth data and event-concentration cross sections  16
- Cross section A  17
- Cross section B  18
- Cross section C  21
- Cross section D  23
- Regions of concentrated seismicity  25
- Entire Study Area  26
- Region 1  27
- Region 2  28
- Region 3  30
- Region 4  31
- The instability of fault triple junctions: a model for the source of AAA complexities  32
- High convergence rate of the African plate and the Iskenderun block  34
- Compression and tension in the southwest portion of the AAA triple junction  38

## Conclusions  42

## Future Research  44

## Acknowledgements  46

## References Cited  47
LIST OF TABLES

1. Fault-plane solutions 13

LIST OF FIGURES

1. Regional plate boundary faults associated with the African-Anatolian-Arabian triple junction. 2
2. Regional plate velocities determined by Global Positioning System measurements. 3
3. Structural map of the East Anatolian Fault Zone. 5
4. East Anatolian Fault Zone and its three sub-parallel strands. 6
5. The western extension of the East Anatolian Fault Zone to Cyprus. 7
6. Hatay graben and associated faults. 8
7. Structural and topographical map of study area 9
8. First-motion analysis and a fault-plane solution. 11
9. Fault-plane solutions of study area. 12
10. Seismicity from 1964 to 1994. 17
11. Four areas enclosing events portrayed in cross section. 18
12. Event depths, topography, and moho depth of area A. 19
13. Event depths, topography, and moho depth of area B. 21
14. Event depths, topography, and moho depth of area C. 23
15. Regional moho depth. 24
16. Event depths, topography, and moho depth of area D. 25
17. Pressure and tension axes of the entire study area. 27
18. Pressure and tension axes of region one. 28
19. Pressure and tension axes of region two. 29
20. Pressure and tension axes of region three. 30
21. Pressure and tension axes of region four. 32
22. Fault-fault-fault and ridge-ridge-ridge triple junctions compared. 33
23. Evolution of a fault-fault-fault triple junction. 34
24. Length of greatest N-S strike along the Northeast Mediterranean Flower Structure 35
25. The Iskenderun Block. 37
<table>
<thead>
<tr>
<th>No.</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.</td>
<td>The base of the Iskenderun Block and inflection along the Northeast Mediterranean Flower Structure</td>
<td>38</td>
</tr>
<tr>
<td>27.</td>
<td>Proposed counter-clockwise rotation of the Iskenderun Block</td>
<td>39</td>
</tr>
<tr>
<td>28.</td>
<td>Generalized stress regime in the area of the African-Anatolian-Arabian triple junction</td>
<td>42</td>
</tr>
</tbody>
</table>

A complete text version is located at [NAU’s Cline Library](#)