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The Calabrian in the Western Transcaucasian basin (Georgia): Paleomagnetic constraints from the Gurian regional stage

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ABSTRACT

The precise Eurasian chronostratigraphy of the Neogene-Quaternary period is still hampered by the existence of numerous regional stages often lacking independent and absolute age constraints. Therefore, detailed paleoclimatic reconstructions of areas like the Caucasus are still poorly constrained and the influence of climate variability on faunal interchange between Africa and Eurasia in the late Neogene-Quaternary is still difficult to address. During the last decades, Quaternary sections from western Georgia have produced a wealth of paleoclimatic proxy data. Unfortunately, these sections do not have a robust age control. This is especially true for the Gurian stage which has been vaguely defined as being coeval with the lower Pleistocene on the basis of poorly documented bio- and magnetostratigraphic data. In order to constrain the age of the Gurian stage, a detailed magnetostratigraphic study has been carried out. All major sections with known Gurian sediments in the former Rioni bay (a marine restricted area to the southeast of the Major Caucasus) have been studied. Our results confirm for the first time the strict correlation between the Gurian succession and the Calabrian stage.

In addition, our data provides further information on the tectonic setting of the Rioni bay during the Calabrian in this region: (1) in the north, Gurian sediments were unconformably deposited on older Meotian sediments in a piggy back basin, (2) in the south, Gurian sediments are conformably overlying Kujalnician (Plio-Pleistocene) strata, (3) magnetostratigraphic correlation among sections indicate drastic changes in sediment accumulation rates within the basin, (4) rock magnetic experiments reveal significant magnetomineralogical differences between Gurian and the underlying Miocene sediments likely documenting a transition related to changes in oxic conditions, supply of terrigenous material and sedimentation rate close to the Miocene-Pliocene boundary.

These results provide a robust basis for further tectonic and paleoclimatic investigations of this region.

1. Introduction

The time period of the late Early Pleistocene seems to play a major role for the rising of the modern Ice Age world, when major faunal and environmental changes occurred during the Mid Pleistocene climatic Transition (e.g., Trauth et al., 2007, and references therein). In this context the Caucasus region between the Black and Caspian Seas (Fig. 1) is of special interest for understanding the history of climate systems and its influence on regional vegetation and landscape evolution at the crossroads between Asia, Africa and Europe. Moreover, the Caucasus is the area of earliest human occupation in Eurasia, proven by findings of *Homo* fossils in Georgia with an age of ca. 1.8 Ma (Gabunia et al., 2000; Ferring et al., 2011). The discussion of the climatic driving forces for this migration event is still not solved (e.g., Agustí et al., 2003; Agustí and Lordkipanidze, 2011). In order to set up a complete paleoenvironmental picture for this important time period and to assess the impact of climate dynamics on landscapes, which are favored by

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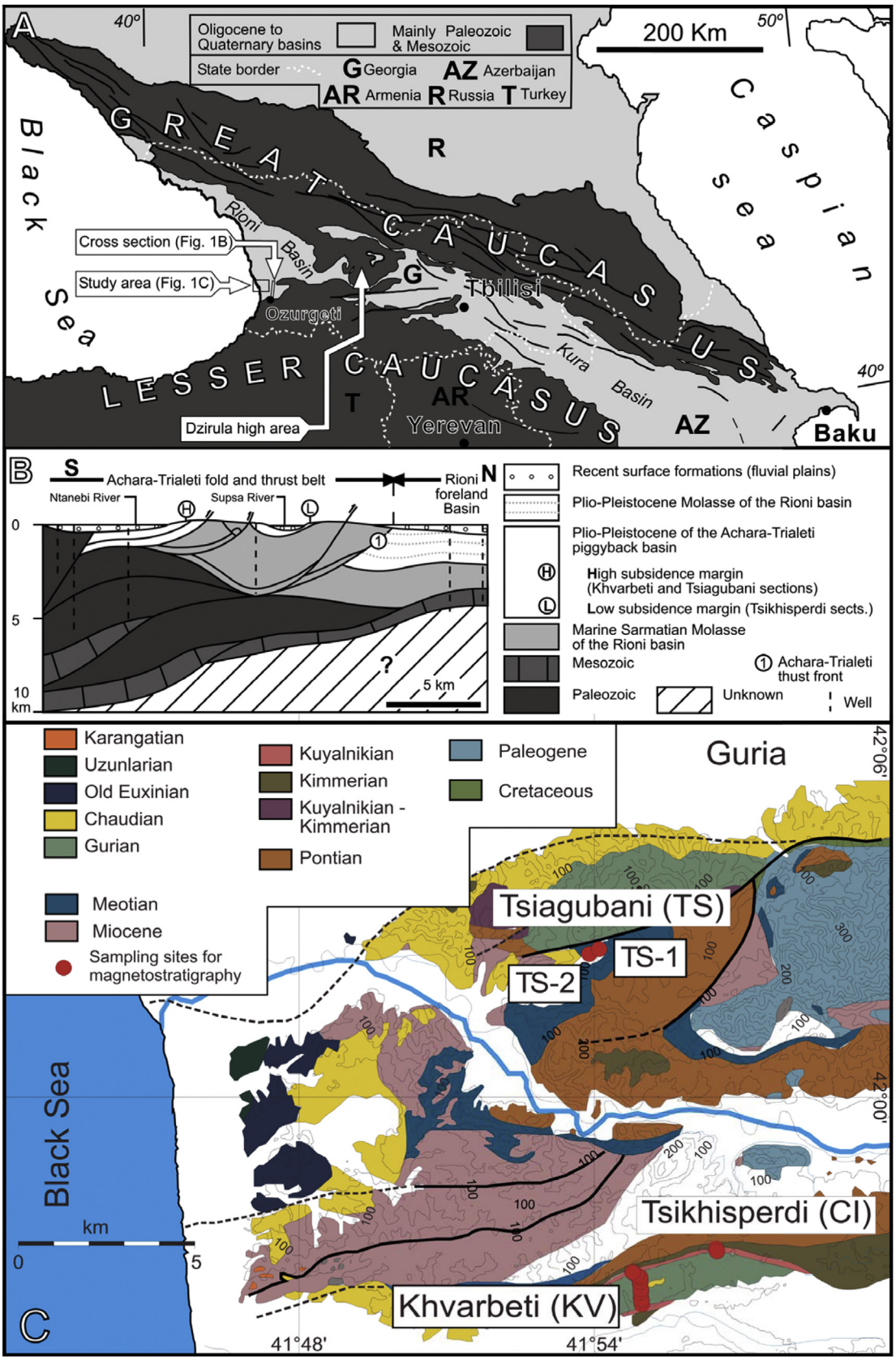

Fig. 1. A: General map of the Caucasus region, between Black and Caspian Seas, with basement rocks (dark) and Oligocene to Quaternary cover. B: Structural setting of the studied sections, partially redrawn and adapted from the original transect by Adamia et al. (2011), which runs some 7 km eastwards of the studied sections. C: Geological map of the study area in the Gurian region, Western Georgia, redrawn after Kitovani (1976). Geographic and topographic map was created using GMT of Wessel and Smith (1998) and data set ETOPO1 of Amante and Eakins (2009). Red dots mark location of studied sections: Tsiagubani-1+2 (TS-1+2), Khvarbeti (KV) and Tsikhisperdi (CI). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)