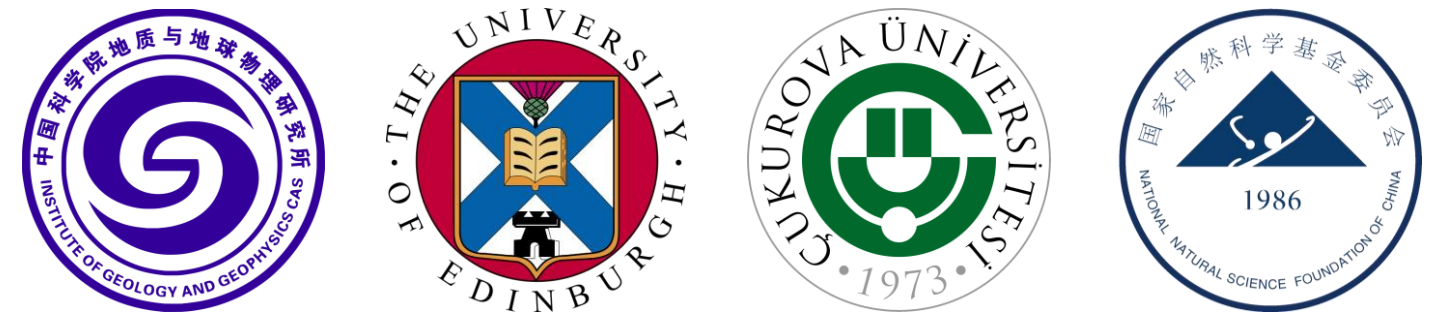


Source to Sink in the Easternmost Mediterranean: Insights from the Provenance of Oligo-Miocene Turbidites in the South Turkish Basins



Guohui Chen¹, Alastair H. F. Robertson², Osman Parlak³, Fu-Yuan Wu¹

¹ State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, China (Corresponding author: Guohui.Chen@live.cn)

² School of GeoSciences, University of Edinburgh, UK; ³ Çukurova Üniversitesi, Jeoloji Mühendisliği Bölümü, Turkey

Introduction

- Neogene basins mainly record **collision-related exhumation/erosion** of Neotethyan crustal units in S Turkey.
- Existing facies and paleocurrent evidence indicate mainly **southward sediment transport** from a collisional setting within Anatolia towards the E Mediterranean deep-water basin to the S.
- Detrital zircon U-Pb geochronology** allow the existing basin models to be tested and developed, and indicate how supply from different aged units varied in space and time.
- The new zircon age data also shed light on **depositional pathways** of regional to local scale.

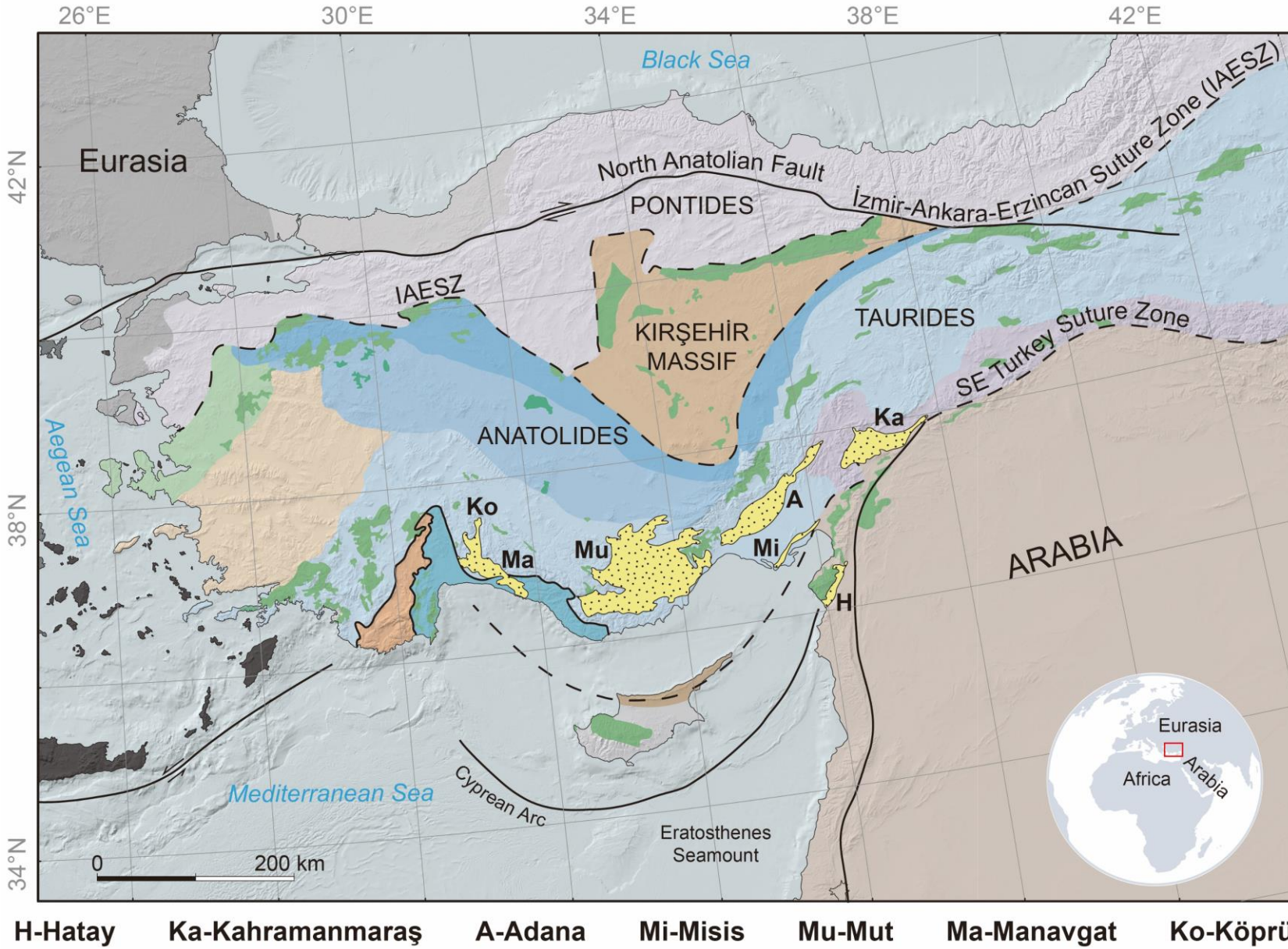


Fig. 1 Outline tectonic map showing the Eastern Mediterranean region with its major tectonic zones, including the basins studied (highlighted in bright yellow).

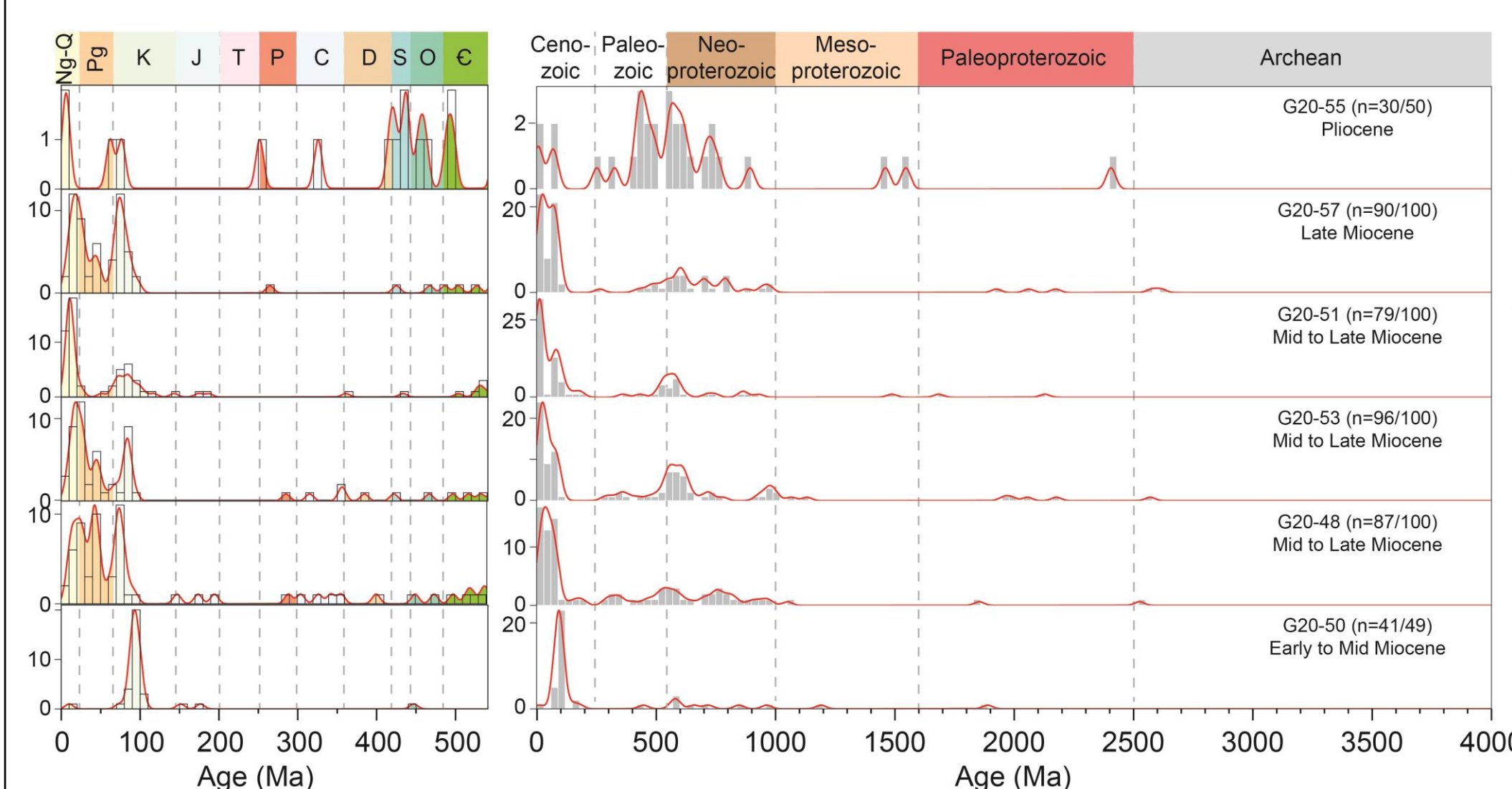
Specific objectives

- To determine the **detrital provenance** of seven related Oligocene-Miocene marine basins in S Turkey;
- To determine the **exhumation/erosional history** of key regional magmatic and/or metamorphic units;
- To test the existing paleontologically **assigned ages of depositional formations**;
- To improve understanding of the **closure history of Tethyan ocean basin** in the E Mediterranean region.

Methods

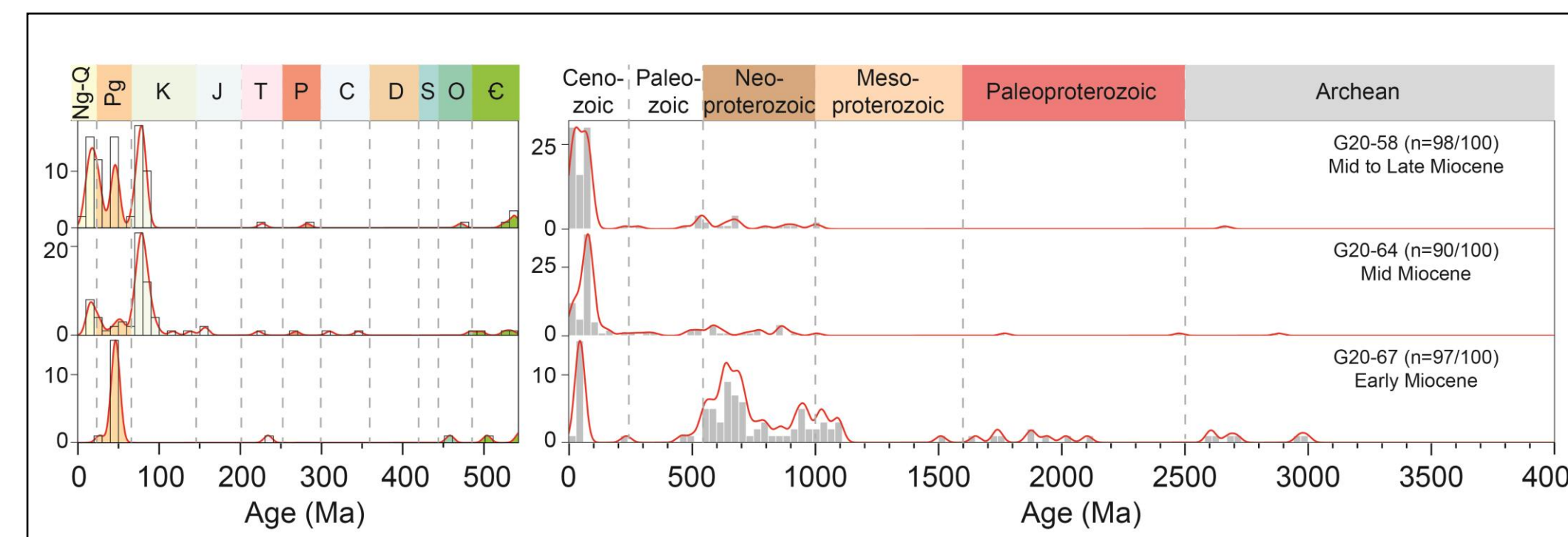
- Cathodoluminescence (CL) imaging: zircon morphology and internal microtexture
- U-Pb dating: Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS)
- Data reduction: GLITTER 4.0 (Griffin et al., 2008) and Iolite software package (Wu et al., 2018)
- Zircon age interpretation: for zircon <1000 Ma, ²⁰⁶Pb/²³⁸U ages preferred; for zircon >1000 Ma, ²⁰⁷Pb/²⁰⁶Pb ages preferred
- Data filtering: for zircon <200 Ma, discordance <20%; for zircon >200 Ma, discordance <10%

Main results (zircons inputs to each basin)



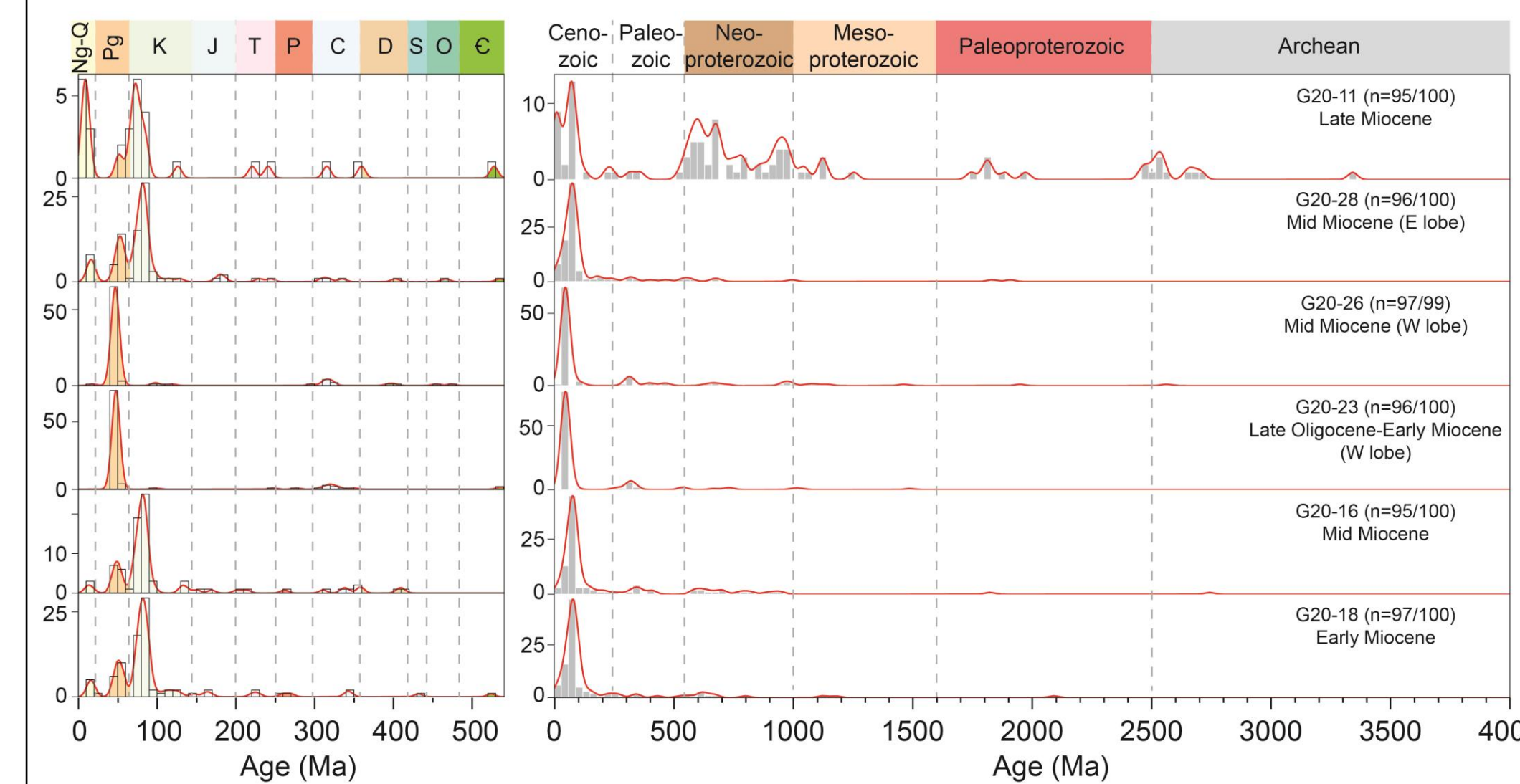
Hatay basin

- L. Miocene:** mainly high-level crustal input (little Precambrian 'basement');
- M. Miocene:** zircons become younger up-sequence;
- Pliocene:** increased 'basement' input (probably from Arabia).



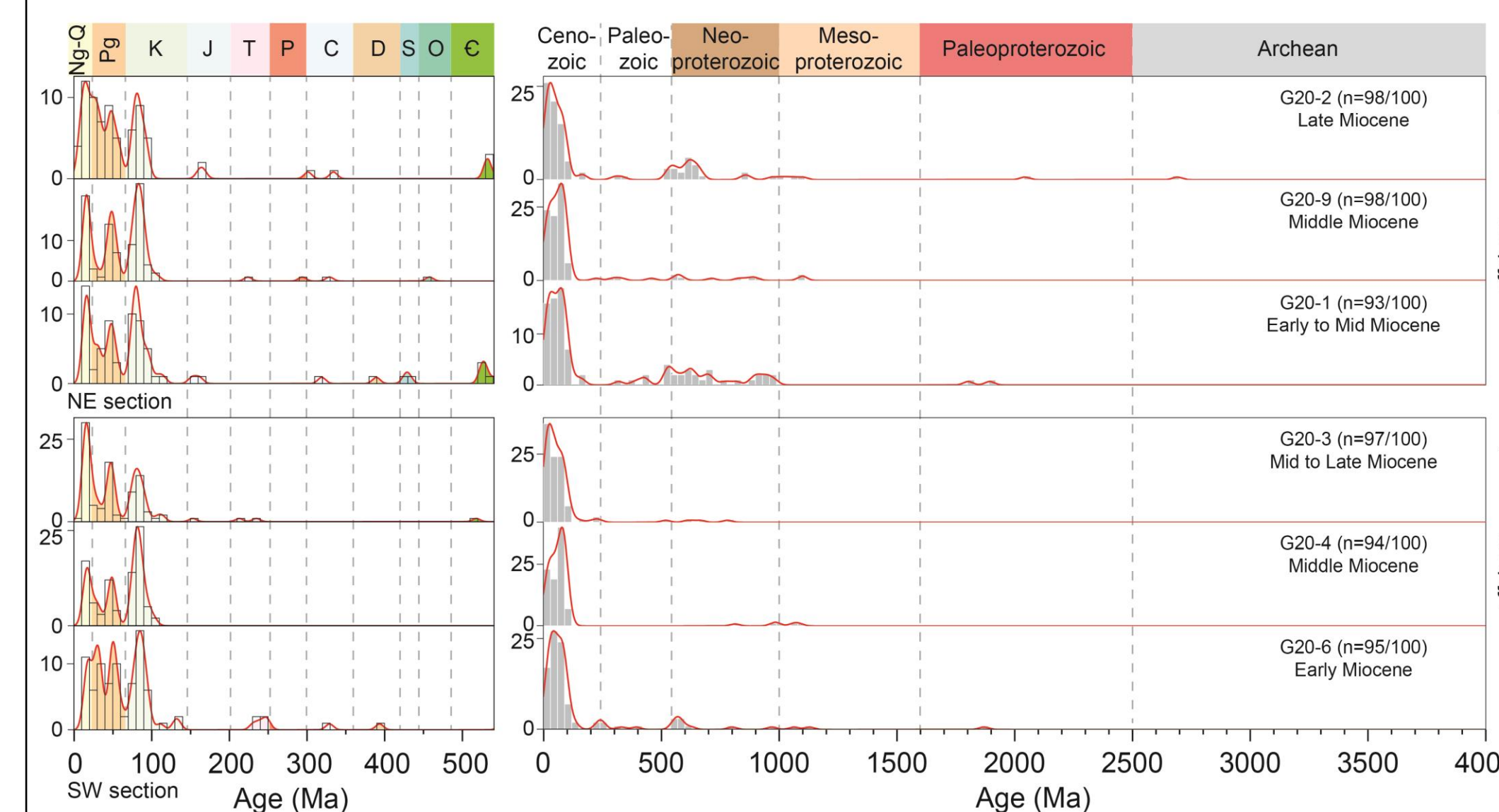
Kahramanmaraş basin

- L. Miocene:** major Precambrian 'basement' input;
- M. Miocene:** major Late Cretaceous input



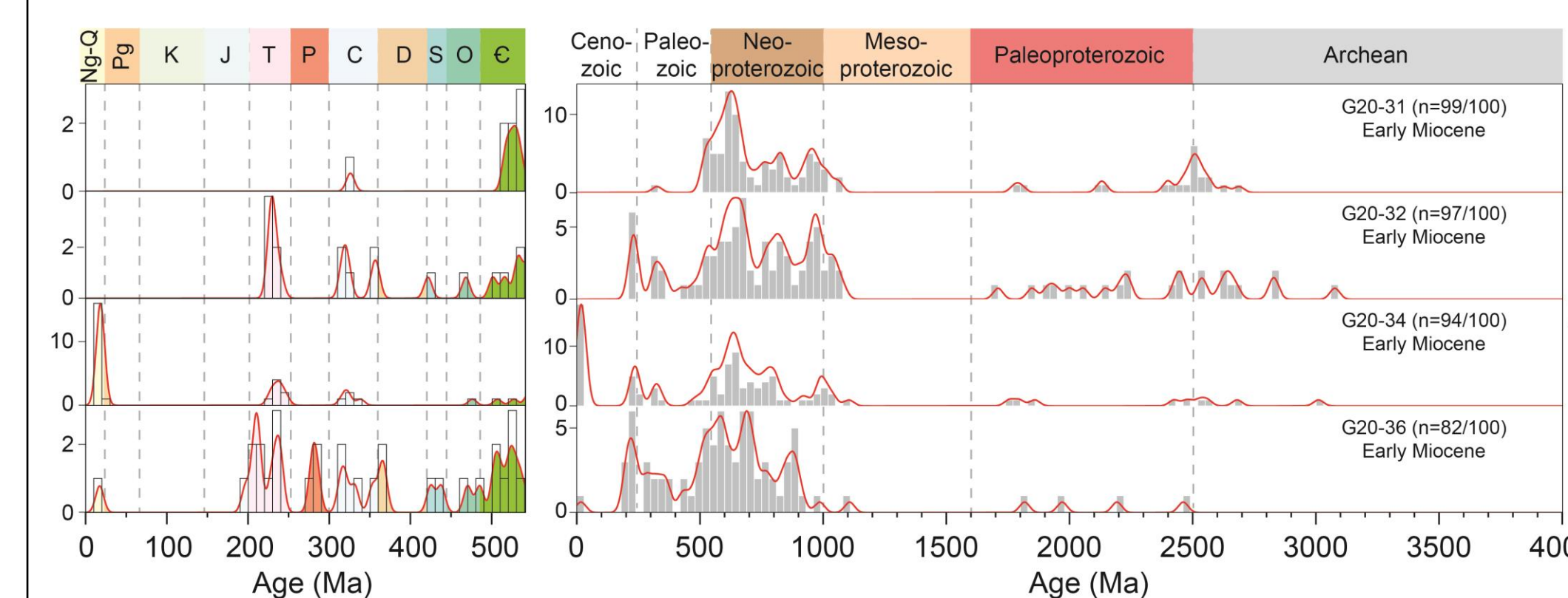
Adana basin

- Two (known) **sedimentary lobes** (turbidites) have contrasting **Late Cretaceous vs. Eocene** input;
- U. Oligocene-L. Miocene:** Late Cretaceous input to the SW/W of the W lobe (from possible topographic highs); also dominant Eocene input near the W lobe;
- M. Miocene:** consistent provenance as Late Oligocene-Early Miocene;
- U. Miocene:** Precambrian 'basement' supply (probably from the Taurides)



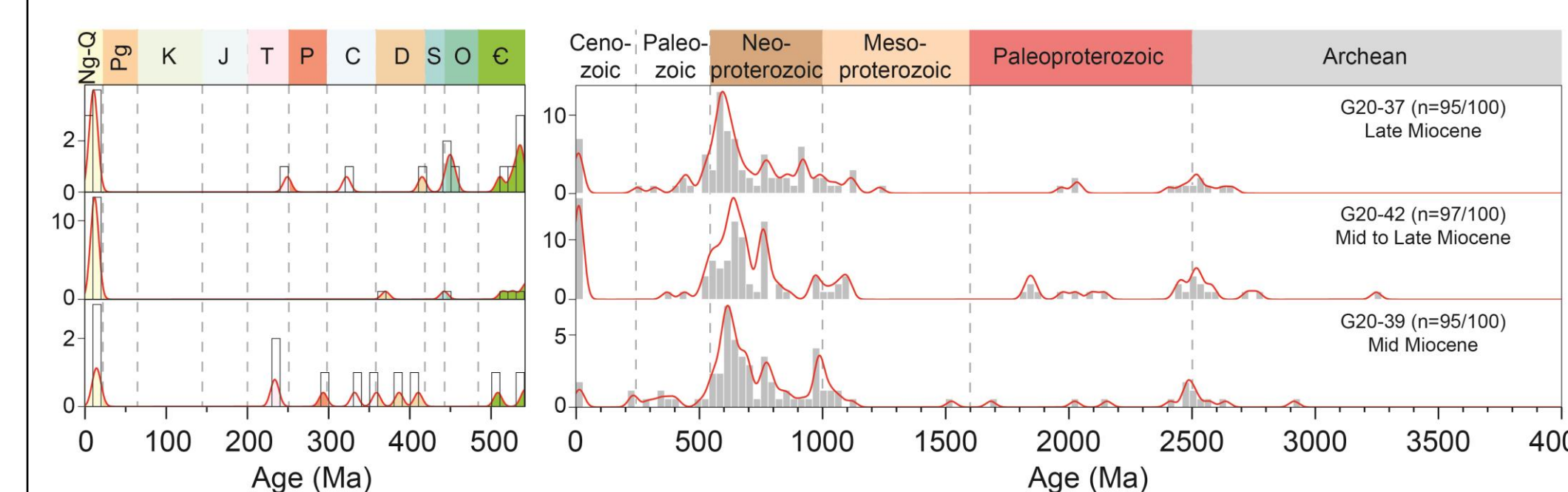
Misis basin

- Continuous input** from Late Cretaceous-Miocene units;
- Evidence of **Oligocene-Miocene volcanism**;
- Abundant **input** from 'basement' only in NE.



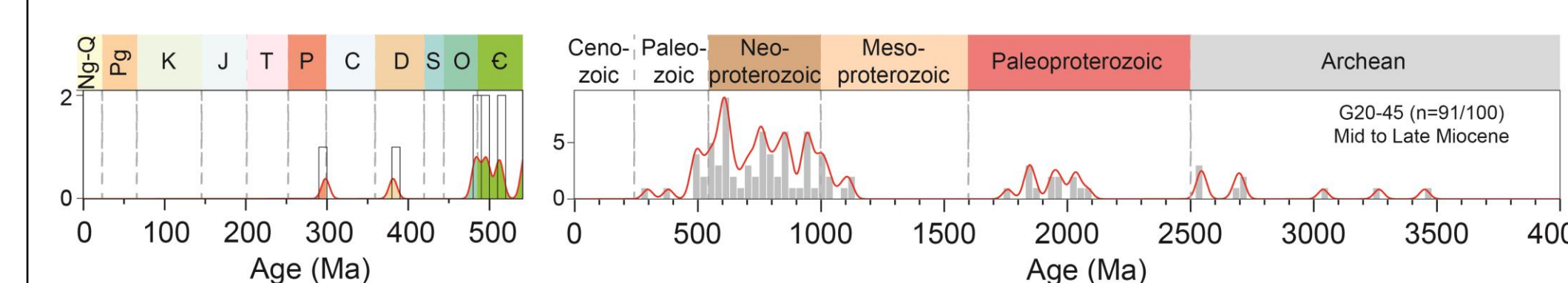
Mut basin

- Background input** from Precambrian 'basement' (ultimately from Gondwana);
- Miocene zircons** from coeval volcanism (to the north).



Manavgat basin

- Late Cretaceous** input is relatively minor;
- M. Miocene:** 'basement' grains increase (probably from the Taurides);
- U. Miocene:** renewed 'basement' input.



Köprü basin

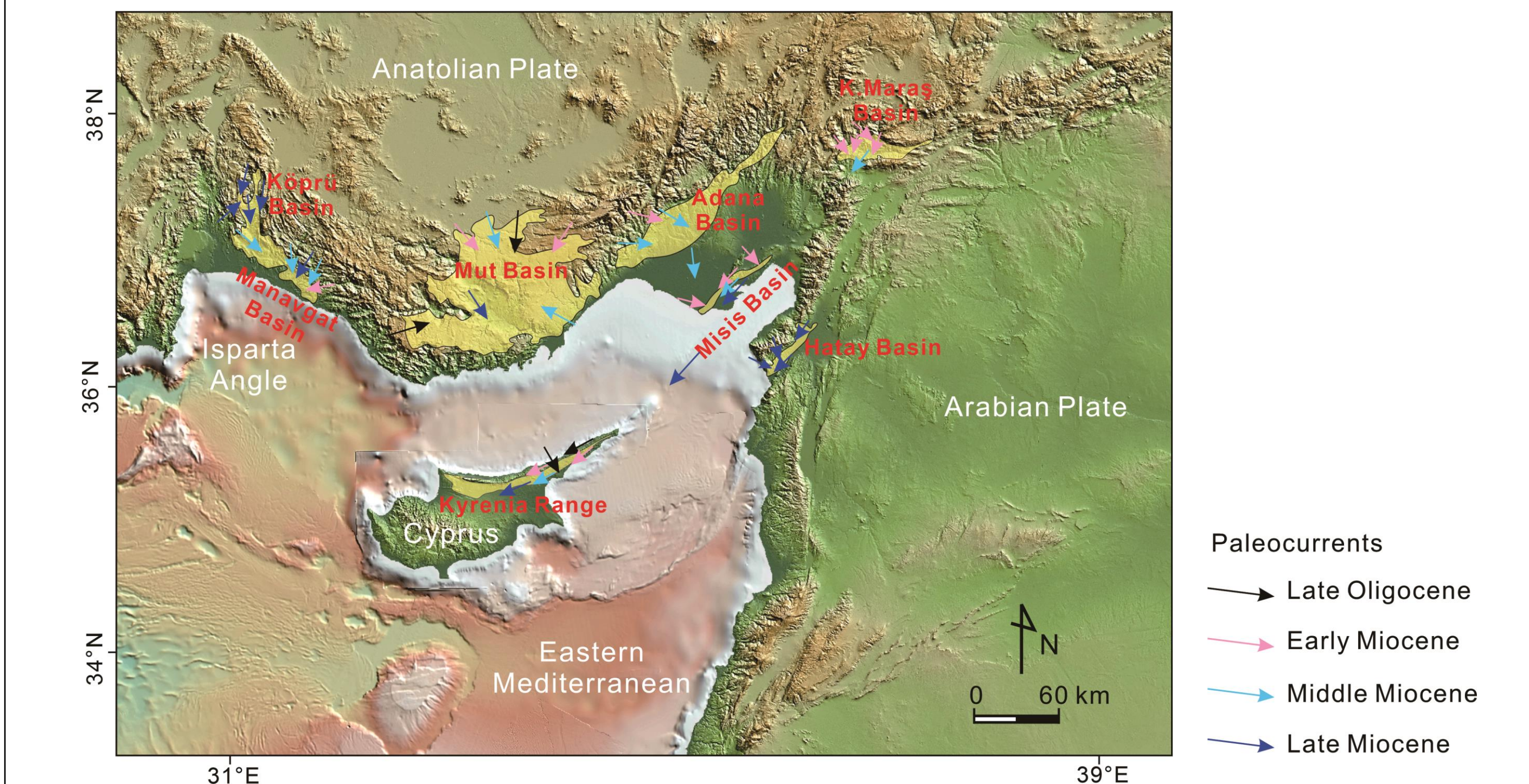
- Precambrian 'basement' grains dominate;
- Rift-related** zircon distribution;
- Miocene zircons are relatively rare.

Discussion

Provenance implications

- Precambrian-Cambrian (1.1-0.9 Ga, 750-500 Ma): NE Africa/Arabian-Nubian Shield origin
- late Ediacaran-early Cambrian (570-520 Ma): Andean-type, Cadomian magmatism
- Ordovician-Devonian (480-360 Ma): extensional pulses in N Gondwana margin (to N)
- Carboniferous (350-310 Ma): recycled from Paleotethys (to N)
- Permian (290-280 Ma): early stage rifting of Neotethys
- Triassic (240-210 Ma): major rifting to open Neotethyan oceans
- Jurassic (170-150 Ma): magmatism within Inner Tauride and/or N Neotethyan oceans
- Cretaceous (97-70 Ma): supra-subduction zone ophiolite and/or magmatic arc
- Paleogene: Eocene (arc magmatism); Oligocene (uncertain, little crustal record)
- Neogene: post-collisional magmatism

Unravelling sediment transport history



- Each basin has its own sediment transport pathways from its erosional hinterland;
- Late Oligocene: S Turkish basins are mainly non-marine in contrast to deep Mediterranean basin to S (e.g., Kyrenia Range, N Cyprus);
- Early Miocene: multiple feeder channels (e.g., Adana basin); drainage connection of Kahramanmaraş and Misis basins; southeastward transport of detritus in Adana and Mut basins;
- Middle Miocene: regional subsidence created deep-marine depocenters that sloped southwards into the E Mediterranean basin; increased 'basement' input in places (e.g., Hatay and Adana basins);
- Late Miocene: increased basement input related to uplift/exhumation of the Taurides.

Preliminary conclusions and further research

- Variable zircon populations in the individual Neogene basins point to differing exhumation/erosion histories (related to closure of Neotethyan basins).
- Two main regional drainage system dominated, one through the Kahramanmaraş basin system (E) and the other through the Isparta Angle basin system (W).
- Basement topography/characteristics influenced the basin development/provenance, e.g., the formation of two sedimentary lobes in the Adana basin.
- Erosion/exhumation history relates to an interplay between collisional processes to the N (Inner Tauride and N Neotethyan suture zones) and 'back-arc' extensional processes to the S (subduction of S Neotethys).
- To further determine the provenance affinities, zircon Lu-Hf isotopes will be analyzed using the LA-MC (multi-collector)-ICP-MS.

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