

# Optically stimulated luminescence dating chronology of relict foredunes in Seyhan Delta, Southern Turkey

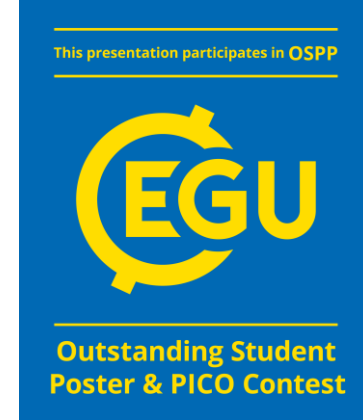
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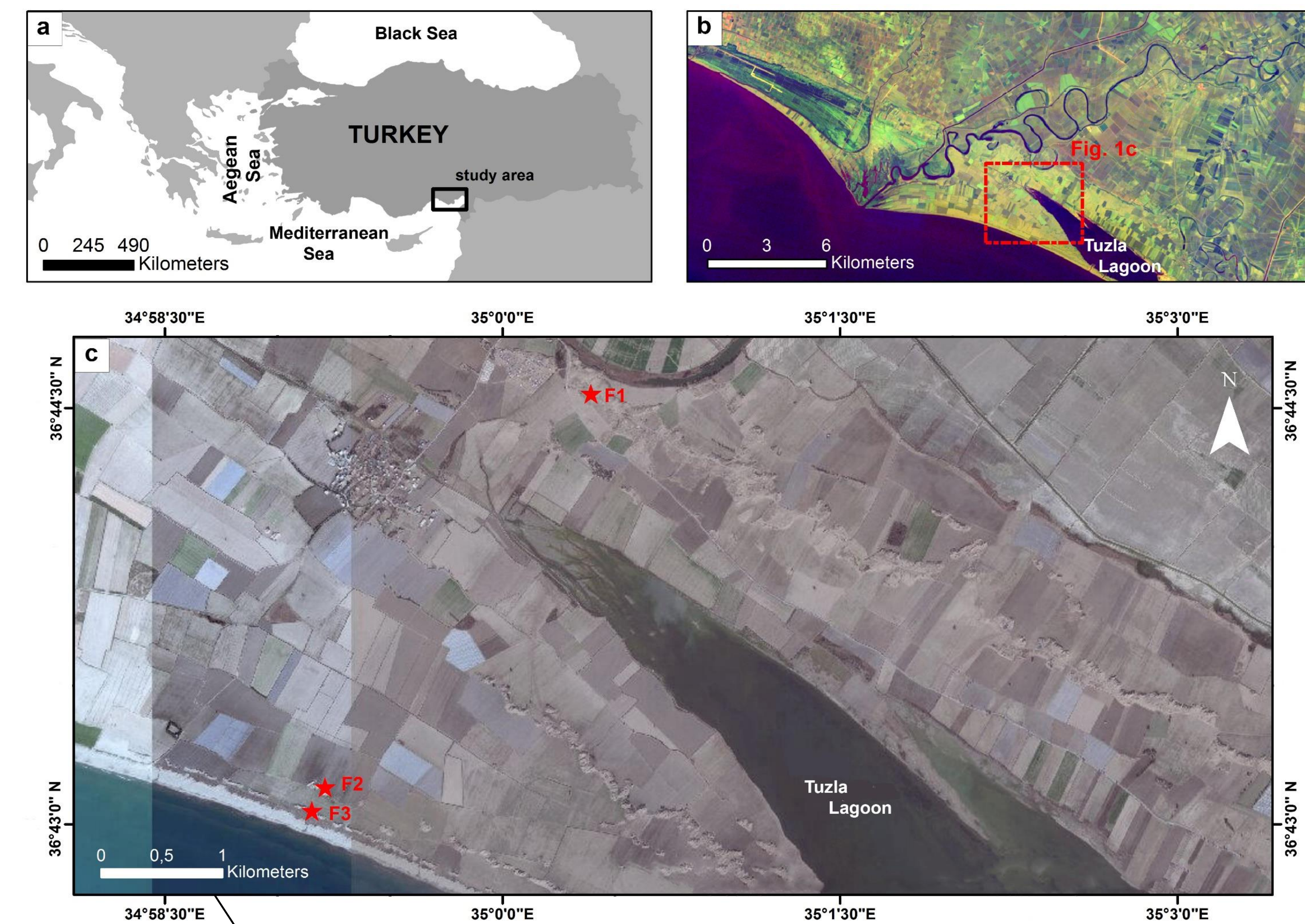
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## 1. INTRODUCTION

- Foredunes are defined as shore - parallel dune ridges formed on the top of the backshore by aeolian sand deposition within vegetation. Foredunes may range from relatively flat terraces to markedly convex ridges. These ridges have been classified into a wide variety of types but generally fall into two main types, incipient and established foredunes (Hesp 2002; 2006).
- Study of the morphology and chronology of foredune ridges successions allows paleogeographic scenarios of coastal evolution. Our study focuses upon firstly establishing the cronology and progradation rate of foredunes in Seyhan Delta.

## 2. STUDY AREA

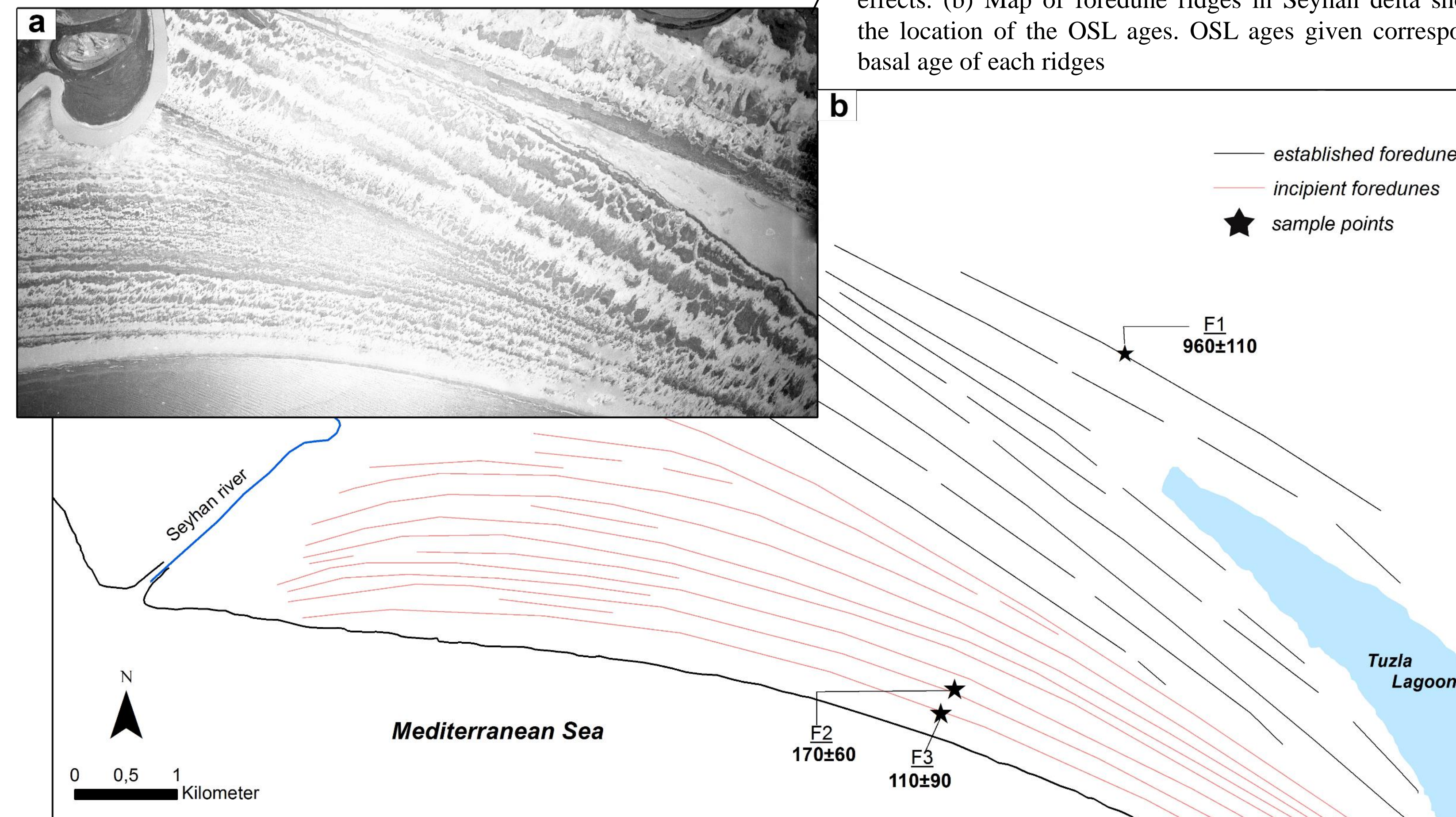


**Figure 1.** Study area showing Seyhan Delta on the southern coast of Turkey (a). Foredunes in study area are located eastern part of Seyhan Delta and western of Tuzla Lagoon (b). 2013 Satellite image showing current foredune ridges and OSL sample points for three ridges (c).

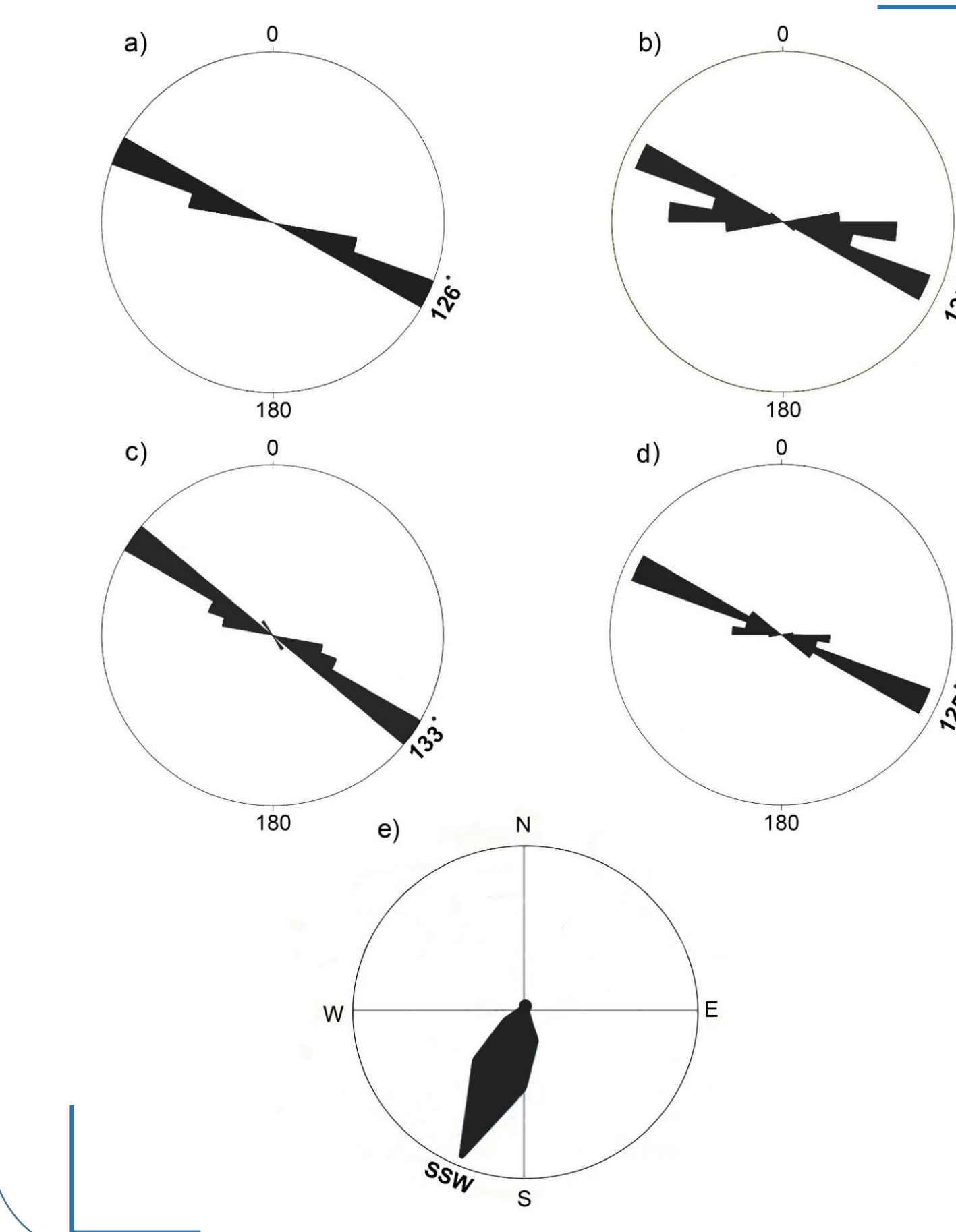
## 3. METHOD

- In this study, OSL dating method was applied for three foredune ridges. In addition, 1956 aerial photos and 2013 satellite image (USGS) were analysed in detail to determine the number of ridges formed over time.
- Progradation rates were determined by measuring the distance perpendicular to the strike of the ridge set to the shoreline and dividing that by the age difference between the earliest and the latest fully formed ridges (Rink and Lopez 2010).
- We also calculated azimuth of coastline, pioneer vegetation and foredune ridges to reveal factors affecting development of foredunes in Seyhan Delta.

## 4. RESULTS



**Figure 2.** (a) Pattern and number of ridges were traced from 1956 aerial photo and 2013 satellite image. 1956 aerial photograph showing foredune ridges before anthropogenic effects. (b) Map of foredune ridges in Seyhan delta showing the location of the OSL ages. OSL ages given correspond to basal age of each ridges



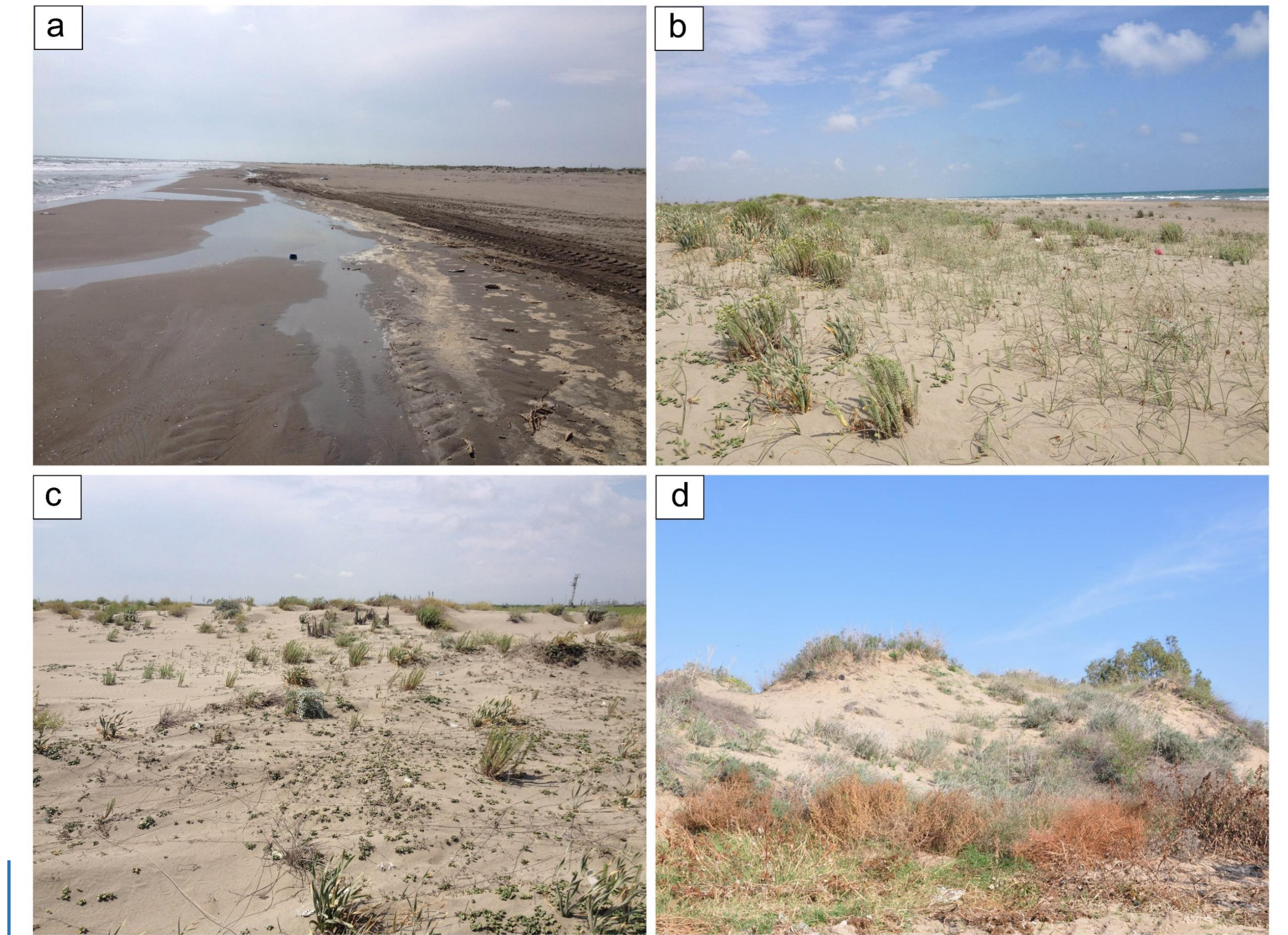
**Figure 3.** (a) Azimuths of coastline, (b) pioneer vegetation, (c) established foredunes, (d) incipient foredunes and (e) prevailing wind direction in dry season. Note that incipient foredunes correspond to modern coastline and pioneer vegetation but not established foredunes.

**Table 1.** OSL ages for three different foredune ridges

Sample code	Depth (cm)	Equivalent dose (Gy)	Dose rate (Gy/a)	Age (year)
F1	450	1.55±0.15	1.61±0.04	960±110
F2	500	0.25±0.10	1.63±0.04	170±60
F3	180	0.20±0.12	1.75±0.05	110±90

**Table 2.** Progradation rates of foredune ridges

Ridge codes at extremities of ridges	Distance in between ridges (m)	Age range (years)	Progradation rate (m/years)	Progradation rate (m/100 years)
F1 – F2	3750	960±110 - 170±60	4,74	474
F2 – F3	250	170±60 - 110±90	4,16	416
F1 – F3 (mean)	4000	960±110 - 110±90	4,70	470



**Figure 4.** (a) Beach surface where source for sand transportation to foredunes by wind. (b) Pioneer vegetation (*Euphorbia paralia*, *Cyperus capitatus*, *Pancratium maritimum*) starting initial or embryo foredune stage. (c) Incipient foredunes and (d) established foredunes.

## 5. CONCLUSION

- Our age results range between 110±90 yr to 960±110 year. Accordingly, we propose 4,7 m/yr of mean foredune progradation rate for the last 960±110 year.
- Also it was found that from 960±110 BP to the present day one foredune ridge has been formed for every 50 years period.
- Azimet analyses show that incipient foredunes correspond to modern coastline, pioneer vegetation and prevailing wind direction but not established foredunes.

## REFERENCES

- Hesp, P. (2002). Foredunes and blowouts: initiation, geomorphology and dynamics. *Geomorphology* (48), 245 - 268.
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- Rink, W., & Lopez, G. (2010). OSL - based lateral progradation and aeolian sediment accumulation rates for the Apalachicola Barrier Island Complex, North Gulf of Mexico, Florida. *Geomorphology* (123), 330 - 342.