Geophysical Research Abstracts, Vol. 7, 05081, 2005 SRef-ID: 1607-7962/gra/EGU05-A-05081 © European Geosciences Union 2005



Late Messinian-Early Pliocene uplift patterns in the southeastern Betic Cordillera

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The uplift patterns of the SE Almería region in the SE extreme of the Betic Cordillera have been deduced through mapping the distribution of sedimentary rocks indicative of sea level during the late Messinian, Zanclean and Piacenzian. These rocks formed at the margins of the Sorbas, Vera, Almería-Níjar, and Carboneras/Agua Amarga basins and were elevated above sea level as the basement highs and the region in general were uplifted. Their age is reasonably well constrained with biostratigraphic and palaeomagnetic data. The Sierra Cabrera block emerged in the late Messinian, promoting the semi-isolation of the Sorbas Basin, leading to gypsum deposition, and separating the Vera and Almería-Níjar basins. No gypsum precipitated in the former basin, which remained open to the main Mediterranean Sea, whereas evaporite beds formed in the latter. Mass-flows in the post-evaporitic sediments at the northern margin of the Almería-Níjar basin record later continued uplift of Sierra Cabrera. Before the deposition of lower Pliocene (Zanclean) sediments, a substantial uplift took place in the Cabo de Gata block. The previous late Messinian carbonate platforms were raised more than one hundred metres and the lower Pliocene sea was restricted to enbayments at the toe of the slope of those platforms. In contrast, the metamorphic-basement uplands were only uplifted some tens of metres. This pattern differs from the previous late Miocene trend of decreasing average uplift rates to the east of the cordillera. By the middle Pliocene (Piacenzian), the SE Almería Neogene basins were emergent except for the south-central part of the Almería-Níjar Basin. Pre-middle Pliocene uplift was concomitant with open folding of the lower Pliocene sedimentary packages. Pliocene and post-Pliocene uplift is relatively minor in the region and concentrated in the main sierras and along the Carboneras fault system.