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BRIEF NOTE ON NEW DATA RELATED TO THE CHRONOSTRATIGRAPHIC LOCATION OF CUMAOVASI VOLCANICS

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This study was made in order to contribute for reviewing Neogene stratigraphy proposed in previous studies (Figure 2a, b, c, d) based on new K/Ar ages obtained from acidic volcanics in Çubukludağ section (Figure 1a, b) of the Akhisar Depression (Kaya, 1979).

Starting with Early Miocene extension, the infill of Çubukludağ half graben under the control of İzmir fault proposed by Kaya et al. (2007) (ancestor of Tuzla fault proposed by Emre et al., 2005) Is formed by deposits of Bahçecik, Yeniköy and Tahtalı formations from bottom to top and of Cumaovası volcanics (Figure 2e). The lower part of Bahçecik formation symbolizing the Early Miocene deposition does not crop out over the area, because Tuzla fault has generated a depression. The observable part of the sedimentary deposit is formed by lacustrine and fluvial deposits consisting of lignite layers at bottom and by the overlying crimson-maroon lacustrine fan delta deposits with distinctive contacts which reflect a probable unconformity. Algal limestone interlayers symbolizing temporal lacustrine deposit take place within fan delta. Yeniköy formation which unconformably overlies Bahçecik formation and evolves from alluvial environment into lacustrine environment, and Tahtalı formation (Göktaş, 2013) which is formed from bottom to top by alluvial, fluvial and lacustrine deposits reflect Middle Miocene sedimentation (Figure 2e). At the main explosion phase of phreatomagmatic Cumaovası volcanism which began in lacustrine environment and where Yeniköy formation was deposited in, the western side of the basin was enclosed with the emplacement of multi layered ignimbrites following the base surge deposition. Then, Tahtalı formation was deposited to the east of the volcanic axis trending in NE-SW direction. Upper Miocene alluvial fan delta deposits overlying Cumaovası volcanics with angular unconformity forms the youngest Neogene infillings of the study area.

1. Cumaovası Volcanics

Cumaovası volcanics contribute to lacustrine suspension deposition which forms the upper section of Yeniköy formation with felsic ash fall interlayers and mainly show a lateral relationship with Tahtalı formation. These volcanics reflect calc alkaline rhyolitic volcanism which have become active in late Middle Miocene and consist of pyroclastics at bottom and lavas in the form of domal flows at top (Figure 1 and 2e).

Akartuna (1962) is the first investigator who mentioned about the presence of rhyolitic volcanics in Çubukludağ basin. Previous studies have begun with Zucci (1970) then continued with Innocenti and Mazzuoli (1972), Borsi et al. (1972) ("Izmir-Lebedos rhyolites"). The products of rhyolitic volcanism have been called as "Cumaovası volcanics" since Eşder and Şimşek (1975) (Eşder and Şimşek, 1976; Özgenç, 1975, 1978; Eşder, 1988; Genç et al., 2001; Wipp, 2006; Uzel and Sözbilir, 2008; Karacık and Genç, 2009, 2011,2012; Karacık, 2011; Karacık et al., 2011).

Ignimbrites flowing into the lake where Yeniköy formation had been deposited and the outer zones of rhyolitic lavas were subjected to strong devitrification

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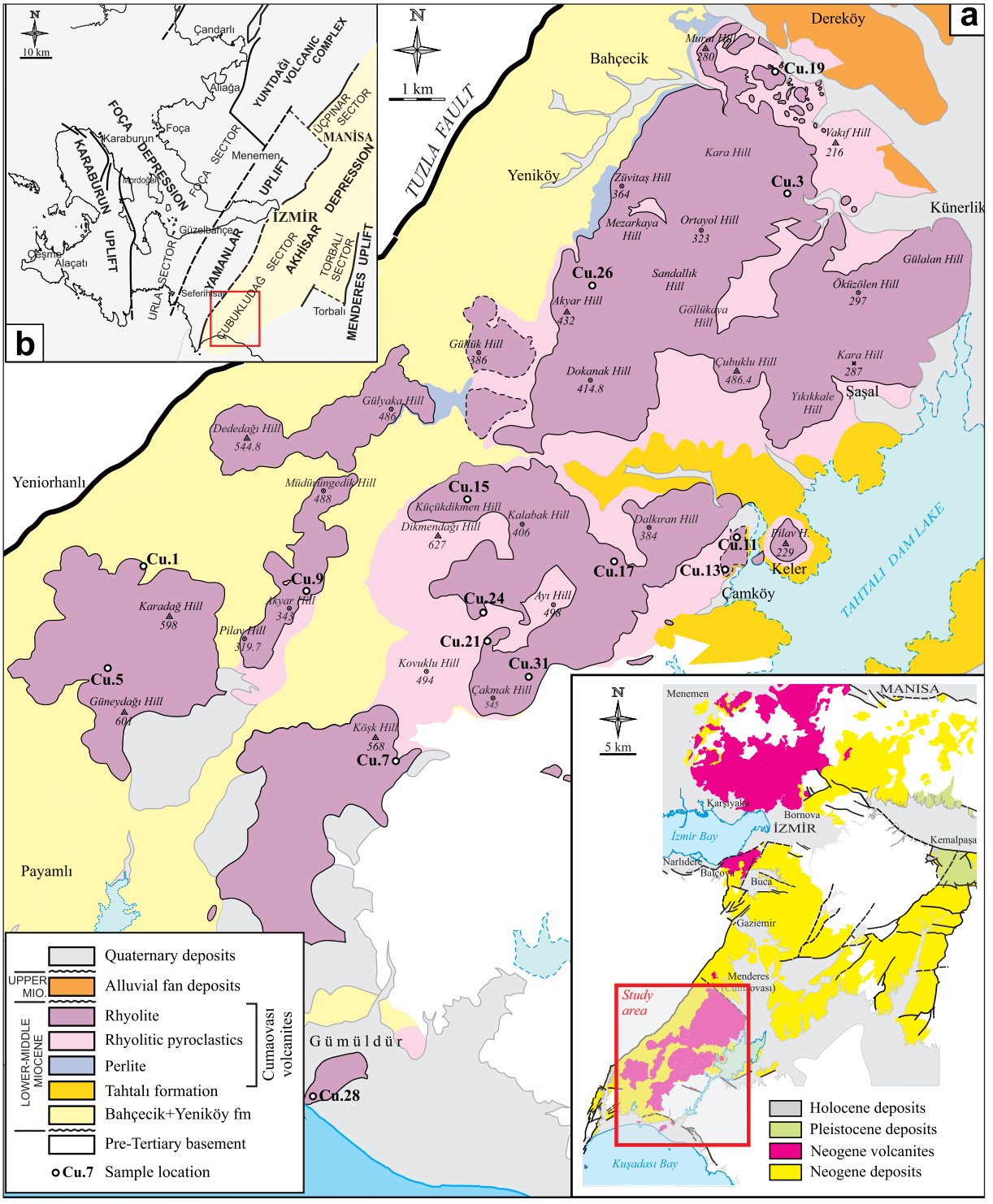

Figure 1- Simplified geological map of Çubukludağ basin (a) and its geographical location in "Akhisar Depression" (Kaya (1979) (b).

and became perlitised (Figure 1). Laterally continuous perlitisation observed especially on basal sections of lavas reflects the entrance of domal flows into the water. Lavas are generally blocky decomposed, bluish dark gray, pink, crimson, maroon and pale yellowish gray, flow laminated or massive, and spatially cooling columns have been developed. Vapor phase products are also common and gas spaces filled with opal and chalcedony, lithophyses and spherulites formed on the outer zones of lava masses are frequently

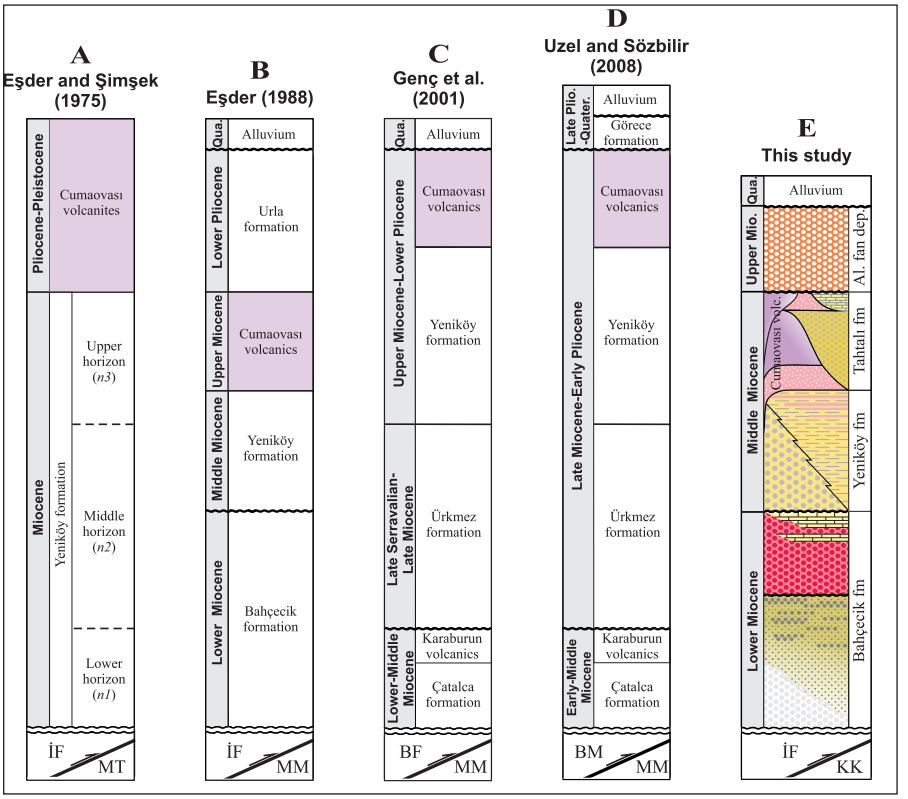

Figure 2- Stratigraphical models proposed for Çubukludağ basin infilling. BM: Bornova melange, BF: Bornova Flysch, İF: İzmir Flysch, KK: Cycladic Complex (Candan et al., 2011), MM: Menderes Massif, MT: Metamorphic Basement.

encountered. Wipp (2006) has determined garnet crystals (almandine – spessartine) that have grown up to 1,5 cm mostly in lithophye and seldom in compact lavas.

Total of 15 chemical and 5 radiometric samples were taken from rhyolitic lavas which were less affected from hydrothermal alteration and devitrification in order to perform analysis. XRF and K/Ar analyses of samples were performed in ACME (Canada) laboratories.

1.1. Major Element Geochemistry

Results of the major element analysis of samples taken from rhyolitic lavas and the location map of the study area are given in table 1 and figure 1, respectively.

All high siliceous lava samples called “rhyolite” in total alkaline-silica diagram of Le Bas et al. (1986) plot on the sub alkaline region and are calc alkaline in

Table 1- The result of major element analysis of Çubukludağ rhyolites. Samples of which radiometric analyses were carried out are shown in yellow color.

Sample	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO	Cr_2O_3	LOI	Total
CU 1	79.39	11.40	0.75	0.11	0.19	1.20	4.83	0.09	0.03	<0.01	<0.002	2.0	99.98
CU 3	77.48	11.49	1.35	0.06	0.39	2.94	4.36	0.05	0.03	0.02	0.003	1.8	99.98
CU 5	79.63	10.84	0.35	0.07	0.23	2.34	5.08	0.02	0.03	<0.01	<0.002	1.4	99.96
CU 7	71.00	15.51	0.70	0.22	1.02	2.95	6.79	0.30	0.06	<0.01	<0.002	1.3	99.85
CU 9	75.61	12.46	1.44	0.15	0.50	2.28	5.20	0.08	0.03	0.01	<0.002	2.2	99.97
CU 11	75.31	12.47	1.16	0.14	0.42	2.95	4.77	0.04	0.01	<0.01	0.006	2.7	99.98
CU 13	75.84	12.29	1.00	0.12	0.42	2.75	4.68	0.05	0.02	<0.01	<0.002	2.8	99.98
CU 15	77.21	12.59	1.02	0.06	0.25	3.09	4.62	0.06	0.02	0.03	<0.002	1.0	99.99
CU 17	76.84	12.49	1.18	0.02	0.37	3.51	4.56	0.04	0.02	0.02	0.002	0.9	99.98
CU 19	78.91	10.83	1.08	0.04	0.44	3.10	4.16	0.05	0.01	0.04	<0.002	1.3	100.00
CU 21	76.91	12.51	1.10	0.09	0.36	3.31	4.70	0.07	0.02	0.03	<0.002	0.9	99.98
CU 24	76.23	12.85	1.42	0.03	0.40	3.28	4.81	0.06	0.02	0.03	<0.002	0.9	99.97
CU 26	79.03	10.82	1.14	0.16	0.42	3.24	4.13	0.03	0.02	0.08	0.003	0.9	99.98
CU 28	76.63	12.56	0.60	0.03	0.15	1.14	7.83	0.14	0.03	<0.01	<0.002	0.8	99.93
CU 31	77.45	12.15	1.19	0.05	0.35	2.94	4.55	0.05	0.02	0.02	<0.002	1.2	99.98

character (Figure 3a). Samples which were assessed in K_2O vs SiO_2 diagram of Le Maitre et al. (1989) accumulate in High-K rhyolitic area (Figure 3b).

1.2. Geochronology

K/Ar age (12,5±3,5 Ma) which Borsi et al. (1972) have obtained from rhyolites has been used as the only data for a long time in previous studies related with Cumaovası volcanics though it has a high margin of error. According to the generalized stratigraphies of Genç et al. (2001) and Uzel and Sözbilir (2008) Cumaovası volcanics are located above Upper Miocene-Lower Pliocene "Yeniköy formation" in accordance with the proposal of Akartuna (1962) (Figure 2c, d). K/Ar ages indicating late Early Miocene of Karacık and Genç (2009) vary between 17,2 – 17,9 Ma.

However, in this study K/Ar ages varying between 13,0 – 13,8 Ma were obtained (Table 2). Layers of felsic ash fall taken by Sözbilir et al. (2011) in "Kocaçay basin" (Torbalı sector of Akhisar depression: Figure 1b) which have an Ar^{40}/Ar^{39} age of 13.8±0.1 Ma were associated with Cumaovası rhyolitic volcanism (Göktaş, 2012). The difference in geochronological data of this study with Karacık and Genç (2009) might support two staged volcanism argued by Özgenç (1978).

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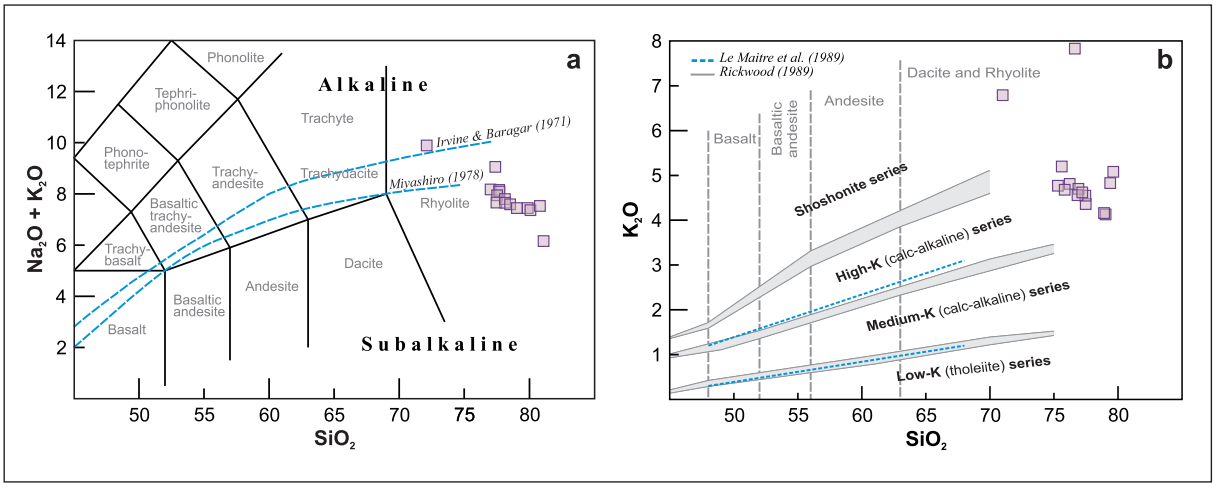

Figure 3- Evaluation of Karaburun volkanites in a) TAS (Le Bas et al., 1986) and b) K_2O vs SiO_2 (Le Maitre et al., 1989) diagrams.

Table 2- The result of radiometric analyses obtained from Cumaovası rhyolites.

Sample	Material	(%)K	$^{40}Ar_{rad}$ (nl/g)	(%) $^{40}Ar_{air}$	Age (My)
CU 3	K-spar	3.28	1.729	68.7	13.8 ± 0.4
CU 5	K-spar	4.52	2.337	86.9	13.5 ± 0.4
CU 7	K-spar	3.98	1.978	69.5	13.0 ± 0.4
CU 15	K-spar	7.23	3.787	14.0	13.7 ± 0.4
CU 24	%15 Q, %85 plj	2.57	1.345	92.8	13.7 ± 0.5

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