Facies successions in the pre-evaporitic Late Miocene of the Lorca Basin, SE Spain

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Abstract

Pre-evaporitic uppermost Tortonian to Messinian carbonate–siliciclastic deposits have been studied in the western part of the Lorca Basin. Individual lithofacies, facies associations as well as facies successions and stratal architecture indicate a gravel-rich fluvial-dominated (Gilbert-type) delta environment. During periods of decreasing terrigenous supply carbonate sedimentation predominated including formation of patch reefs and fringing reefs. The observed progradational stacking pattern of facies successions is attributed to a ‘3rd-order’ eustatic highstand that pre-dates the Messinian lowstand evaporites of the well known ‘salinity crisis’. Five facies successions have been recognized. Each succession is composed of three facies associations that are: mixed carbonate–siliciclastic (mcs), carbonate-dominated (cd) and siliciclastic-dominated (sd). They show retrogradation–aggradation–progradation architecture and represent ‘4th-order’ transgressive–regressive cycles. The five successions can be correlated through the whole basin and are interpreted as a useful tool for basinwide sequence stratigraphic correlation. If, in addition, other recently published data from SE Spain are considered it may turn out that future correlations between different Neogene basins at this cycle scale (‘4th-order’) will be possible. Higher-frequency successions or cycles at a bed or bedset scale (‘5th- or higher order’) are noticeable but are clearly related to local depositional processes (facies dynamics). They do not have any significance for a basinwide sequence stratigraphic correlation. © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

Late Neogene marine deposits are well exposed within a number of sedimentary basins in the Betic Cordillera of southeast Spain. The Betic Cordillera represents the westernmost part of the large Alpine orogenic system and is composed of a pile of nappe units including sedimentary and metamorphic rocks.

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Compressional deformation with nappe emplacement started during the Late Cretaceous (Weijermars, 1991) and continued in different phases into the Miocene. Since the Early Miocene a wrench tectonic regime evolved resulting in a mosaic of uplifted blocks of the Betic domain and subsiding sedimentary basins filled with Neogene to Recent marine and non-marine strata (Montenat et al., 1987a,b; Larouziere et al., 1988; Sanz de Galdeano, 1990). Sedimentation inside these basins used to be and continues to be strongly influenced by transpressional and transtensional forces resulting in a great variability of sedi-