Sedimentology Working Group

Dokuz Eylül University

Institute of Marine Science and Technology

SEDIMENTOLOGY WORKING GROUP (SÇG) 2025 WORKSHOP

WITH INTERNATIONAL PARTICIPANTS

MARINE DEPOSITIONAL SYSTEMS & CLIMATE CHANGE

FIELD TRIP GUIDE

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13 September 2025

Field Trip:

The Mesozoic-Cenozoic stratigraphy of Karaburun-İzmir, Türkiye

11-14 SEPTEMBER 2025

14 September 2025

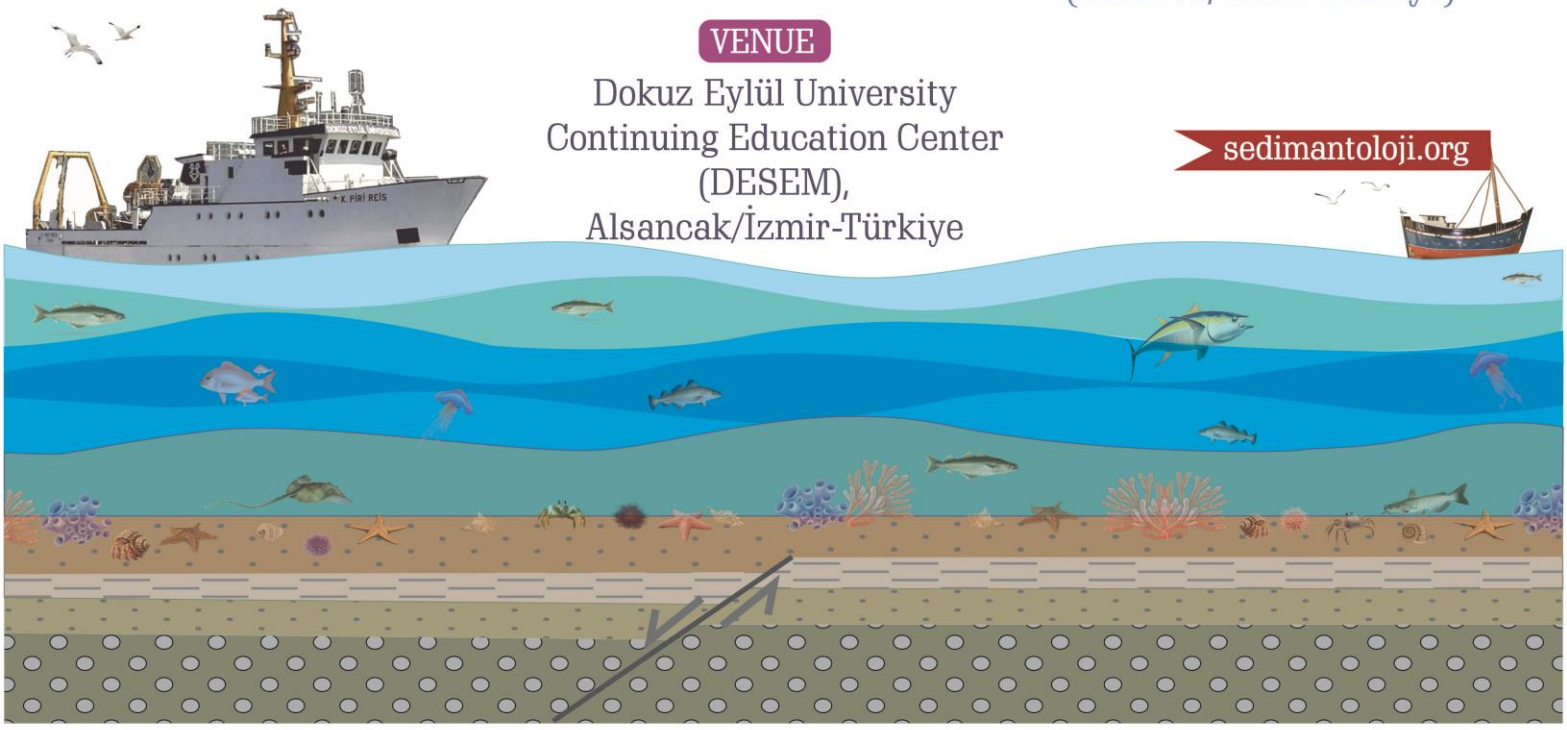
Social Trips:

- İzmir Gulf sea tour
- Yeşilova ve Hassıhöyük archaeological site (Bornova, İzmir-Türkiye)

VENUE

Dokuz Eylül University Continuing Education Center (DESEM), Alsancak/İzmir-Türkiye

sedimantoloji.org



SUPPORTING INSTITUTIONS & ORGANIZATIONS

TÜRKİYE PETROLLERİ ANONİM ORTAKLIĞI

IAS

JEOLOJİ MÜHENDİSLERİ ODASI TMMOB

İZMİR BÜYÜKŞEHİR BELEDİYESİ

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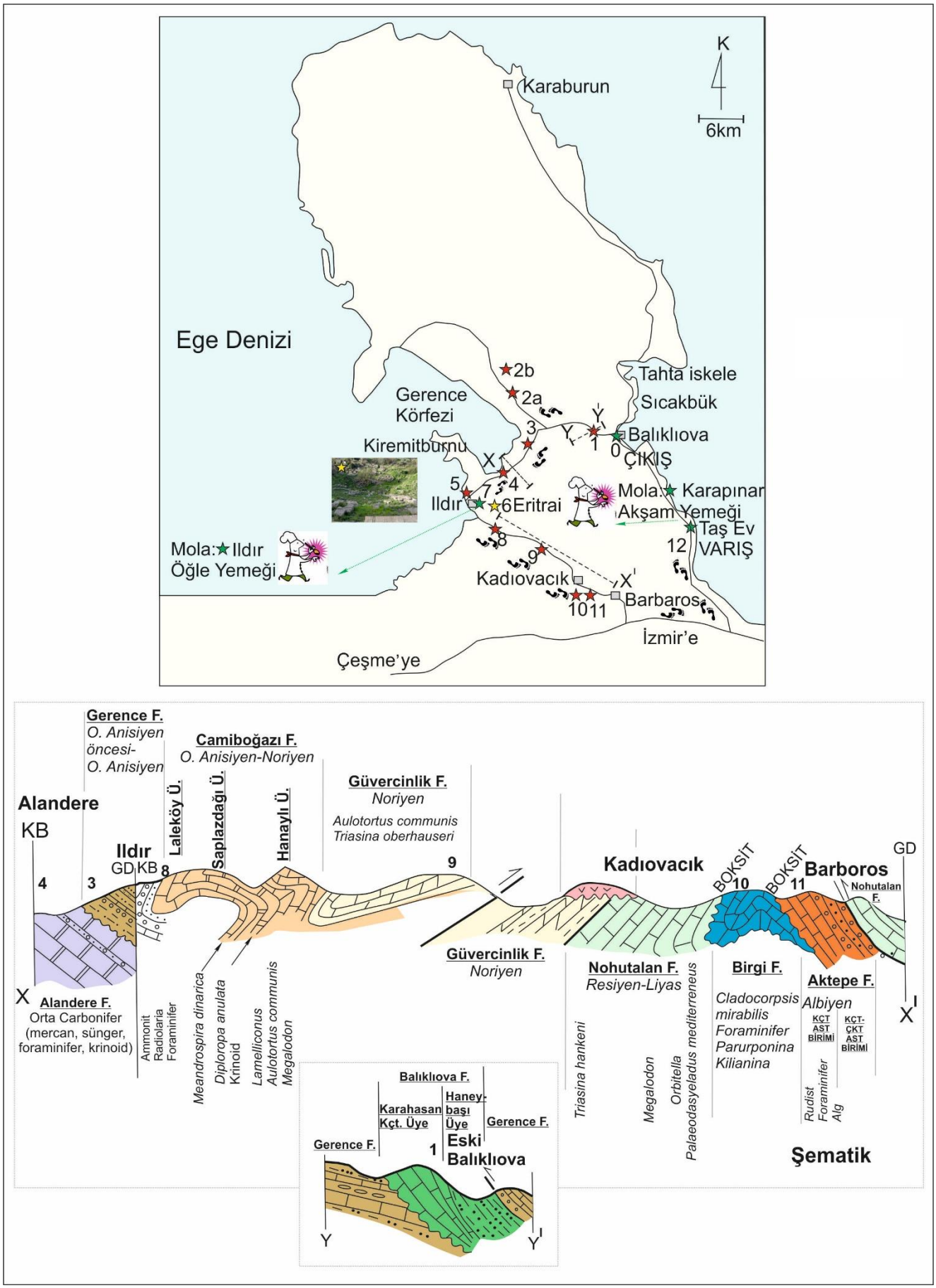

Figure 1. Route map of the SÇG-2025 geological field excursion in the Karaburun Peninsula and the cross-sectional views of lithostratigraphic units (İşintek, 2002 and Erdoğan et al., 1990).

FIELD EXCURSION STOPS

Stop 1a, b: Around the old Balıklıova Village (8a), pelagic limestones belonging to the Karahasan Limestone Member of the Balıklıova Formation and mud–shale outcrops belonging to the Haneybaşı Member can be observed. In this area, the Balıklıova Formation unconformably overlies the Gerence Formation. This relationship can be traced from a distance at stop 8b (Figures 1–6).

Stop 2a, b: Along the Gerence–Karareis road, at Harapağıl locality (2a), pelagic mudstones, volcanogenic sandstones, deep-marine cherts (radiolarites), cherty limestones, mafic volcanic lavas and tuffs belonging to the İdecik Unit are observed. Proceeding northwards along the road (2b), the Dikendağı Formation is encountered. Sandstone–mudstone alternations, mud shales, as well as debris-flow deposits with lydite pebbles of the Dikendağı Formation can be examined along the road.

Stop 3: Along the Ildır–Balıklıova road, at the Kiremitburnu ridges, red-colored deep-marine cherts and light green pelagic mudstones of the Gerence Formation, and the overlying slope to neritic limestones of the Camiboğazı Formation can be observed. Within the mudstones of the Gerence Formation, casts of pelagic bivalves may be found. From the observation point, the contact between the Gerence and Camiboğazı formations can be examined and discussed from a distance.

Stop 4: Along the Ildır–Balıklıova road, at the Alandere locality, dark grey neritic limestones of the Alandere Formation are exposed. Within the limestones of the Alandere Formation, corals, algae, bryozoans, sponges, brachiopods, and crinoid fossils can be observed. From the observation point, the contacts between the Alandere, Gerence, and Camiboğazı formations can be traced and discussed from a distance.

Stop 5: Along the Ildır–Balıklıova road, at the old Yeldeğirmenleri Cape locality, green-colored turbiditic sandstone–mudstone outcrops of the "Paleozoic" Dikendağı Formation can be observed. Intercalated and blocky slices of black deep-marine chert (lydite) are well exposed within these outcrops.

Stop 6: Within Ildır Village and on the hill at its western margin, the remains of the ancient city of Erythrai can be examined. In the walls of the agora and the amphitheater, conglomerates derived from the Gerence and Camiboğazı formations observed nearby, as well as Neogene andesitic lavas forming the ancient hill, were utilized as building materials.

"The ancient name of Ildır Village was Erythrai. The term Erythrai is believed to have been derived from the Greek word erythros, meaning 'red', likely referring to the red color of the local soils, hence 'Red City'. Another hypothesis suggests that the name came from Erythros, the son of Rhadamanthes of Crete, the legendary founder of the city.

Findings in the city indicate continuous settlement in the area since the Early Bronze Age. During the second colonization period, the city was ruled by Knopos, a descendant of King Kadros of Athens. Initially governed as a monarchy, the city was later ruled by Basileis—kings elected from royal lineage by the people. The city participated in the Panionion, the religious and political union of Ionian cities. During the short tyranny of Pythagoras, Erythrai gained importance by producing and exporting millstones.

The city later fell under Lydian and subsequently Persian control. Like other Ionian cities, Erythrai revolted against Persian domination but regained independence in 334 BC under Alexander the Great. After Alexander's death, the city changed hands several times, eventually coming under the control of the Kingdom of Pergamon, and in 133 BC it became a free city within the Roman Empire. During this period, Erythrai became renowned for its wine, goats, millstones, and its female oracles Sibyl and Herophile. In the 1st century BC, earthquakes, wars, and Roman plundering caused major destruction, and by the 16th century the settlement became known as Ilderen and later Ildırı.

Excavations conducted between 1963–1966 by Prof. Hakkı Gültekin, and later by Prof. Ekrem Akurgal, unearthed the ancient theater on the northern slope of the acropolis, believed to have been constructed in the late 3rd century BC. Investigations on the acropolis plateau revealed remains of the Temple of Athena. The city was enclosed by walls approximately 5 km in length. The theater was partially excavated but restoration works were left incomplete. Archaeological research uncovered pottery, stone, and terracotta figurines from the 6th–7th centuries BC, representing the oldest cultural finds of Erythrai." (wikipedia.org)

Stop 7: Lunch break at Ildır Village.

Stop 8: Near Ildır, along the Ildır–Kadıovacık road, pink pelagic nodular limestones of the Laleköy Member of the Camiboğazı Formation, together with conglomerate and mudstone outcrops of the Gerence Formation, can be observed. The contact between the Camiboğazı and Gerence formations can be discussed. Ammonite fossils may possibly be found within both formations at the contact zone.

Stop 9: Along the Ildır–Kadıovacık road, dolomitic limestones, dolomites, red clays, yellow and green clays, and very shallow-marine (beach) sandstone deposits rich in feldspar and quartz belonging to the Güvercinlik Formation are observed. The contact between the Güvercinlik Formation and the Camiboğazı Formation (Hanaylı Member) can be traced and discussed from a distance.

Stop 10: Along the dirt road connecting the Barboros–Kadıovacık road to Birgi Village, outcrops of the Birgi Formation are exposed. Light brown micritic limestones of the Birgi Formation contain abundant Cladocoropsis mirabilis sponges. The contact between the Birgi and Nohutalan formations can be observed.

Stop 11: West of Barboros Village, outcrops belonging to the Limestone Subunit and the Limestone–Conglomerate Subunit of the Aktepe Formation are exposed. Within the Limestone Subunit, rudist, bivalve, and gastropod fossils can be observed. The contact between the Aktepe and Birgi formations can be examined.

Stop 12: Dinner at the Taş Ev

PRE-NEOGENE STRATIGRAPHY OF THE KARABURUN PENINSULA
(Çakmakoğlu and Bilgin, 2006)

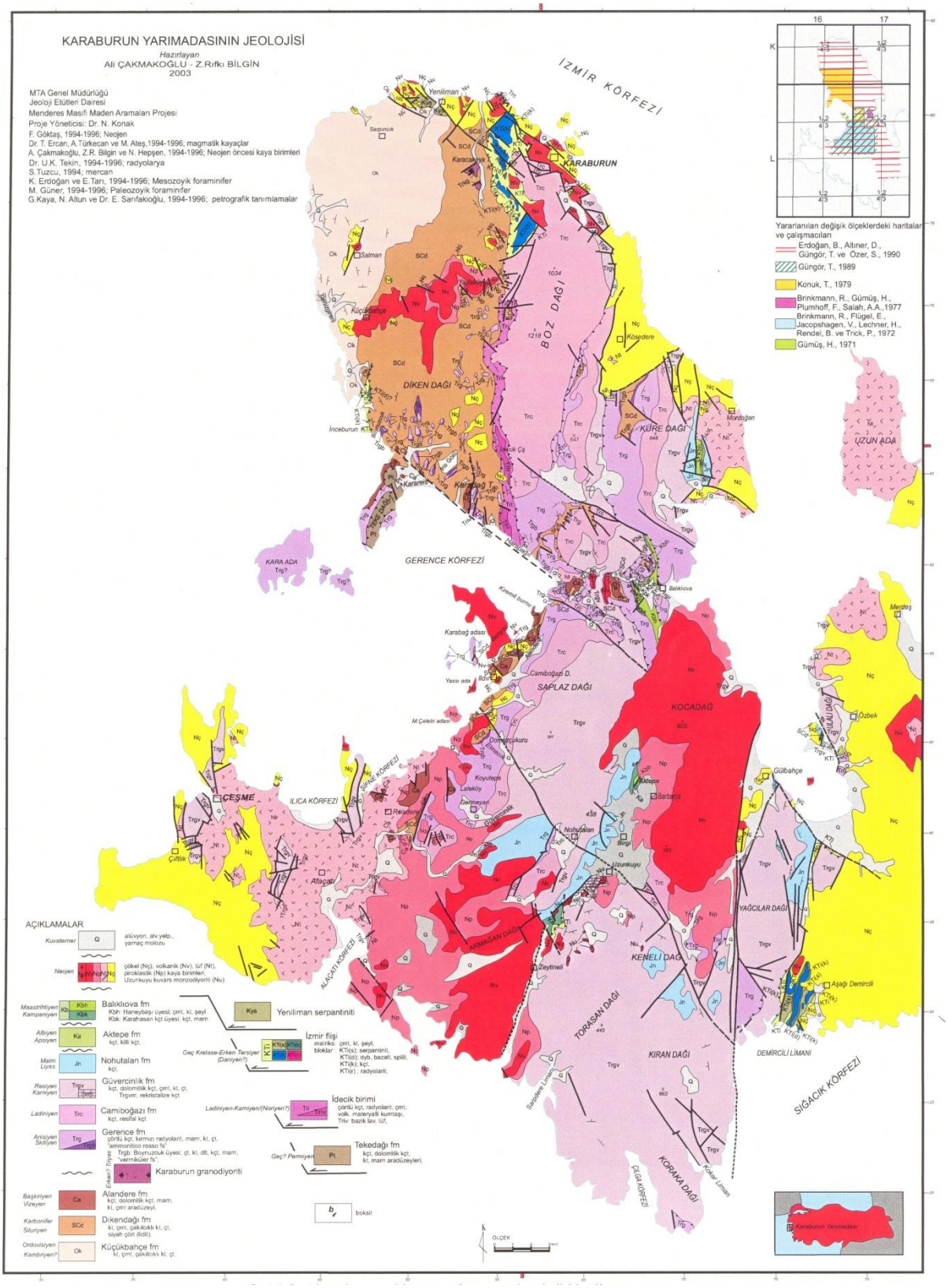

Figure 2. Pre-Neogene geological map and stratigraphy of the Karaburun Peninsula (Çakmakoğlu and Bilgin, 2006).

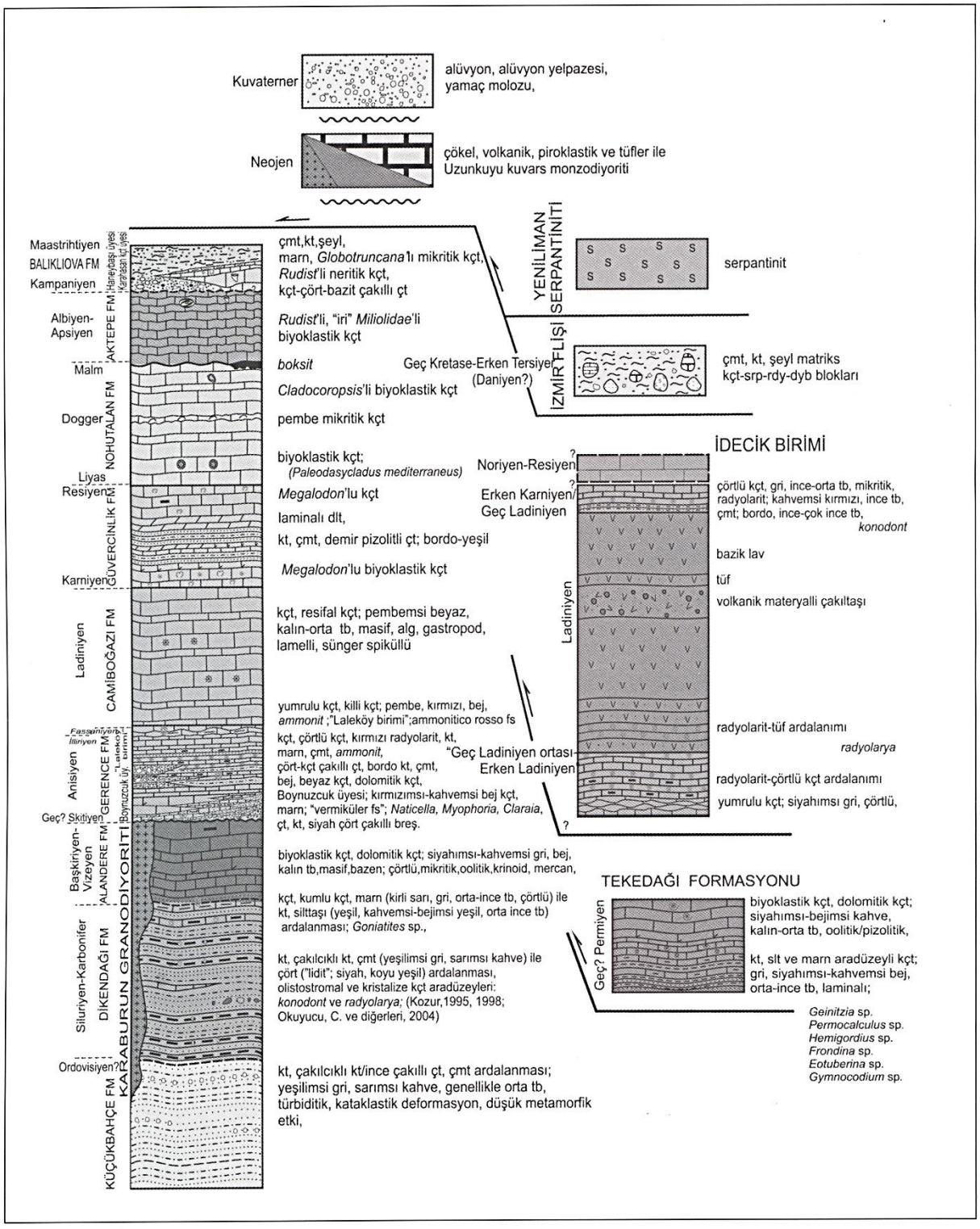

Figure 3. Pre-Neogene stratigraphy of the Karaburun Peninsula (Çakmakoğlu and Bilgin, 2006).

GEOLOGY AND STRATIGRAPHY OF THE CENTRAL PART OF THE KARABURUN PENINSULA

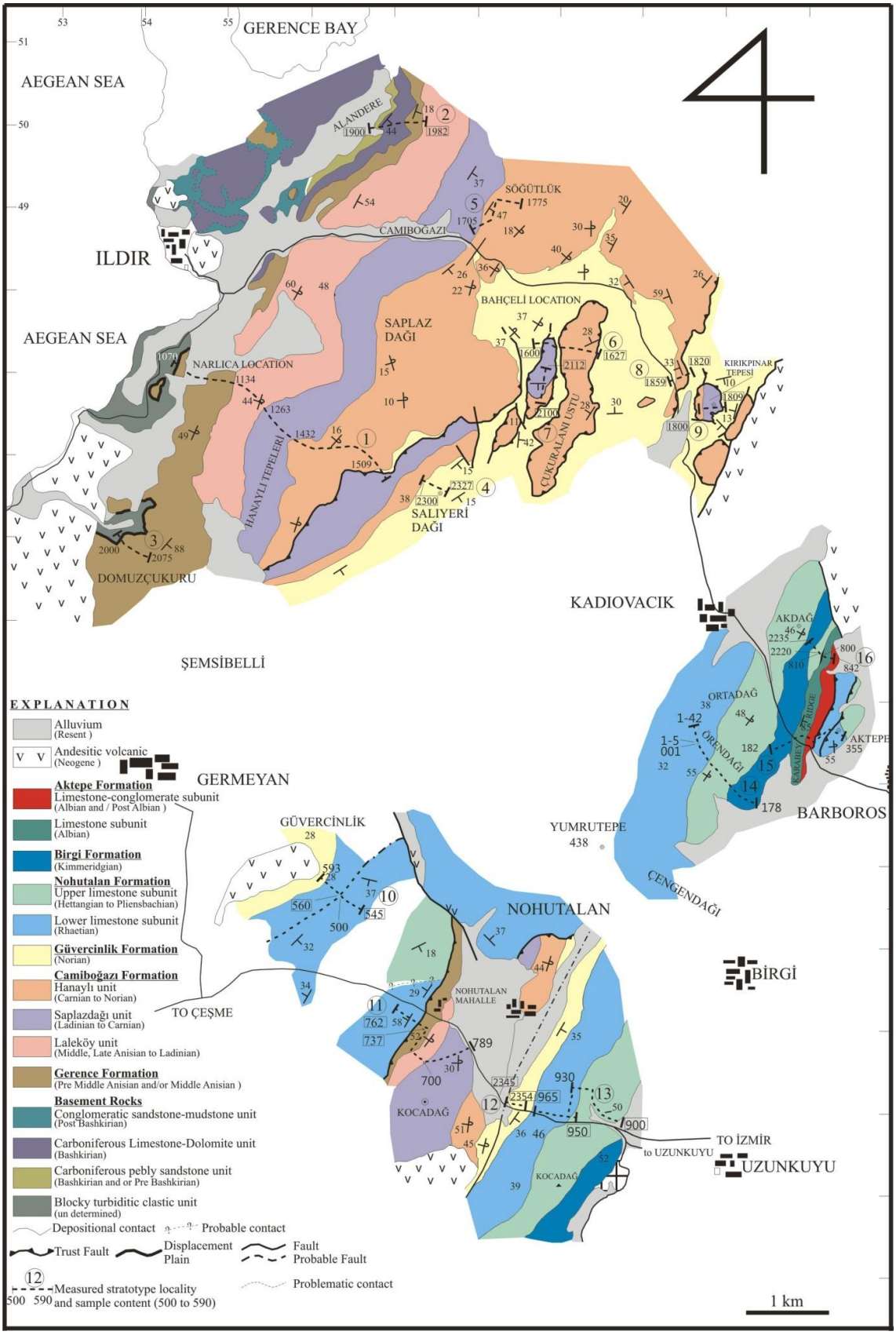

Figure 4. Geological map of the central part of the Karaburun Peninsula (İşintek, 2002; after Brinkmann et al., 1972, and Erdoğan et al., 1990).

BASEMENT ROCKS

In the central part of the Karaburun Peninsula, basement rocks are exposed around Ildır. From bottom to top, a conglomeratic sandstone unit and a limestone–dolomite unit occur in conformable succession. Around these two units, a conglomeratic sandstone–mudstone unit and a blocky turbiditic clastic unit are present; however, the contacts between these two units, as well as with the underlying units, are problematic and uncertain. The Conglomeratic Sandstone and Limestone–Dolomite units correspond to the Alandere Formation of Erdoğan et al. (1990) and Çakmakoğlu & Bilgin (2006). The other two units resemble the Karareis Formation (deep-marine equivalent of the Gerence Formation in Erdoğan et al., 1990) and correspond to the Dikendağı Formation of Çakmakoğlu & Bilgin (2006).

The Limestone–Dolomite unit, representing part of the Alandere Formation, contains abundant foraminifera, corals, algae, brachiopods, and sponges, and is Bashkirian in age (Figures 1–6).

KARAREIS FORMATION

According to Erdoğan et al. (1990), the Karareis Formation is composed of gray sandstones, mudstones, thin-bedded black cherts, and lenses of pelagic limestone. Olistostromal limestone blocks of Carboniferous age occur within the formation. The age of the Karareis Formation is assigned to Scythian–Late Anisian, and it laterally interfingers with the Gerence Formation (Erdoğan et al., 1990). The entire unit corresponds to the Paleozoic Dikendağı and Tekedağı formations and the Triassic İdecik Unit of Çakmakoğlu and Bilgin (2006).

DİKENDAĞI FORMATION (Çakmakoğlu and Bilgin, 2006)

The upper part of the Karareis Formation corresponds to the Dikendağı Formation. However, its age is assigned to Silurian–Carboniferous by Çakmakoğlu & Bilgin (2006). The formation is composed of light green to green turbiditic sandstones and mudstones, mud shales, and debris-flow deposits with black chert pebbles. Numerous intercalated slices and blocks of black chert (lydite) and carbonates occur within the formation.

GERENCE FORMATION

This formation consists of dark grey thin- to medium-bedded micritic limestone, radiolarian-bearing grey and red micritic limestone, oolitic limestone, ammonite-bearing pink limestone, light green mudstone, sandstone, sandy limestone, dolomitic limestone, chert-interbedded limestone, red radiolarian thin-bedded chert, red ammonite-bearing nodular limestone (*ammonitico rosso*), and thick-bedded conglomerates. The depositional environments range from deep-marine to relatively shallow-marine settings. The middle part of the formation contains *Meandrospira pusilla*, whereas the uppermost layers include *Meandrospira dinarica*. The age is pre-Middle Anisian to Middle Anisian in the lower and middle sections, and Middle Anisian in the uppermost section.

CAMİBOĞAZI FORMATION (Brinkmann et al., 1972)

In the central Karaburun Peninsula, the Camiboğazı Formation is subdivided, from bottom to top, into the Laleköy, Saplazdağı, and Hanaylı members.

Laleköy Member: Composed of medium-bedded pink ammonite-bearing micritic limestones at the base, thick-bedded light grey to beige foraminiferal intra-pelsparitic tidal-flat limestones in the middle, and thick-bedded sponge-, coral-, and algal-rich biostromal limestones at the top. The member is dated to Middle Anisian–Ladinian.

Saplazdağı Member: Consists of beige to light brown thick to very thick-bedded (massive) sponge-, coral-, algal-, and foraminiferal-rich biostromal limestones and reefal debris limestones of pel-intrasparitic type. Up to its top levels, it contains dasyclad algae Diplopora nodosa and *Diplopora annulata*. In the uppermost layers, these algae disappear and the unit terminates with limestones containing *Agathammina*? iranica and *Gandinella* aff. *falsofriedli*. The age is Ladinian–Carnian.

Hanaylı Member: Comprised of light brown to beige-colored, regular medium- to thick-bedded argillaceous limestones with interbedded shales; foraminiferal limestones (*Lamelliconus multispirus, Aulotortus communis, Gandinella falsofriedli*), intra-biomicritic and intra-biosparitic limestones with small megalodont-type bivalves. The age is Carnian at the base, and Norian in the middle to upper levels.

GÜVERCİNLİK FORMATION (Brinkmann et al., 1972)

The formation starts with red quartz-rich beach sandstones at the base, overlain by whitish yellow to beige thick- to very thick-bedded fenestral limestones, dolomitic limestones, dolomites, green shales, and red–yellow shales and marly shales. The limestones and dolomites contain foraminifera (*Aulotortus communis, Triasina oberhauseri*), large megalodonts, and dasyclad algae; locally, sponge-, coral-, and algal-rich reefal limestones are common. The formation is dated to Norian.

NOHUTALAN FORMATION (Brinkmann et al., 1972)
The formation is divided into two subunits as the lower limestone and the upper limestone members.

Lower limestone member: This member consists of light brown to beige, thick-bedded dolomitic limestones and fenestral limestones with intercalations of dolomite. The limestones are generally represented by biomicritic types containing large-sized megalodonts, foraminifera (Triasina hantkeni in the upper levels), and dasyclad algae. In the upper parts of the subunit, pinkish-red quartz-bearing sandstones, green-yellow mudstones, and claystone interbeds are common. The age of the subunit is Rhaetian.

Upper limestone member: This subunit is represented by light brown, beige to brown, very regularly medium- to thick-bedded intra-biomicritic, intra-biosparitic, and fenestral intra-pelsparitic limestones. It contains abundant foraminifera (*Orbitopsella praecursor, Orbitopsella primaeva*), the dasyclad alga *Paleodasycladus mediterraneus*, and small-sized megalodontid-type bivalves. The age of the unit is Early Jurassic (Liassic).

BIRGI FORMATION
This formation is composed of brown to dark brown, thick to very thick-bedded biomicritic and biomicroditic limestones. Within the unit, abundant sponges (*Cladocoropsis mirabilis*) occur, together with foraminifera such as *Parurgonina caelinensis* and *Kilianina rahonensis*. The age of the unit is Kimmeridgian.

The Birgi Formation unconformably overlies the Liassic-aged upper limestone member of the Nohutalan Formation along a bauxitic erosional surface at the base. At the top, it is overlain unconformably by the Albian-aged limestone member of the Aktepe Formation, again along a bauxitic erosional surface.

AKTEPE FORMATION (Brinkmann et al., 1972)
The formation consists of two subunits: the limestone member and the limestone–conglomerate member.

Limestone member: This subunit is composed of brown-beige to dark brown and reddish-brown, thick-bedded biomicritic and biosparitic limestones. The unit contains abundant Radiolitidae rudists, foraminifera, dasyclad algae, gastropods, and bivalve fossils. The Aptian–Albian foraminiferal fauna

includes *Sabaudia minuta, S.* cf. *capitata, Nezzazata simplex, Pseudonummuloculina heimi, Cuneolina parva, C.* gr. *pavonia, Vercorsella arenata, Praechrysalidina infracretacea, Orbitolina (Conicorbitolina)* gr. *paeneconica, Orbitolina* (*Conicorbitolina*) sp., *Mayncina* cf. *bulgarica, Favusella washitensis*, "*Hensonina*" *lenticularis*, and *Rotalia mesogeensis*. In addition, algae such as *Cylidroporella kochanskyae, C. ivanovici, Hensonella urladanasi*, *Hetoroporella lepina, Neomeris* sp., *Salpingoporella hasi*, *S.* cf. milovanovici, *S.* ? cf. *turgida, Terquemella* cf. *antique*, and *rudists* (*Eoradiolites*) have been identified, assigning an Albian age to the member (Masse & İşintek, 2000; Masse et al., 2010).

Limestone–conglomerate member: This subunit consists of medium- to thick-bedded conglomerates, conglomeratic sandstones, sandstones, and mudstones, fining upward from conglomerates at the base to mudstones at the top. Although the conglomerates contain sandstone, chert, and mudstone clasts, limestone clasts are the most abundant. Among these, pebbles derived from the Nohutalan and Birgi formations are common. No fossils have been found within the matrix or clastic levels of this subunit.

BALIKLIOVA FORMATION (Erdoğan et al., 1990)
The formation is subdivided into the Karahasan Limestone at the base and the Haneybaşı Member at the top (Erdoğan et al., 1990).

Karahasan Limestone: The unit begins with a polygenic basal conglomerate and continues upward with beige, thick to very thick-bedded intra-pel-biosparitic and intra-pel-biomicritic limestones. Upwards, it passes into siliceous limestones with sponge spicules, and finally into red pelagic limestones with planktonic foraminifera at the top. In the lower and middle parts, abundant *Dicyclina* sp., foraminifera, red algae, rudist fragments, and echinoid debris are present. Based on the planktonic foraminifera in the uppermost part, the unit is assigned a Campanian–Maastrichtian age.

Haneybaşı Member: This member is composed of green, regularly laminated mudstones–shales with interbeds and intercalations of turbiditic sandstones and siltstones. No fossils have been identified within the Haneybaşı Member. Its age is accepted to be the same as the underlying Karahasan Limestone, which it conformably overlies.

BORNOVA MELANGE (Erdoğan et al., 1990)
The Bornova Mélange in the Karaburun Peninsula is represented by a sandstone–shale unit forming the matrix of the mélange, Cretaceous limestones occurring as blocks within the mélange, and serpentinites occurring as tectonic slices. These tectonic units were emplaced onto the Karaburun platform along tectonic contacts (Erdoğan et al., 1990).

STRATIGRAPHY OF THE KARABURUN PENINSULA (Erdoğan et al., 1990)

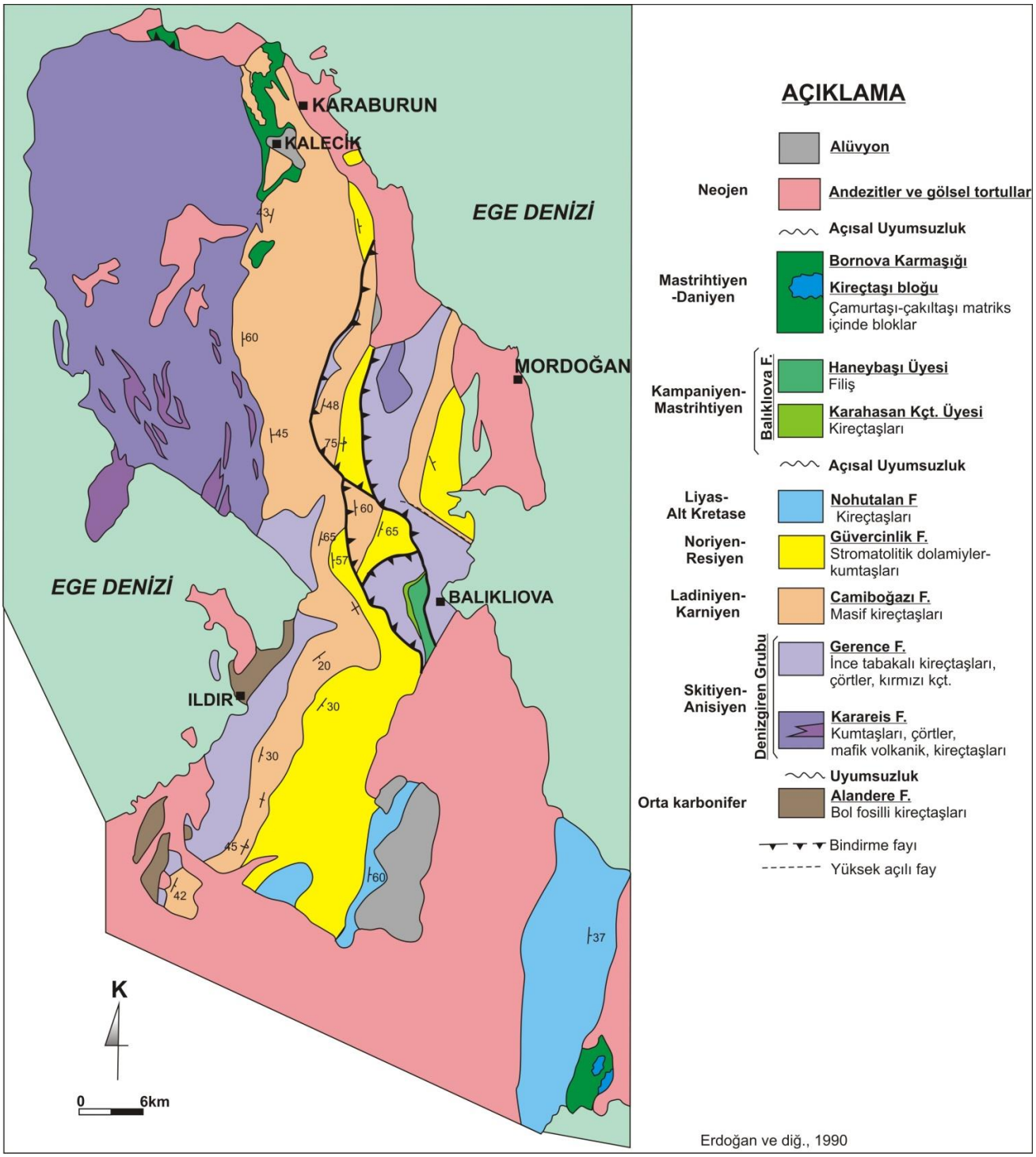

Figure 5. Geological map and stratigraphy of the Karaburun Peninsula (Erdoğan et al., 1990; colored by Mine Sezgül KAYSERİ ÖZER in 2012).

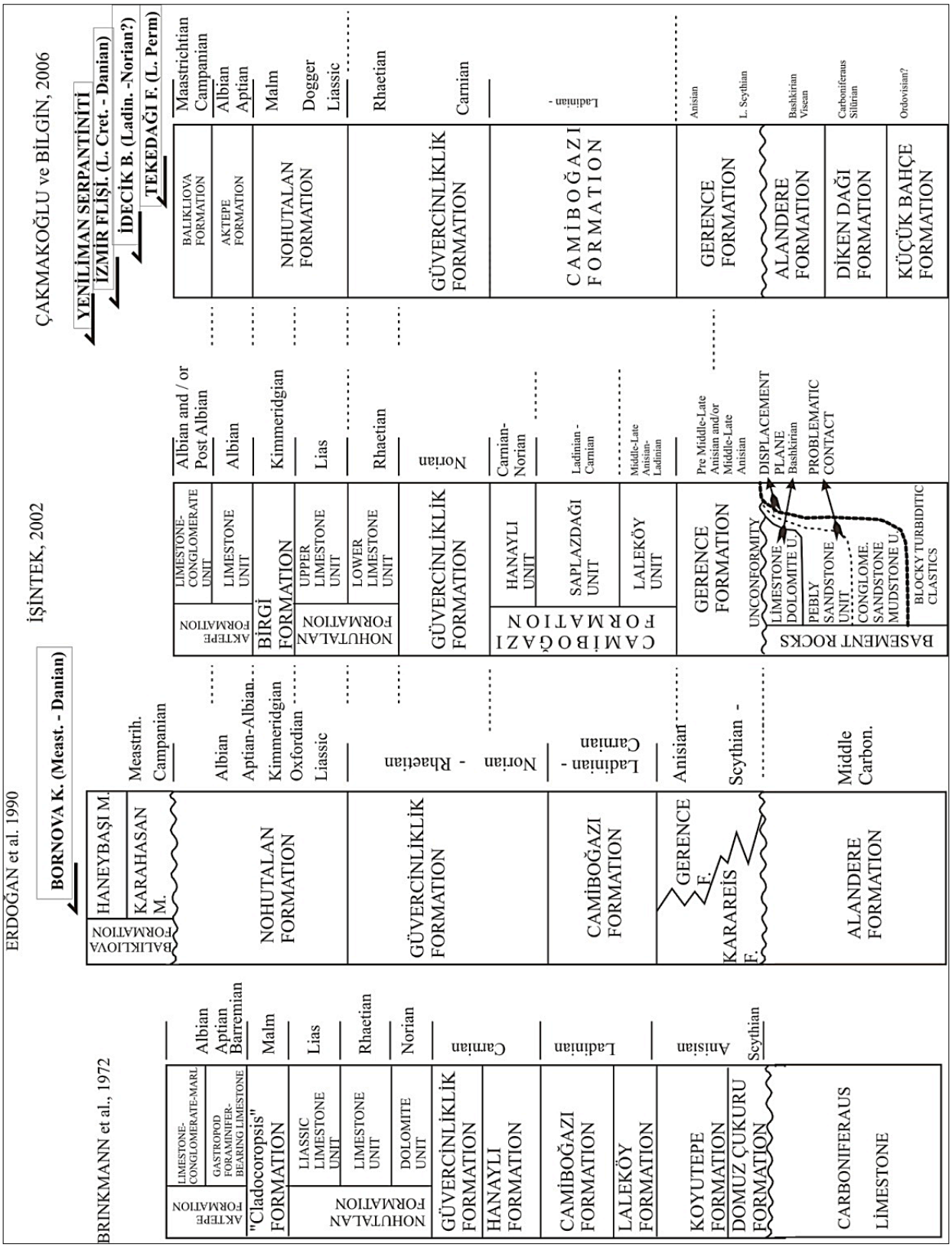

Figure 6. Comparison of the studies of Brinkmann et al. (1972), Erdoğan et al. (1990), İşintek (2002), and Çakmakoğlu and Bilgin (2006), which explain the stratigraphy and geology of the Karaburun Peninsula.

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