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PREFACE

In order to better understand long-term climate changes in the Neogene of Eurasia, the international research network NECLIME – *Neogene Climate Evolution in Eurasia* – was established in the year 2000. The main objectives of NECLIME are: (1) the quantitative reconstruction of the Neogene climate evolution in Eurasia and its patterns in time and space based on proxy-data and their quantitative climatic interpretation by means of standardised techniques, (2) the reconstruction of Neogene regional and global atmospheric circulation patterns via climate modelling, (3) the analysis of the interaction between palaeogeography, vegetation and climate.

With 95 members from 34 countries in the year 2010, more than 160 articles published, annual meetings, sporadic thematic workshops and regular symposia on international conferences, NECLIME has proven to be a vigorous group of palaeobotanists, palaeoclimatologists, palaeontologists, and climate and environmental modellers. More details about the concept, structure and members of NECLIME as well as news about forthcoming events can be found on the NECLIME homepage (www.neclime.de).

A first NECLIME synthesis volume '*Miocene Climate in Europe – Patterns and Evolution*' published in 2007 (Bruch *et al.* 2007) combined results focusing on the Miocene of Europe as a key area for understanding Neogene climate and presented a summary of the Miocene climate evolution in the Western part of Eurasia. Up to then, more than 300 Miocene fossil flora had been compiled and quantitatively analysed in terms of several climatic parameters. To synthesize NECLIME results, quantitative climate maps for Europe were generated on palaeogeographic maps for the Langhian and early Tortonian. Characteristic climate patterns appear for each time interval and can be related to both global climate change and Alpine tectonics.

The second NECLIME synthesis volume '*The Neogene of Eurasia: Spatial Gradients and Temporal Trends*' published in 2011 (Utescher *et al.* 2011) aims at reconstruction and analysis of changing Neogene patterns with respect to vegetation, biodiversity and climate, but under a Eurasia-wide perspective, thus allowing for a comprehensive study on a larger scale. Integrating proxies from various sources (palaeobotany, vertebrate palaeontology, geology) and data obtained from numeric modeling, the volume focuses on precipitation patterns and landscape development, the East Asian Monsoon System, and the potential of past climates for evaluating future climate change scenarios.

After more than ten years of NECLIME activities, this special issue intends to give an overview on the current variety of projects conducted under the umbrella of NECLIME. The thematic set of papers has been selected from contributions to the 10th NECLIME Annual Meeeting held at the Seferihisar Student Education and Recreation Centre of Dokuz Eylül University, İzmir, Turkey, from September 28th to October 1st, 2009. Twenty-five scientists from ten countries attended the meeting that was organised by Funda Akgün, Mehmet Serkan Akkiraz and Mine Sezgül Kayseri from the Department of Geological Engineering, Dokuz Eylül University (DEU). The broad range of topics presented there is also covered by the content of this special issue, encompassing environmental research with a spatial range from Europe to Asia and a temporal range from Oligocene to Pliocene.

Erdei *et al.* [Early Oligocene continental climate of the Palaeogene Basin (Hungary and Slovenia) and the surrounding area] discuss and evaluate climate reconstructions based on Oligocene macroflora from Hungary and Slovenia. The paper concentrates on the Early Oligocene palaeoclimate of the southern part of Eastern and Central Europe and gives a detailed climatological analysis, combined with leaf-morphological studies and modelling of the palaeoatmospheric CO_2 level using stomatal and $\delta^{13}C$ data. Besides the generally warm climate with low seasonality of temperature, spatial gradients of temperature are recorded between central and southeastern Europe.

Ivanov *et al.* [Late Miocene palaeoclimate and ecosystem dynamics in Southwestern Bulgaria – a study based on pollen data from the Gotse-Delchev Basin] investigate Late Miocene climate

and vegetation dynamics based on palynological evidence. The data show unusual fluctuations in summer temperatures and prove cyclic climatic changes within the sequence.

Akkiraz *et al.* [Palaeoflora and climate of lignite–bearing Lower–Middle Miocene sediments in the Seyitömer and Tunçbilek sub-basins, Kütahya Province, Northwest Turkey] study Early to Middle Miocene palaeoclimate and palaeovegetation on the basis of palynological data. The reconstruction of palaeoclimate documents an equable subtropical climate with small variation in precipitation.

Three manuscripts assess Pliocene climatic changes, their influences on leaf physiognomy and the possibilities to estimated Pliocene palaeoclimate based on such relationships. **Sun et al.** [Carbon isotope and stomatal data of Late Pliocene Betulaceous leaves from SW China: implications for palaeoatmospheric CO_2-levels] studied a succession of the Late Pliocene Tuantian flora from Yunnan and show a gradual decrease in CO_2 during the time of deposition. The increase of $\delta^{13}C$, SD and SI in the Late Pliocene corresponds clearly to a decrease in atmospheric CO_2 during this time interval rather than the tectonic uplift of West Yunnan, especially since the regional uplift had already approached its peak before the Late Pliocene.

For the same locality, **Xie *et al.*** [Palaeoclimatic estimates for the Late Pliocene based on leaf physiognomy from Western Yunnan, China] give a detailed leaf physiognomic analysis and conclude from precipitation data a late increase in Monsoon intensity and a late uplift of the local Gaoligong mountain range.

Thiel *et al.* [Palaeoclimate estimates for selected leaf floras from the Late Pliocene (Reuverian) of Central Europe based on different palaeobotanical techniques] apply different quantitative palaeobotanical techniques to derive palaeoclimate estimates from several Late Pliocene leaf flora of Europe. They discuss in detail the different approaches and their limits of application, contributing to a better understanding of the methodology of climate quantification.

On a larger temporal scale **Utescher *et al.*** [Variability of Neogene continental climates in Northwest Europe? a detailed study based on microfloras] study a detailed continental palaeoclimate record for the Neogene of Northwestern Europe. Their data suggest a distinct coupling of continental climate with the marine environmental system, with phases connected to Neogene glaciation events mirrored in the continental signal. This continental record shows cyclicity at different scales and amplitudes mainly connected to eccentricity. Moreover, a substantial shift of the climate system from Miocene to Pliocene is documented in a different coupling of temperature and summer precipitation. Similar general patterns, however in lower resolution, are shown by **Popova *et al.*** [Palaeoclimate evolution in Siberia and the Russian Far East from the Oligocene to Pliocene – evidence from fruit and seed floras]. Their quantification of the palaeoclimatic evolution of the Asian part of Russia based on carpofloras documents the transition from very warm and humid conditions in the late Oligocene via the middle Miocene climatic optimum to a cool temperate climate during the Pliocene. Additionally, this last paper puts together the newly derived climate data with the existing NECLIME data base and gives a spatial overview allowing for a synthesis and discussion of temperature and precipitation patterns on a Eurasia-wide scale. Longitudinal and latitudinal gradients of temperature reflect the development of continentality, whereas the patterns of precipitation confirm the establishment of more arid conditions in the mid-latitudes of the continental interior of Eurasia in the later middle Miocene.

All those contributions hugely increase the NECLIME data set that makes large-scale analyses possible to assess temporal and spatial patterns of climate, and profoundly contribute to a better understanding of the Neogene climate evolution in Eurasia.

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