

PREFACE

This publication contains a collection of papers dedicated to the dynamics of coarse-grained deltas, both in marine and lacustrine settings. Contributions extend from glaciomarine to coastal and terrestrial deposits and include papers dealing with the use of mathematical models and the evaluation of the volumes of transported sediments.

Some of the papers were presented and discussed during the II Fan-delta Workshop (Murcia, Spain, 1990), but the majority were prepared for this book. Considering the wide focus of the contributions, they were grouped according to their geodynamic and sedimentary features, from marine to lacustrine settings. The last section is devoted to methodology and the Field Guidebook of the excursion.

The first part of the book is devoted to the dynamics of present and fossil deltas. The paper by Uchupi & Swift illustrates that canyons that formed on a smooth slope during periods of low sea level and high sediment supply rarely survived, being filled during subsequent transgressions when sediment supply was less. High sedimentation rates by subglacial sediment plumes during late Wisconsin lead to extensive sediment failure that produced low relief slump and debris flow structures.

Somoza & Rey studied the internal structure of a transgressive systems track in a Rfa. Prograding bodies with seismic reflection patterns of parallel, sigmoidal and oblique prograding clinoform, are interpreted as fan-deltas deposited during still-stands in a transgressive regime. They are separated by discontinuity surfaces. The major control of clinoform types is the increased rate of sea-level rise.

The coincidence of tectonic and eustatic changes of sea level is illustrated

in Dabrio & Polo's paper. Uplift of positive reliefs around the basin favoured the deposition of thick successions of conglomerates. Facies associations indicate deposition on the steep slope of a basin. The resulting fan delta is comparable in many respects to those described in fjords.

The application of Sequence Stratigraphy to delta deposits is illustrated by Maestro's paper which describes four depositional sequences bounded by unconformities. The delta-front sediments consist of distributary mouth bars parasequences ranging from fluvial-dominated to wave- and storm-dominated sediments. Gullies, listric sedimentary faults, mudlumps, rotational slides, and balls and pillows illustrate instability in the fine-grained environments (usually prodelta and distal delta front). The transgressive systems tracts of depositional sequences consist of carbonate shelf facies.

Two papers deal with Gilbert-type deltas. The first (Dabrio, Bardají, Zazo & Goy) presents a Gilbert-type delta that is a summatory of smaller-scale delta units deposited during successive highstands of sea level. The effects of sea-level changes are recorded in different way in the foreset and the transition zone. Individual highstand deltas included a wave-worked delta front, with gravelly reflective beaches, a sandy delta platform, and a steep delta slope with episodic sediment input and reworking by waves.

The second (Muto & Okada) evaluates the possibilities of models for paleogeographical reconstructions of marine Gilbert-type deltas. One of the keys to the problem are the erosional unconformities at the set bases, related to lateral confinement of the deltas. Multiply-stacked Gilbert-type systems associated with the unconformities, and alluvial-fan deposits can be interpreted to have prograded within fan-dissecting valleys which elongated along the maximum-slope direction of the basin-margin area.

Two papers consider the dynamics of coarse-grained deltas in foreland basins. Santisteban & Martín-Serrano found that late Neogene siliciclastic and carbonate rocks in Guadalquivir Basin can be grouped into deltas with debris-flow, proximal and distal braided-channels and sandy plain sediments, marine littoral bars and carbonate shelf deposits. The evolution of the system was controlled by sea-level fluctuations related to changes in the volume of the basin caused by syndepositional movements along the active southern margin. The paper by Capuano illustrates that the Montecalvo in Foglia basin was filled with rudites and arenites derived from the erosion of the «Ligurid» rocks. They were elaborated in fluvio-torrential systems under temperate-warm climate conditions. Afterwards, during relative sea level lowstands, these were eroded, cannibalized and resedimented into fans or aprons confined to the narrow sub-basins of the Adriatic Foredeep. A premature diagenesis inhibited the mechanical compaction of sediments.

García-Gil's paper presents a review of the coastal and shallow-marine dynamics in the middle-Triassic western Tethys and proposes a new sedimentary model characterized by a low depositional gradient (it is a part of a homoclinal carbonate ramp), combined tectonic, climatic and eustatic

controls, and textural homogeneity. The clastic wedge is a highstand systems tract deposited during a relative rise of sea level rise.

A group of papers describe the dynamics of coarse grained deltas in lacustrine settings. Flores & M'Gonigle present a lake that is a microcosm of clastic, carbonate and organic environments, hydrodynamics, provenance tectonism, climate, and basin subsidence that greatly influenced facies variations. The Medicine Lodge beds were deposited in freshwater lake alluvial-fan delta and short-headed stream delta environments. The alluvial-fan delta complex formed an aggrading, subaerial alluvial fan and a prograding, subaqueous delta front. Climate did not significantly influence fluctuations of the lake level, but microclimate may have controlled coal distribution.

The Daban Basin illustrates the sedimentation in a rift system under the control of climatic changes and the asymmetry of the basin, as stated by Abbate, Bruni & Sagri. Toward the top of the succession, perennial lake sediments interfinger with a thick delta sequence. The basal portion of this delta system consists of conglomeratic mouth-bars deposited in shallow water at the lacustrine margin. The middle and upper portions include stacked and horizontally laminated sandstone units, deposited at the lake margin as a terminal fan which was fed by ephemeral streams during a period of aridity.

Lacustrine fan-deltas dominated by debris and stream flows can be exemplified by the Villanueva complex in the Guadix Basin, described by Fernández, Bluck & Viseras. The whole sequence is thinning and fining upward, as a result of retrogradation during the three main phases of the fan delta's construction.

The investigation of the depositional environment of fan-deltas might involve some quantitative measurements as stated by Pool. A program written in Fortran-77 may provide an initial step. This particular volume calculation method is based on cone shaped bodies or derivative shapes.

The last paper (Dabrio, Zazo, Goy, De Santisteban, Bardají & Somoza) presents a guided field-trip through the basins of Fortuna, Carrascoy-Murcia, Lower Segura and Cope with detailed sections, interpretation of sediment bodies, geodynamic patterns and sedimentary models. This was the Field Guidebook used during the II Fan-delta Workshop.

The preparation of the Special Volume involved an incredible amount of work which had not been possible without the help of many people. P. G. Silva designed the emblem of the fan-delta event which figures in the front page. A. Colella supplied the list of addresses for delivering the circulars. Participants in the Workshop also co-operated with discussions in the field and generously helping the editors with advices and reviews.

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