GEOLOGY

Supplemental Material
for

When did the North Anatolian Fault reach southern Marmara?

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1. Introduction

This information includes supplementary text, figures and tables for kinematic analyses, sampling sites, U-Th methodology and results.

2. Kinematic analysis of fault planes and implications on the regional stresses

The Uludağ Range forms the boundary between the NAF strike-slip regime and the western Anatolian extensional region (Okay et al. 2008, Özalp et al. 2013, Selim and Tüysüz 2013) (Figure 1). According to Şengör et al. (2005), all basins developed in the north of the Uludağ Range (i.e. Ulubat, Bursa, İnegöl and Yenişehir Basins; Figures 1 and 2) and the structures controlling them are defined as part of the North Anatolian Shear Zone. In this area, the southernmost members of the NAF extend in a southwest direction and control the development of the Yenişehir Basin (Yılmaz and Koral 2007, Seyitoğlu et al. 2016). The Kestel fault proceeds in an E-W direction towards the north of the Uludağ Range that is bounded by Ulubat, Bursa, and the İnegöl faults from west to east with an arc-shape geometry (i.e. Özalp et al. 2013, Özaksoy 2018) (Figure 2a). To the southwest of the Marmara Sea, the NAF represents a deformation zone widening to the west, and is widest between the Erdek Gulf in the Marmara Sea and the Edremit Gulf in the Aegean Sea (Figures 1, 2b and 2c). It proceeds further southwest from the Erdek Gulf through the Edincik, Sinekçi, Biga-Çan, Karabiga, Gündoğan, Sarıköy, Manyas, Yenice-Gönen Faults (Figure 2b). In the south, the southern branch extends to the Aegean Sea through the Edremit Basin with multiple parallel/subparallel segments (Pazarköy, Eybek, Edremit, Havran and Balıkesir Faults) (Figure 2c).

Earthquake activity (Figure S1a) and geomorphological analysis of drainage basins in the vicinity of the study area suggest that the faults are active and form the southernmost member of the NAF strike-slip domain (Yılmaz and Koral 2007, Kürçer et al. 2008, 2017, Emre and Doğan 2010, Emre et al. 2011a, b, c, Kop et al. 2016, Özalp et al. 2013, 2016, Seyitoğlu et al. 2016, Sözbilir et al. 2016a,b, Özaksoy et al. 2018, Sümer et al. 2018). For example, recent paleoseismological studies show that the most of the studied faults (e.g. Edremit, Havran, Yenice-Gönen, Manyas, Ulubat, Bursa and İnegöl Faults) has been ruptured with Holocene earthquakes (Kürçer et al. 2008, Kop et al. 2016, Özalp et al. 2013, 2016, Sözbilir et al. 2016a,b, Özaksoy 2018, Karabacak et al. 2021).

Since understanding the relationship between the present-day crustal in-situ stress field and recent deformation is critical, stress data in the vicinity of the study area has been reviewed. Figure S1a shows the focal mechanism solutions of instrumental period earthquakes ($M > 4$) while Figure S1b shows the orientation of maximum horizontal stress (SHmax), and global positioning system (GPS) velocity vectors in the region. Current plate tectonic GPS vectors reveal the presence of a westward

movement in the southern Marmara region (Meade et al. 2002, Reilinger et al. 2006, Aktuğ et al. 2013). The orientation of the maximum horizontal stress (SHmax) (Heidbach et al. 2016) is approximately WNW-ESE. Furthermore, focal mechanism solutions of instrumental period earthquakes ($M > 4$, Seyitoğlu et al. 2016), which constitute the evidence of dextral and normal faulting, are consistent with GPS vectors and SHmax orientations. To test these data in the field, kinematic studies were carried out on the fault planes.

Analysis of the fault kinematics was performed using Win-Tensor software developed by Delvaux and Sperner (2003). Results of the inverse solution process provide numeric values of the positions (direction and plunge) and the stress ratio (R) of the main (principal) stress axes (σ_1 , σ_2 , σ_3 ; compression, intermediate, extension) of the stress tensor. The fault planes and their poles were plotted on the stereographic projection and as a result, the main principal stresses, local extension, and compression directions in the region were graphically evaluated (Figures 2a, 2b, 2c and Table S1). Additionally, previous studies were compiled from Gürer et al. (2003 and 2006), Dirik et al. (2008), Sözbilir et al. (2016), Özalp et al. (2016) and Sümer et al. (2018) (Figures 2a, 2b and 2c). In this way, the effective stress directions in the Southern Marmara region were unveiled along different faults.

Results of the analysis indicate that most of the studied faults exhibit a pure strike-slip motion (e.g. Ulubat, Yenişehir, Manyas, Sarıköy, Havran and Eybek faults) while the Bursa and Edremit Faults are characterized by pure extension. The character of slip on some faults (e.g. İnegöl Fault) change along the strike from oblique normal to strike-slip fault. Details of mechanism obtained in all locations are given in Figure 2 and location photos are shown in Figure S2-S20.

The current stress orientations in the Marmara region shown in Figure S1 are supported by the kinematic data collected in the field. The data reveal that the region is under the effect of an NE-SW extension and NW-SE trending compression. The sense of slip of the fault exhibits normal or dextral strike-slip in the present stress regime according to their local geometries.

Figure S1. a. Detailed geometry of the western NAFZ (Emre et al. 2010, 2011a,b,c) and Focal mechanisms solutions of some earthquakes in the region. Yellow circles show the epicentres. Red balls show the focal solutions from Ministry of Interior Disaster and Emergency Management Presidency (AFAD- <https://depem.afad.gov.tr/faycozumleri>) ($M > 4$), while blue ones show focal solutions from Seyitoğlu et al. (2016). **b.** Current stress state in the Marmara region. Blue (Reilinger et al. 2006) and white arrows (Aktuğ et al. 2013) indicate the GPS vectors whereas yellow lines present the SHmx (Heidbach et al. 2016). (basemaps were generated using GTOPO30 digital data)

Table S1. Characteristics of stress state. D° and P° – trends and plunges of stress axes in degrees; R – ratio of stress magnitude differences; AD – angular deviation.

	coordinates	principal stress axes (D°/P°)			R	AD	sense of motion
		σ_1	σ_2	σ_3			
1	40.14138N, 28.70010E	105/31	245/52	002/20	0,48	7,5	pure strike-slip
2	40.178363N, 28.969008E	094/13	232/72	001/12	0,49	12,3	pure strike-slip
3	40.19468N, 28.95909E	217/83	127/00	037/07	0,5	2,8	pure extension
4	40.18108N, 29.20595E	118/34	305/55	211/03	0,69	36,2	strike-slip (with minor extension component)
5	40.171229N, 29.366046E	313/08	143/82	043/01	0,5	4	pure strike-slip
6	39.99883N, 29.48999E	176/67	325/20	059/11	0,66	36,7	extension (with minor strike-slip component)
7	39.943200N, 29.591879E	151/30	287/51	047/23	0,5	12,7	pure strike-slip
8	39.92295N, 29.61253E	133/33	329/56	228/07	0,5	3,6	pure strike-slip
9	39.94582N, 29.64172E	163/32	329/57	069/06	0,5	5,2	pure strike-slip
10	40.05527N, 27.92822E	131/44	268/37	017/23	0,66	27,8	pure extension
11	40.27133N, 27.52973E	113/13	255/74	020/10	0,5	6	pure strike-slip
12	40.27200N, 27.47816E	128/15	272/72	035/11	0,67	24,2	strike-slip (with minor extension component)
13	40.18438N, 27.72765E	122/05	314/85	212/01	0,58	14,9	pure strike-slip
14	40.09301N, 27.12978E	135/13	293/76	044/05	0,82	40,2	trans-tensive
15	40.32754N, 27.82932E	301/71	136/18	045/05	0,58	39	extension (with minor strike-slip component)
16	40.16258N, 27.43750E	103/03	354/81	194/09	0,63	22,1	strike-slip (with minor extension component)
17	39.91767N, 27.21769E	334/23	140/66	241/05	0,79	33,9	trans-tensive
18	39.53989N, 27.08373E	063/29	242/61	333/01	0,5	35	pure strike-slip
19	39.602944N, 27.015878E	240/18	060/72	330/00	0,49	7,6	pure strike-slip

Figure S2. **a.** Location 1 on Ulubat Fault (40.14138N, 28.70010E; view towards the north). **b.** An example of semi-eroded fault planes and slip lines along the fault scarp in the area. **c.** Results of kinematic analysis.

Figure S3. Location 2 on Ulubat Fault (40.178363N, 28.969008E).

Figure S4. Photo from close to western termination of the Bursa Fault (Location 3; 40.19468N, 28.95909E; view towards the south). The result of the fault plane analysis is given in the lower-right corner.

Figure S5. **a.** View of the Bursa Fault from a quarry (location 4) (40.18108N, 29.20595E) located on the northern branch of Yenişehir Fault (Kestel segment) **b.** An example of fault plane and slicken lines observed at the location. **c.** The results of kinematic analysis.

Figure S6. Location 5, where the Yenişehir Fault cuts the pre-Neogene bedrock (40.171229N, 29.366046E; view towards north). The yellow shaded area shows the general position of the fault plane. The result of the fault plane analysis is given in the lower-right corner.

Figure S7. a-b. The fault plane (39.99883N, 29.48999E) within the İnegöl Fault (Location 6). **c.** The results of kinematic analysis.

Figure S8. **a.** General view of location 7 (39.943200N, 29.591879E) (view towards south). The fault marks the boundary between Pre-Neogene basement and Neogene deposits (red dashed line indicates fault trace, blue arrow indicates sampling location). **b-c.** Examples of fault planes and slicken lines. **d.** The results of kinematic analysis.

Figure S9. **a.** Location 8 (39.92295K, 29.61253D). The fault defines the boundary between Pre-Neogene basement and Neogene deposits. **b.** At this location, slickenlines of different stress conditions are recognized. **c.** Kinematic analysis results of different stress periods.

Figure S10. a. The fault sets the boundary between Neogene sediments and Quaternary units. Location 9 is on the easternmost part of the İnegöl Fault (Location 8, 39.94582N, 29.64172E). b-c. Fault planes in the location and their kinematic analysis.

Figure S11. Location 10 on Manyas Fault (40.05527N, 27.92822E).

Figure S12. Location 11 on Sinekçi Fault (SIN; 40.27133N, 27.52973E).

Figure S13. Location 12 on Sinekçi Fault (40.27200N, 27.47816E).

Figure S14. Location 13 on Gündoğan Fault (40.18438N, 27.72765E).

Figure S15. Location 14 on Biga-Çan Fault (40.09301N, 27.12978E).

Figure S16. Location 15 on Edincik Fault (ED; 40.32754N, 27.82932E).

Figure S17. Location 16 on Sarıköy Fault (40.16258N, 27.43750E).

Figure S18. Location 17 on Yenice Fault (39.91767N, 27.21769E).

Figure S19. Location 18 on Havran Fault (HV; 39.53989N, 27.08373E).

Figure S20. Location 19 on Edremit Fault (39.602944N, 27.015878E).

Figure S21. Examples for the geomorphological and geological offsets in the study area. **a.** ~3 km right-lateral offset on the M. Kemalpaşa River at the westernmost end of the Ulubat Fault (from Karabacak et al. 2021). **b.** ~3 km right-lateral offset on the Nilüfer River at the easternmost end of the Ulubat Fault (from Karabacak et al. 2021). **c.** Geological map along the Kestel Fault indicated with blue star in Figure 1b (Kantar et al. 2013). **d.** Schematized field relations between the lacustrine sediments in Figure S11c and our fault mapping. The units show dextral displacement about 1.7-2.6 km. Note that yellow units indicate the Upper Miocene-Pliocene lacustrine sediments up on the pre-Cretaceous base-units. **e.** Lineations of supposed faults on satellite map (from GoogleMaps).

3. Sampling sites

Figure S22. a. general view of the east-west trending Bursa-İnegöl fault, b. one of the best outcrops of the İnegöl fault zone, c. outcrop of the samples IN-2 (calcite vein) and IN-1, d. close up view of the samples coded IN-1, e. close up view of the samples coded IN-2, f. sample coded IN-3.

Figure S23. **a.** General view of the calcite striation marks (sample TOB-B), **b.** calcite coating with striation sample coded TOB-C, **c.** outcrop of two different calcite striation marks on a fault plane, **d.** general view of sample TOB-G3, **e.** calcite veins in host rock, **f.** view of sample TOB-1.

Figure S24. **a.** General view of the nearly east-west trending vein injection in the Bursa quarry, **b.** Vein-type samples TOB-Va, TOB-Vb, TOB-Vc, TOB-Vd and TOB-Ve were taken from vein injection, **c.** sample TOB-3, **d.** alternating calcite veins within sample TOB-3, **e.** general view of sample TOB-2.

Figure S25. a. General view of the metamorphic units in Gümüştepe-Dağyenice Village, **b.** outcrop of calcite veins, sample UB-1, **c.** sample UB-5.

Figure S26. **a.** general view of the Edincik quarry, Balıkesir, **b.** outcrop of almost vertical calcite striation mark on fault plane (note that straight dashed line indicate calcite striation), **c.** general view of polished fault surface, **d.** outcrops of calcite vein in a dilatation breccia.

Figure S27. Different type of calcite precipitates in a quarry, Havran, Balıkesir; **a.** striated fault plane with calcite coating, **b.** calcite vein in the host-rock, **c.** calcite cement in a brecciated zone with striation marks, **d.** horizontal calcite striation marks on host-rock, **e-f.** calcite vein (banded).

4. Microstructural data

Microstructural investigations on oriented thin sections of calcite minerals, which are thought to have crystallized in relation to the faulting provide insight into how the crystal growth mechanisms developed and how the crystal formation is temporally related to the fault movement.

Microstructural studies were conducted through the structure-texture observation of crystals by thin-section and scanning electron microscope (SEM) analyses. SEM examinations of calcite samples were carried out at Nuclear Science Institute of the Ankara University using ZEISS EVO 40 (500 V – 30 kV).

In thin-section micrographs of sample IN-1 (Figures 28a and b), large and small calcite crystals exhibit sharp contacts with iron oxide filling. Iron-oxide is generally seen along the veinlets where they terminated to form, with sharp contacts with the subsequent formation of coarse-grained calcite crystals. Large and small calcite crystals in the iron-oxide matrix (calcite gouge, cf., Nuriel et al., 2012) network have a brecciated appearance in sample IN-3 (Figure 28b). Brecciated calcite clasts are surrounded by iron-oxide networks (angular fragments; Figure 28b). Angular, randomly oriented calcite fragments are interpreted to have been produced by microfracture during cataclasis. TOB samples are presented in Figures 28i-g. Calcite textures are defined by elongate columnar (Figure 28c) and blocky crystals (Figure 28d). Calcite bands show sharp, euhedral crystal terminations between sealing hiatuses (Figures 28c and f). The growth of columnar calcite bands is often terminated by iron-oxide layers (Figures 28c and f). Blocky calcites, on the other hand, occur usually as filling of spaces between the clasts consisting of either earlier-formed calcites or limestone host rocks (e.g., Figure 28e). The large and blocky calcites show often twinning that indicate the significance of deformation and stress events as a result of faulting (Figure 28d) (cf., Nuriel et al. 2012). Brecciated texture with the presence of iron-oxide-rich material (calcite gouge) as matrix between the angular calcite clasts is also seen in TOB-2 sample (Figure 28e). Quartz co-generation is observed in UB and HV-2 calcite vein samples. Quartz is generally evident in the form of patchy scattering and veins within calcites (Figures 28h-j). Multiple generation of striation on the parallel calcite fibres are seen in HV-2b sample (from lower right to upper left in the micrograph; Figure 28k). Striation from lower left to upper right of the micrograph affected both calcite generation. We also captured an SEM image of striated surface of HV-2 sample (Figure 29a).

Figure 28. Microstructural photomicrographs of fault-related calcite precipitates under cross polarized light (XPL). (a) sample IN-1; (b) sample IN-3; (c-d) sample TOB-1; (e) sample TOB-2; (f) sample TOB-3; (g) sample TOB-C; (h) sample UB-1; (i-j) sample HV-2a; (k) sample HV-2b; (l) sample HV-3a; (m) sample HV-4; (n) sample ED-1b; (o) sample ED-2; (p) sample ED-5b; (q) sample ED-8b; (r) sample ED-11a. Note that “B” means breccia, “T” means twinning and “HR” means host-rock.

Figure 29. SEM images of calcite showing slickenfibre (a) and slickenlines (striations; b-d) on fault planes (a) sample HV-2; (b) sample ED-1; (c) sample ED-5; (d) closer image of sample ED-5. SEM conditions are in each micrograph.

In the micrograph of HV-3a sample, an earlier calcite generation characterized by a parallel calcite fibres growth is cross-cut by an injection vein containing poorly sorted, sub-rounded fragments that define foliation parallel to the injection vein (Figure 28l). Striated calcite grains and quartz veins surrounding the calcite clasts are seen in the sample HV-4, which is another prominent example of a cataclastic texture (Figure 28m). Sample ED-1b in the outcrop appears as a striated calcite layer on the fault surface. Slickenline (striation) structures on the surface of the same sample (ED-1) are also observed in SEM images (Figure 29b). However, in thin section, this sample occurs as fragmented and micro-fractured calcite, whereby the micro-fractures are filled by a later calcite phase (calcite veinlet) (Figure 28n). Sample ED-2, which occurs as a calcite coating on the fault surface (without visible macroscopic striations), is also observed as fractured and fragmented euhedral/anhydral calcite crystals (Figure 28o). Striated and deformed calcite crystals are clearly seen in the thin section images of ED-5b and ED-8b samples (Figures 28p and q, respectively). We also captured SEM images

of ED-5 sample. Striated calcite surfaces are clearly visible (Figures 29 c and d). Calcites as vein filling with coarser, irregularly oriented euhedral-anhedral crystals are seen in the thin-section view of ED-11a (Figure 28r).

5. U-series dating of calcites

U-series dating was performed using a Nu Plasma multi-collector inductively-coupled plasma mass spectrometer (MC-ICP-MS) in the Radiogenic Isotope Facility (RIF) at the School of Earth and Environmental Sciences, The University of Queensland (UQ) following chemical treatment procedures and MC-ICP-MS analytical protocols described elsewhere (Zhao et al. 2009; Clark et al. 2012, 2014). Powdered or chipped sub-samples weighing 3–170 mg were spiked with a mixed ^{229}Th - ^{233}U tracer and then completely dissolved in concentrated HNO_3 . After digestion, each sample was treated with H_2O_2 to decompose trace amounts of organic matters (if any) and to facilitate complete sample-tracer homogenization. U and Th were separated using conventional anion-exchange column chemistry using Bio-Rad AG 1-X8 resin. After stripping off the matrix from the column using double-distilled 7N HNO_3 as eluent, 3 ml of a 2% HNO_3 solution mixed with trace amount of HF was used to elute both U and Th into a 3.5-ml pre-cleaned test tube, ready for MC-ICP-MS analyses, without the need for further drying down and re-mixing. After column chemistry, the U-Th mixed solution was injected into the MC-ICP-MS through a DSN-100 desolvation nebuliser system with an uptake rate of around 0.1 ml per minute. U-Th isotopic ratio measurement was carried out on the MC-ICP-MS using a detector configuration to allow simultaneous measurements of both U and Th isotopes (Zhou et al. 2011; Clark et al. 2014). The $^{230}\text{Th}/^{238}\text{U}$ and $^{234}\text{U}/^{238}\text{U}$ activity ratios of the samples were calculated using the decay constants given in Cheng et al. (2000). The non-radiogenic ^{230}Th was corrected using an assumed bulk-Earth atomic $^{230}\text{Th}/^{232}\text{Th}$ ratio of $4.4 \pm 2.2 \times 10^{-6}$. For the calculation of U-series ages the Isoplot/Ex 3.75 Program (Ludwig 2012) was used.

Table S2. Summary of MC-ICP-MS Uranium (U)-series age data.

location	sample no	sample type	U (ppm)	±2σ	²³² Th (ppb)	±2σ	²³⁰ Th/ ²³² Th	±2σ	²³⁰ Th/ ²³⁸ U	±2σ	²³⁴ U/ ²³⁸ U	±2σ	uncorr. age (ka)	±2σ	corr. age (ka)	±2σ
18	HV-1b	calcite striation	0.16269	0.00006	14.535	0.014	32.36	0.07	0.9528	0.0018	1.0814	0.0008	218.1	1.4	215.8	1.6
	HV-2b	calcite coating	0.20079	0.00007	2.032	0.002	301.73	0.53	1.0063	0.0016	1.0056	0.0008	697	121	697	121
	HV-3a1	calcite striation	0.95366	0.00109	406.5	1.9	7.37	0.05	1.0354	0.0059	1.0178	0.0008	>500 secular equilibrium			
	HV-3a1 rpt	calcite striation	0.95276	0.00065	409.1	1.4	7.37	0.04	1.0433	0.0044	1.0178	0.0007	>500 secular equilibrium			
	HV-3a2	calcite coating	1.00194	0.00091	415.5	1.9	7.472	0.050	1.0213	0.0050	1.0030	0.0014	>500 secular equilibrium			
	HV-3a2 rpt	calcite coating	1.00104	0.00047	419.1	1.2	7.467	0.037	1.0302	0.0042	1.0045	0.0005	>500 secular equilibrium			
	HV-3b1	calcite striation	0.78069	0.00060	418.4	1.7	5.732	0.036	1.0124	0.0049	1.0048	0.0013	>500 secular equilibrium			
	HV-3b1 rpt	calcite striation	0.78054	0.00033	420.6	1.2	5.721	0.023	1.0160	0.0030	1.0064	0.0007	>500 secular equilibrium			
	HV-3b2	calcite striation	0.62644	0.00037	683	1.7	2.836	0.012	1.0191	0.0034	1.0066	0.0011	>500 secular equilibrium			
	HV-3c1	calcite cement	0.14417	0.00005	6.337	0.005	70.02	0.13	1.0144	0.0017	1.0058	0.0008	>500 secular equilibrium			
	HV-3c2	calcite cement	0.45821	0.00028	6.710	0.016	208.04	0.83	1.0040	0.0032	1.0049	0.0009	633	122	633	122
	HV-3c3	calcite striation	0.59512	0.00032	184.38	0.68	10.014	0.053	1.0225	0.0039	1.0099	0.0007	>500 secular equilibrium			
	HV-3c3 rpt	calcite striation	0.59467	0.00039	183.68	0.51	10.044	0.042	1.0224	0.0033	1.0076	0.0006	>500 secular equilibrium			
	HV-4	calcite striation	0.09303	0.00004	42.096	0.053	7.168	0.025	1.0690	0.0036	1.0352	0.0012	>500 secular equilibrium			
	HV-5	calcite striation	0.91118	0.00071	25.50	0.13	109.94	0.81	1.0141	0.0054	1.0163	0.0012	519	67	518	67
	HV-7a	calcite vein	0.23343	0.00010	2.456	0.003	313.90	0.82	1.0885	0.0026	1.0690	0.0010	531	32	531	32
	HV-7b	calcite vein	0.33230	0.00012	16.012	0.015	70.06	0.16	1.1126	0.0024	1.1064	0.0010	389.2	7.9	388.1	8.7
	HV-7c	calcite vein	0.26126	0.00009	31.186	0.042	24.076	0.070	0.9472	0.0025	1.1942	0.0011	159.6	1	156.8	1.5
	HV-8b	calcite vein	0.11788	0.00005	4.310	0.004	86.04	0.19	1.0367	0.0021	1.0605	0.0010	347.9	5.6	347	5.7
	HV-8c	calcite vein	0.09818	0.00005	0.1485	0.0002	2069.8	5.8	1.0315	0.0025	1.0269	0.0011	555	46	555	46
	HV-8d	calcite vein	0.11244	0.00006	0.0807	0.0002	4314	13	1.0199	0.0023	1.0223	0.0010	493	25	493	25
	HV-8e	calcite vein	0.12248	0.00004	0.710	0.001	533.2	1.8	1.0189	0.0031	1.0195	0.0009	524	41	524	41
	HV-8f	calcite vein	0.20205	0.00009	15.338	0.016	42.63	0.08	1.0665	0.0018	1.0489	0.0007	635	59	633	65
15	ED-1b1	calcite striation	0.04646	0.00005	18.163	0.023	8.32	0.03	1.0716	0.0035	1.0532	0.0013	612	90	603	169
	ED-2	calcite coating	0.00301	0.00003	0.870	0.004	18.07	0.22	1.7237	0.0249	1.6098	0.0121	330	26	326	48
	ED-5b	calcite coating	0.26508	0.00017	31.649	0.056	26.25	0.08	1.0331	0.0028	1.0480	0.0011	382	10	379	11
	ED-8b	calcite striation	0.02025	0.00002	3.726	0.003	16.76	0.08	1.0162	0.0047	1.0186	0.0017	507	55	502	56
	ED-9	calcite coating	0.00316	0.00002	1.995	0.010	5.24	0.06	1.0903	0.0145	1.0969	0.0067	363	41	347	56
	ED-11a	calcite vein	0.01462	0.00003	4.514	0.007	9.95	0.06	1.0128	0.0059	1.0274	0.0025	408	29	399	30
	ED-11b	calcite vein	0.06668	0.00004	6.078	0.005	34.16	0.08	1.0262	0.0024	1.0304	0.0012	456	19	453	19
	ED-11c	calcite vein	0.00510	0.00003	2.828	0.010	5.51	0.06	1.0071	0.0123	1.0120	0.0044	507	149	490	150
7	IN-1a	calcite striation	0.23553	0.00014	23.090	0.034	36.08	0.09	1.1657	0.0025	1.1168	0.0014	722	139	720	196
	IN-1c	calcite striation	0.62570	0.00032	9.678	0.024	198.50	0.73	1.0119	0.0028	1.0065	0.0008	>500 secular equilibrium			
	IN-1d	calcite vein	0.61490	0.00033	7.407	0.013	256.79	0.77	1.0194	0.0025	1.0048	0.0008	>500 secular equilibrium			
	IN-2	calcite vein	0.07251	0.00006	0.689	0.001	328.6	1.5	1.0284	0.0043	1.0052	0.0018	>500 secular equilibrium			
	IN-2a	calcite vein	0.08336	0.00007	6.038	0.012	43.71	0.18	1.0436	0.0038	1.0215	0.0016	>500 secular equilibrium			
	IN-2b	calcite vein	0.07624	0.00008	5.144	0.008	45.97	0.17	1.0223	0.0036	1.0175	0.0016	648	157	646	157
	IN-2c1	calcite vein	0.13770	0.00010	0.639	0.001	667.9	2.1	1.0219	0.0029	1.0046	0.0012	>500 secular equilibrium			
	IN-2c2	calcite vein	0.06945	0.00005	0.622	0.001	349.5	1.3	1.0320	0.0037	1.0049	0.0017	>500 secular equilibrium			
	IN-2d1	calcite vein	0.03710	0.00010	1.893	0.004	62.07	0.28	1.0435	0.0050	1.0218	0.0024	>500 secular equilibrium			

	IN-2d2	calcite vein	0.09501	0.00007	2.254	0.006	132.05	0.64	1.0323	0.0041	1.0101	0.0012	>500 secular equilibrium			
	IN-2e	calcite vein	0.03093	0.00005	4.488	0.008	21.42	0.10	1.0240	0.0045	1.0368	0.0021	402	21	399	21
	IN-2f	calcite vein	0.04734	0.00007	1.649	0.004	89.09	0.46	1.0230	0.0050	1.0124	0.0017	>500 secular equilibrium			
	IN-2g	calcite vein	0.11035	0.00007	1.758	0.003	191.29	0.58	1.0044	0.0027	1.0080	0.0014	544	52	544	52
	IN-3a	brecciated calcite	0.19100	0.00007	23.464	0.032	25.57	0.07	1.0351	0.0024	1.0309	0.0012	528	35	525	37
	IN-3b	brecciated calcite	0.20387	0.00009	12.701	0.018	50.12	0.16	1.0291	0.0030	1.0277	0.0009	509	34	508	34
5	BI-1	calcite vein	0.03968	0.00003	7.759	0.006	20.60	0.06	1.3272	0.0038	1.2872	0.0018	346.5	6.6	343	22
	BI-2	calcite vein	0.07711	0.00005	12.835	0.019	103.73	0.23	5.6904	0.0101	6.7168	0.0063	144.4	0.5	143.9	6.9
	BI-AK	calcite vein	0.22665	0.00009	10.585	0.017	68.06	0.22	1.0475	0.0029	1.0420	0.0009	497	28	495	29
4	TOB-Va	calcite vein	0.04231	0.00006	4.956	0.012	25.95	0.11	1.0018	0.0038	1.0035	0.0022	630	169	626	169
	TOB-Vb	calcite vein	0.03242	0.00007	0.325	0.001	299.4	1.2	0.9901	0.0040	1.0005	0.0030	496	59	496	59
	TOB-Vc	calcite vein	0.04305	0.00006	0.460	0.001	282.4	1.1	0.9945	0.0038	1.0012	0.0018	538	70	538	70
	TOB-Vd	calcite vein	0.11947	0.00009	5.465	0.008	66.75	0.20	1.0064	0.0027	1.0014	0.0014	>500 secular equilibrium			
	TOB-Ve	calcite vein	0.27435	0.00013	4.441	0.011	188.45	0.71	1.0055	0.0030	1.0012	0.0009	>500 secular equilibrium			
	TOB-3V1	calcite vein	0.01503	0.00006	1.516	0.003	31.47	0.25	1.0459	0.0090	1.0219	0.0037	>500 secular equilibrium			
	TOB-3V2	calcite vein	0.01586	0.00006	14.053	0.034	3.70	0.03	1.0797	0.0091	1.0442	0.0029	>500 secular equilibrium			
	TOB-3V3	calcite vein	0.01251	0.00006	3.249	0.011	12.32	0.10	1.0545	0.0095	1.0436	0.0050	548	163	542	169
	TOB-3a	calcite striation	0.02317	0.00007	50.27	0.13	1.633	0.009	1.1674	0.0069	1.1240	0.0029	>500 secular equilibrium			
	TOB-3b	calcite striation	0.02564	0.00007	32.672	0.082	2.701	0.015	1.1342	0.0065	1.0944	0.0029	>500 secular equilibrium			
	TOB-1	calcite striation	0.02810	0.00009	57.35	0.16	1.730	0.010	1.1635	0.0069	1.1242	0.0028	>500 secular equilibrium			
	TOB-2	calcite striation	0.03016	0.00008	101.57	0.25	1.074	0.007	1.1914	0.0079	1.1263	0.0036	>500 secular equilibrium			
	TOB-B	calcite striation	0.14140	0.00010	178.78	0.35	2.620	0.012	1.0917	0.0045	1.0835	0.0014	423	20	388	160
	TOB-C	calcite striation	0.02987	0.00005	10.100	0.019	9.200	0.058	1.0254	0.0064	1.0236	0.0022	534	94	525	98
	TOB-D	calcite striation	0.01391	0.00004	17.500	0.046	2.824	0.024	1.1707	0.0100	1.1541	0.0028	377	25	347	169
	TOB-G	calcite striation	0.02791	0.00006	126.43	0.23	0.767	0.005	1.1453	0.0073	1.1131	0.0032	492	59	492	59
	TOB-G2	calcite striation	0.00929	0.00004	28.72	0.10	1.080	0.008	1.1006	0.0084	1.0916	0.0044	>500 secular equilibrium			
	TOB-G3	calcite striation	0.01048	0.00004	25.772	0.070	1.300	0.014	1.0533	0.0120	1.0469	0.0040	>500 secular equilibrium			
	TOB-H	calcite vein	0.30125	0.00014	30.442	0.066	30.079	0.094	1.0018	0.0023	1.0042	0.0012	596	72	593	72
2	UB-1a	calcite vein	0.01425	0.00006	51.87	0.16	0.891	0.008	1.0688	0.0094	1.0385	0.0049	>500 secular equilibrium			
	UB-1c	calcite vein	0.00852	0.00004	22.431	0.071	1.175	0.012	1.0201	0.0108	1.0040	0.0046	>500 secular equilibrium			
	UB-5a	calcite vein	0.00592	0.00005	7.632	0.049	2.745	0.036	1.1665	0.0171	1.1468	0.0083	390	55	360	199
1	UF-1	calcite vein	0.13184	0.00004	130.25	0.14	3.127	0.008	1.0182	0.0025	1.0307	0.0006	412	11	381	37

Figure S30. The graphical distribution of dated samples (between 200 and 800 ka BP) on Inegöl (a), Yenisehir (b), Kestel (c), Ulubat (d), Edincik (e) and Havran Faults (f). The DensityPlotter 8.5 software was used for the graphs (Vermeesch 2012). PDP: probability density plot curve, KDE: kernel density estimate curve, rectangles: histograms of the samples. Note that yellow circles on the x-axes represent the results of the samples.

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