Tectonics

Supporting Information for

Segmentation and Holocene Behavior of the Middle Strand of the North Anatolian Fault (NW Turkey)

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Contents of this file

Additional Supporting Information (Files uploaded separately)

Introduction

Data files include the full visual documentation for the horizontal offset measurements, and a vector file of the MNAF mapping in GML format. The measurements and mapping were done using Pleiades orthorectified imagery, a Pleiades derived DEM (as shaded relief, slope map, aspect map, contour map) and Google Earth imagery.

Text S1.

Determination of the marker quality score

The marker quality score is determined from six criteria.

1. If the marker shows no trace of significant anthropic modification and can be confidently considered of tectonic nature = 5 points ; otherwise = 0 points.

2. Preservation score /3. a) For offsets measured on Pleiades data, we count the number of different derived datasets on which the marker is visible (image, hillshade, contour map, slope map…). For offsets measured on Google Earth images, we count the number of different images (acquired on different dates) on which the marker is visible. If this number is 1, 2, or >2, we give 0, 1, or 2 points. b) If the marker appears continuously with a distinct trace, we give 1 additional point for sharpness.

3. Shape score /4. a) If marker width is less than 3 m, between 3 and 6 m, or more than 6 m, we give 2, 1 or 0 points. b) If marker sinuosity is less than 1.5, between 1.5 and 2.5, or more than 2.5, we give 2, 1, or 0 points.

4. Fault complexity score /3. a) If the plausible fault zone width is less than 5 m, between 5 and 10 m, or more than 10 m, we give 2, 1, or 0 points. b) If the fault is composed of only one splay, we give 1 additional point.

5. Angle score /3. If the angle between marker and fault is more than 70°, between 60° and 70°, or less than 60°, we give 3, 1, or 0 points.

6. Resolution score /2. If the offset was measured on Pleiades image = 2 points; on Google Earth image = 1 point; on Pleiades topography = 0 point.

The final score /20 is obtained by summing the scores for each criteria.

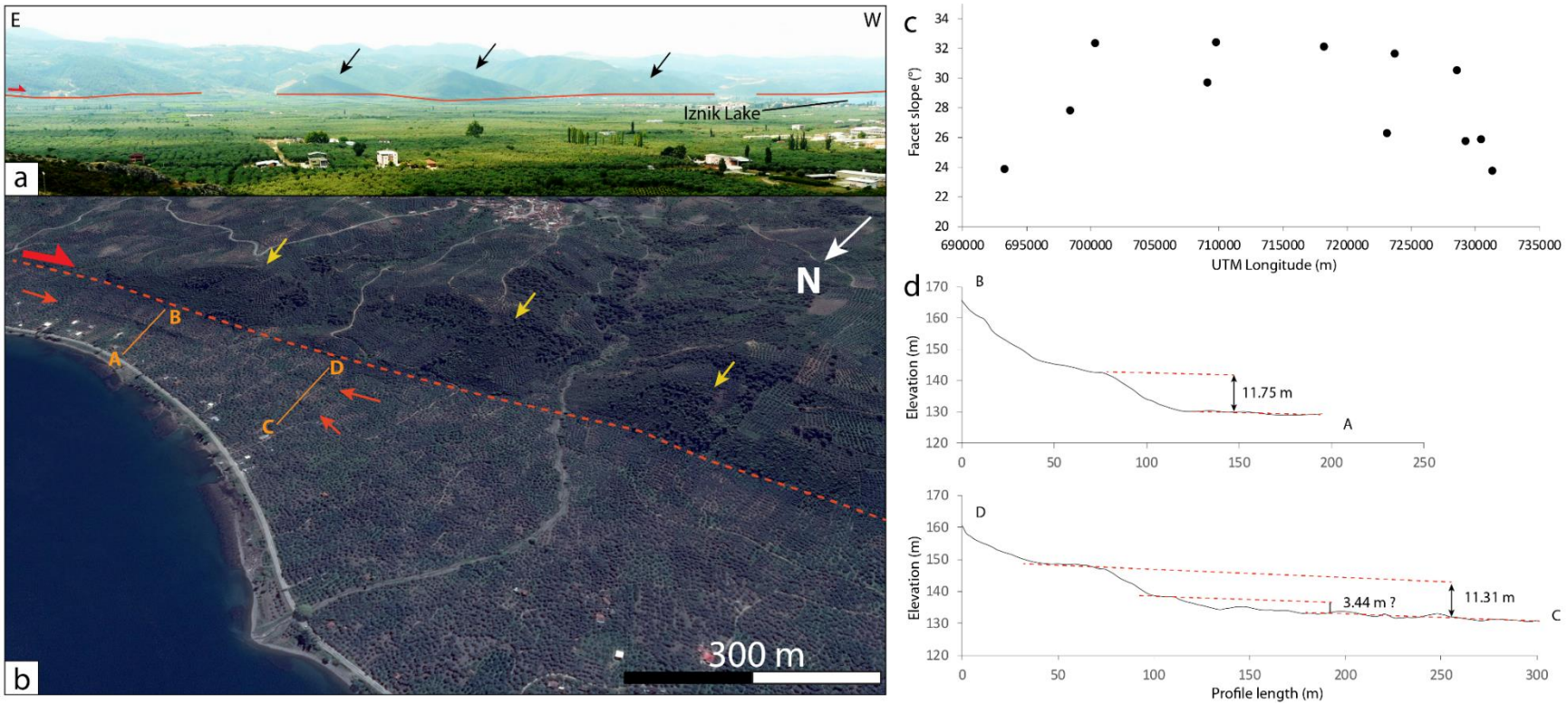

Figure S1. Examples of vertical slip markers along the MNAF south of Iznik Lake. (a) Triangular facets (black arrows) at the southeast corner of the lake. (b) Eroded triangular facets (yellow arrows) and smaller, more recent scarps in front (delimited by red arrows). (c) Slope values of the triangular facets. The central section along Iznik Lake shows almost constant values around 30° while the sides are marked by a sharp decrease and the disappearance of well-developed facets. (d) Topographic profiles across recent vertical scarps (A-B and C-D located on (b)). The vertical offsets are given with a conservative 1σ uncertainty of ±1 m.

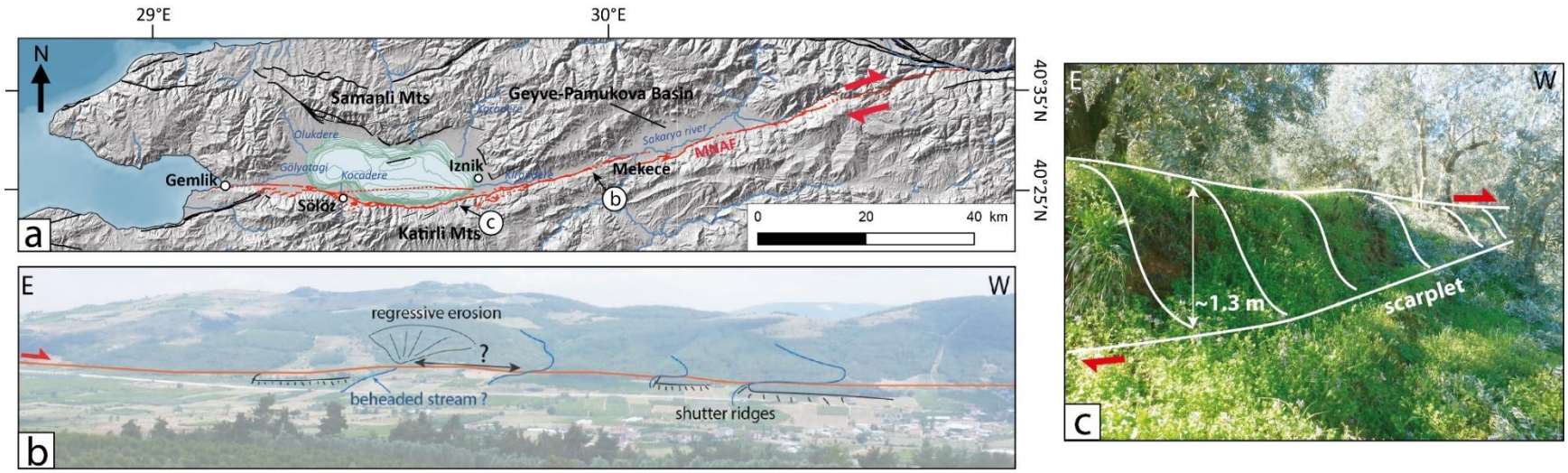

Figure S2. Field examples of Late Quaternary faulting along the MNAF. (a) Shaded DEM of the MNAF region, with the locations of the field photographs. The MNAF segments are mapped in red, and other active faults in black. (b) Interpreted panorama of the MNAF at the eastern end of segment E, showing typical features of strike-slip tectonics. The MNAF segments are generally marked in the topography by a slope break. Several rivers present a right-lateral offset when they cross the fault trace. (c) Vertical fault scarp in the alluvial plain south of Iznik Lake.

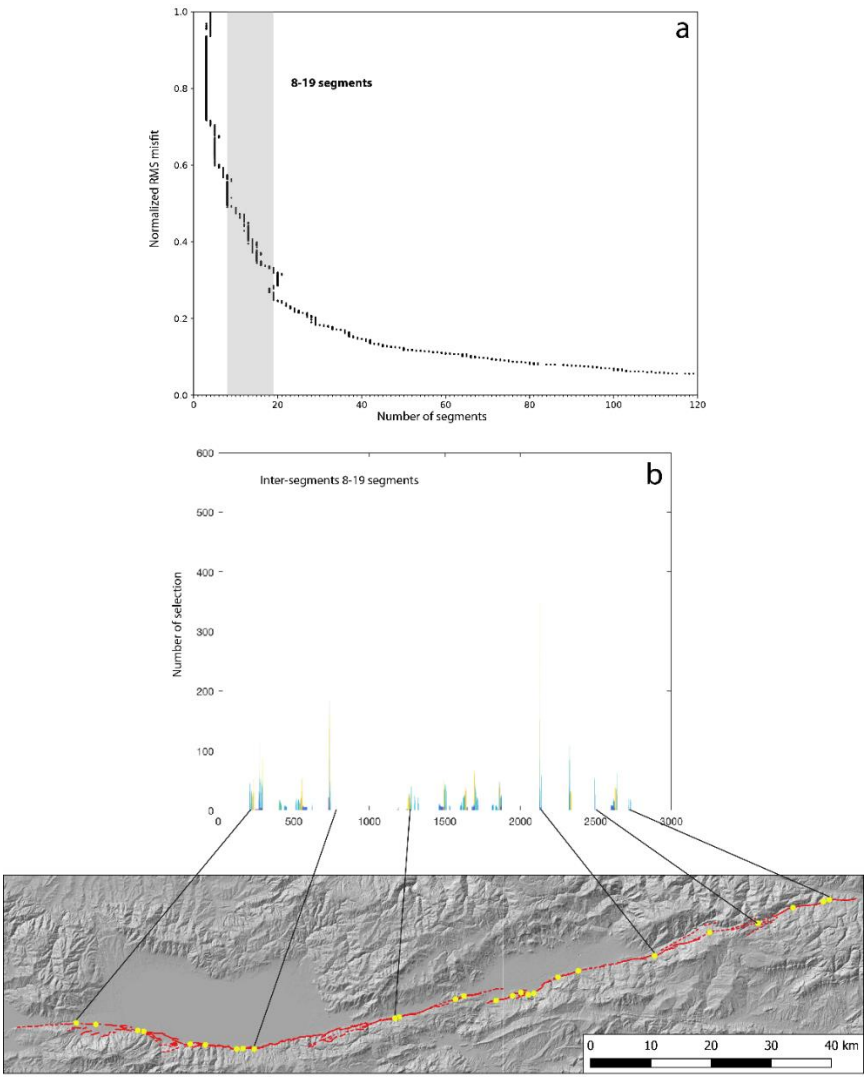
a
8-19 segments
Normalized RMS misfit
Number of segments
b
Inter-segments 8-19 segments
Number of selection
0 10 20 30 40 km
c
9 segments
Number of selection
A
B
C
D
E
F
G
H
Cmin
Dmax
Emin
Mekece stepover
Sölöz bend

Figure S3. Results of the automatic fault discretization procedure. (a) Trade-off curve between number of segments and misfit (quadratic difference between fault mapping and segment model). (b) Histogram of selected inter-segments along the fault, for models in the range 8-19 segments. The most frequently selected inter-segments are located on the fault map below. (c) Histogram of selected inter-segments, assuming that the faults consists of 9 segments, and favored discretizations of the MNAF below.

Table S1. Summary of the historical earthquakes displayed on Fig. 2. Coordinates are in decimal degrees.

Table S2. Summary of the paleoseismic investigations displayed on Fig. 2.

Table S3. Offset values measured along the MNAF.

Data Set S1. Mapping of the MNAF segments in GML format. Attributes 0 and 1 on individual fault sections stand for low confidence and high confidence mapping respectively.

Data Set S2. Horizontal offset retrodeformations. Marker ID code is indicated on the left. North direction is upward. Columns 1 and 2 show the original morphologies. The fault is drawn in red. Columns 3, 4 and 5 show the retrodeformed morphologies giving the minimum, preferred and maximum offset values respectively.