

Formation of Holocene paleosols in a relict sand dune sequence at Kıyıköy, Türkiye

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Abstract: The paleoclimatic indicators from a relict dune and paleosol sequence observed south of Kıyıköy Port, NW Türkiye, provide insights into the variable paleoclimatic conditions in the western Black Sea coastal zone over the last 4700 yrs BP. The relict dune-paleosol sequence consists of reddish-brown coarse sands with abundant shells and overlying paleosol. Radiocarbon dating of *Donax trunculus* shells collected from the lowest part of the relict dune revealed the onset of sand deposition 4689 ± 123 yrs ago. The dark-colored paleosol layer, with an Rb/Sr ratio of 0.008, yielded an age of 287 ± 32 yrs cal BP. These findings indicate that the paleosol developed around the 1700s, during one of the coldest phases of the Little Ice Age. This layer is followed by a brown-colored buried soil, indicating a short-lived humid and rainy period, as evidenced by an Rb/Sr ratio of 0.42.

Key words: Relict dune, paleosol, Rb/Sr ratio, Little Ice Age, paleoclimate

1. Introduction

Paleosols, or fossil soils, formed under past climatic conditions, serve as archives with paleopedological importance, reflecting the climate and vegetation of the era in which they developed (Retallack, 1998, 2001). After their formation, these ancient soils are often buried by river sediments, flood debris, coastal dune sands, tsunami deposits, lava flows, and/or volcanic ashes. The paleoenvironmental significance of the micromorphological features of these sequences has been discussed, as they reflect key stages of pedosedimentary development (Kemp, 1999). In addition to reflecting the climate of their formation period, they also contribute to understanding geomorphic processes (Kraus, 1999), thus representing an underappreciated aspect of sequence stratigraphy that deserves more attention. Indeed, research has shown that paleosols have been addressed through a wide variety of quantitative proxies (Sheldon and Tabor, 2009; Tabor and Myers, 2015).

Studies on paleosols in Türkiye have primarily focused on the Pre-Quaternary period, mostly reported from the interior regions of the Anatolian peninsula (Pasquare, 1968; İnci, 1998; Küçükuysal and Kapur, 2014; Gürel

and Özcan, 2016; Opluštil et al., 2018; Kadir et al., 2022). Late Quaternary paleosols have been identified among aeolianite layers that were used as an ancient shipyard on Dana Island (Erginal et al., 2021) and among fluvial deposits in NW Anatolia, where a Middle Paleolithic artifact was also discovered (Ocakoglu et al., 2018). However, records of paleosols formed during the Holocene or just before are rather limited. Paleosols from the Hellenistic period or earlier have been identified on the southeastern Mediterranean coast of Türkiye (Beach and Luzzadder-Beach, 2008). A paleosol evidence reflecting the arid conditions of the Younger Dryas has also been reported from archaeological sites in southeastern Anatolia (Sedov et al., 2017).

Paleosols that developed on relict coastal dunes may be exposed at the surface due to deflation (Buynevich et al., 2007), although publications on the paleosol formation in Holocene relict dunes are notably limited. This study examines the paleoenvironmental records preserved in oxidized relict dune sands exposed in the Kıyıköy area along the Black Sea coast of Thrace, along with the paleosol layers developed on top of them.

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