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**Contributions to Modern and Ancient Tidal Sedimentology
Proceedings of the Tidalites 2012 conference**

Contributions to Modern and Ancient Tidal Sedimentology: an introduction to the volume

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History of the “Tidalites” conference proceedings

Besides pioneer works of the 60s, the tidal sedimentologist community really emerged in the 70s (see Klein, 1998). The first international conference on tidal sedimentology took place in 1973 in Florida (USA). It was devoted to carbonate facies, less to siliciclastic deposits, and mostly to intertidal areas. The conference resulted in a book gathering case studies (Ginsburg, 1975). The fining-upward tidal flat sequence represented at this time the tidal facies model, and was mainly applied to carbonates. The growing knowledge in siliciclastic tide-dominated environments was synthesized a few years later by Klein (1977). Following the paper of Visser (1980) evidencing the record of tidal cycles in estuarine dunes, clastic tidal sedimentology evolved quickly towards more comprehensive and quantitative studies, both in ancient and modern. A community was born.

In 1985, this community met in Utrecht (Netherlands) at the “1th Clastic Tidal Deposits symposium”. The proceeding book contains 31 papers, covering a large spectrum of topics, including facies and stratigraphic studies, from the offshore to the nearshore (de Boer et al., 1988). Few articles are devoted to processes and modelling but many focus on modern shelf tidal bodies description and surveying. As noted by Davis et al. (1998), the concept of tidal bundles is expressed for the first time in this book.

The 2nd conference, held in 1989 in Calgary (Canada), gave rise to another book of 26 papers (Smith et al., 1991). Beyond the increasing range of topics covered (e.g. the study of primary processes, such as flocculation), this book contains the pioneer paper of G. Allen establishing the estuarine tripartite facies and stratigraphic model of the Gironde estuary (SW France). The growing knowledge on modern tidal settings is applied at the scale of petroleum reservoirs (e.g. Cretaceous Western Interior seaway).

The 3rd conference, named “Tidal Clastics”, took place in 1992 in Wilhelmshaven (Germany). The proceeding book (Flemming & Bartholomä, 1995) contains 23 papers highlighting the increasing interest for studies dedicated to modern processes and facies in nearshore settings such as tidal inlets and tidal deltas. Wave and tide interactions are also considered. Ground penetrating radar appears as a new technique to explore ancient tidal subsurface outcrops.

In 1996, the 4th conference was held in Savannah (USA) and founded the “Tidalites” name of the series. The proceeding book (Alexander et al., 1998) contains 17 papers and on three thematic sessions; one on the Wadden Sea, a second one on tidal rhythmites, and a third one on stratigraphy, with study cases of reconstructions of incised valley fills (in the Holocene and the rock record). This conference was marked by a decrease in participation and correlatively a decrease in the number of papers published in the proceedings. This probably reflects the increase in the range of topics covered

by the tidal sedimentologist community and, hence, the need to publish more continuously in more specialized international journals.

This change was confirmed as the next conference, Tidalites 2000, in Seoul (South Korea), brought about 12 papers only, mostly devoted to modern tidal settings in China, Korea and Japan, that were therefore published in a special volume of the Korean Society of Oceanography (Park & Davis, 2001),.

The Tidalites 2004 conference was held in Copenhagen (Denmark), and 19 papers were published in a special issue of Marine Geology (Barholdy & Kvale, 2006). Most these papers are dedicated to modern processes, and especially on fine-grained sediment dynamics and budgets (turbidity maximum, flocculation, tidal marsh sedimentation). Only four papers deal with stratigraphy, one in the Holocene, and three in the rock record.

The Tidalites 2008 took place in Qintao (China), and no proceedings were published. During the conference, contributions were mostly focused on open coast tidal flats and tide-dominated deltas characteristic of Asian tidal seas, mud flats and salt marshes, as well as fluid muds in tidal channels. The conference is also marked by an increase of numerical and flume modelling of hydrosedimentary dynamics, and a rise of studies dedicated to climate and anthropogenic changes, and to coastal engineering.

To summarize, since the beginning, the Tidalite conference logically reflects the research made by the organiser teams rather than a general, worldwide evolution in tidal sedimentology. For instance, the North American conferences, in Calgary and Savannah, have highlighted facies and stratigraphic aspects, in relationship with a petroleum-oriented perspective, while the European meetings, in Wilhemshaven and Copenhagen, focused more on modern settings and processes. The Asian conferences, in Seoul and Qintao, put forward challenging environmental issues. At the same time, the Tidalite community has become more diverse and the pressure on young colleagues for publishing their research works in international journals increased.

To get a more accurate idea of the tidal sedimentology production in the last years, we made a rapid overview of the articles published between 2009 and 2015 in international journals of geosciences featuring the keywords *tide* or *tidal* in the title and *sediment* or *deposit* in the abstract. The query sent back about 400 papers mostly covering the following subjects :

- Facies and architecture in siliciclastics: IHS and fluvial-tidal transition. Tidal deltas and inlets. Wave-dominated, open-coast tidal flats. Tidal signature in open-, muddy coastlines, shelves and slope systems. Carbonate peritidal flats and channels, offshore bioclastic carbonate bodies. Tidal straits.
- Biota: Benthic diatoms/foraminifera to assess tidal changes, and long-term tidal flat dynamics. Ichnology of tidal environments. Tides and life: bacterial mats, cambrian explosion.
- Processes and Modelling: Tidal bores, tidal channels and fluid muds. Tidal bars, ridges and inlets. Offshore dunes and shelf sand transport. Internal tides and deep sands, gas hydrates; tide influenced hyperpycnal flows and turbidites. Effect of sea-level rise on tidal range, estuarine circulation. Palaeotidal reconstructions.
- Climate: Effect of storms on tidal systems. Tide-storm interplay in the evolution of offshore dunes. Rapid, climate or sea-level changes and morphodynamic evolution of coastal marshes and freshwater wetlands. Astronomical cycles and tidal rhythmites.
- Environmental studies: Carbon sequestration and geochemical tracing of tidal transport, Pollution record in tidal flats. Anthropogenic effects in tidal environments.

As a consequence of the diversification of tidal sedimentology and increase of contributors, there has been a need for more synthetic productions. Martinius & Van den Berg (2011) opened the way with their atlas of estuarine facies partly based on the extensive lacker peel collection of the Utrecht University. Also, the 27th IAS Meeting of Sedimentology in Alghero (Italy) in 2009 had a special session on Tidal Sedimentology, which resulted in a special issue of Sedimentary Geology providing

more syntheses and less case studies than in the previous edited volumes (Longhitano et al., 2012). At the same period, a special issue of the Bull. Soc. Géol. France was published on the incised-valleys around France (Chaumillon et al., 2010). Six over the 10 contributions of this volume focus on the tide-dominated to tide-influenced estuaries located along the Atlantic and Channel coasts. Finally, the textbook “Principles of Tidal Sedimentology” (Davis & Dalrymple, 2012) was the first general book dedicated to tidal sedimentology, since that of Stride (1982) on offshore tidal sands. Most authors from the steering committee of the past Tidalites conferences (except carbonate specialists) authored the chapters of this book, which provides a state of the art on typical tidal environments including a renewed perspective on carbonates and, for the first time, a specific insight on the deep sea and well-known ancient tidal basins.

Outline of the present volume

The Tidalites 2012 conference was held in Caen (France) and gathered about 100 colleagues. In addition to the 70 talks and posters covering the main fields of tidal sedimentology, the meeting offered the opportunity to visit the following sites: (i) the Arcachon basin and Gironde estuary on the Atlantic coast (Chaumillon and Féliès, 2012); (ii) the wave-dominated Somme estuary, in the Eastern Channel area (Trentesaux et al., 2012); (iii) the Anjou Miocene tidal crags (André et al., 2012); (iv) the Bay of Mont-Saint-Michel in the Western Channel (Tessier et al., 2012). The four field trip guide-books are grouped together in a single volume (ASF, 2012).

The Caen Tidalite 2012 conference brought about 17 papers, gathered in the present volume. The book content is organized following a progressive succession of papers going from methodological papers to papers on processes and facies in modern and ancient environments, and then to papers dealing with stratigraphy of tidal successions.

The introducing papers highlight a diversity of tools and methodologies used in modern tidal sedimentology, such as the numerical modelling of tidal circulation in a very shallow water microtidal lagoon (Zhang et al.), the satellite monitoring of deltaic mouthbars using SAR data (Tanaka et al.) or the GIS database setup for microtidal flat ichnofacies (Baucon and Felletti). The next three papers reflect the relatively recent interest for tidal bore research. Two of the them are process-oriented: Furgerot et al. document resuspension processes due to the tidal bore in the Mont-Saint-Michel estuary, while Fan et al. consider the morphodynamic impact of the tidal bore in the Qiantang River. The third one links tidal bores to sediment supply in a Cretaceous fluvio-estuarine system (Chamiso et al.).

The recognition of tidal facies is still matter of discoveries and debate. Fluvial to lacustrine floodplains can be misinterpreted as tidal flats (Flemming), as they share many similar features (Quijada et al.). The imprint of tides on the growth of stromatolites is also questioned (Suarez-Gonzalez et al.). The geometric analysis of crossbeds is used to locate the bedforms within a larger-scale tidal landscape (Chiarella et al.). Tidal rhythmite deposition and preservation are discussed in settings where accommodation can increase rapidly, either due to tidal channel erosion (Pelletier et al.) or melt-water pulses (Archer et al.).

The final group of papers illustrates the continued interest for replacing the tidal facies in a high-resolution sequence stratigraphic framework. The multiplicity of tidal ravinement surfaces within a tide-dominated Pleistocene estuarine fill is exemplified (Kitazawa & Murakoshi), while the estuarine to shoreface transition is documented within the infilling of a Holocene coastal plain (Margotta et al.). The tide-to-wave, estuarine-to-marine transition is also addressed in an example from the Devonian of Iran (Sharafi et al.). Finally, the transgressive reworking of lowstand deltas into headland-attached, tide-dominated sandbodies is documented from the classic example of the Roda sandstones in Northern Spain (Michaud & Dalrymple).

We are very grateful to the Tidalites community for the opportunity given to organize the Caen 2012 conference and then to publish this volume. Gathering and organizing the articles, as well as writing

this editorial, was a stimulating experience that helped to clarify our own view of the scientific production of this community. We would like to thank the authors and reviewers for their contribution to the volume, as well as the editorial board of the IAS, the series editors Thomas Stevens and Mark Bateman, and Adam Corres the editorial manager, for their continued patience. At last, we wish a good success to the next Tidalites Conference (Tidalites 2015) that is going to be held in Puerto Madryn, Argentina, in November 2015.

References

- Alexander, C.R., Davis, R.A. and Henry, V.J., Eds (1998) *Tidalites : processes and products*. SEPM Spec. Publ., 61, 171 p.
- André, J.-P., Redois, F., Gagnaison, C. and Reynaud, J.-Y. (2012) The Miocene Tidal Shelly Sands of Anjou-Touraine, France. In : *Tidalites 2012, the 8th International Conference on Tidal Environments*. Field trip booklet. Editions ASF, 72, 65-102.
- ASF, 2012. *Tidalites 2012, the 8th International Conference on Tidal Environments*. Field trip booklet. Editions ASF, 72, 200 p.
- Bartholdy, J. and Kvale, E.P., Eds (2006) *Proceedings of the 6th international congress on Tidal Sedimentology (Tidalites 2004)*. Marine Geology, 235, n°1-4, 271 p.
- Chaumillon, E., Tessier, B. and Reynaud, J.-Y., Eds (2010) *Symposium ASF-SGF : Incised valleys and estuaries, Caen 23-25 octobre 2007*. Bull. Soc. Géol France, vol. 181, 224 p.
- Chaumillon, E., and Féliès, H. (2012) *The Incised-Valleys of SW France: Marennes-Oléron Bay, Gironde Estuary and Arcachon Lagoon*. In : *Tidalites 2012, the 8th International Conference on Tidal Environments*. Field trip booklet. Editions ASF, 72, 3-63.
- Davis, R.A., Alexander, C.R. and Henry, V.J. (1998) *Tidal sedimentology: historical background and current contributions*. In: *Tidalites : processes and products* (Eds C.R. Alexander C.R., R.A. Davis and V.J. Henry). SEPM Spec. Publ. 61, 1-4.
- Davis, R.A. and Dalrymple, R.W., Eds (2012) *Principles of tidal sedimentology*. Springer, 621 p.
- De Boer, P.L., Van Gelder, A. and Nio, S.D., Eds (1988) *Tide-Influenced Sedimentary Environments and Facies*. D Reidel Publishing Company, Dordrecht. 530 p.
- Flemming, B.W. and Bartholomä, A., Eds (1995) *Tidal Signatures in Modern and Ancient Sediments*. International Association of Sedimentologists. Special Publication, 24, 358 p.
- Ginsburg, R.N., Ed (1975) *Tidal deposits. A casebook of recent examples and fossil counterparts*, Springer-Verlag, NY, 428 p.
- Klein, G. de V. (1977) *Clastic tidal facies*. CEPCO, Champaign, Illinois, 149 p.
- Klein, G. de V. (1998) *Clastic Tidalites: a partial retrospective view*. In: *Tidalites : processes and products* (Eds C.R. Alexander C.R., R.A. Davis and V.J. Henry). SEPM Spec. Publ. 61, 1-4.
- Longhitano, S., Mellere, D. and Ainsworth, B., Eds (2012) *Modern and ancient tidal depositional systems : perspectives, models and signatures*. Sedimentary Geology, 279, 186 p.
- Martinius, A.W. and Van den Berg, J.H. (2011) *Atlas of sedimentary structures in estuarine and tidally-influenced river deposits of the Holocene Rhine-Meuse-Scheldt system: Their application to the interpretation of analogous outcrop and subsurface depositional systems*. EAGE Publication, 298 p.

Park, Y.A. and Davis, R.A., Eds (2001) Proceedings of Tidalites 2000, The Korean Society of Oceanography, Special publications, 103 p.

Smith, D.G., Reinson, G.E., Zaitlin, B.A. and Rahmani, R.A., Eds (1991) Clastic Tidal Sedimentology. Mem. Can. Soc. Petrol. Geol., 16, 387 p.

Stride, A.H., Ed (1982) Offshore tidal sands: processes and deposits. Chapman & Hall, London, 222 p.

Tessier, B., Bonnot-Courtois, C., Billeaud, I., Weill, P., Caline, B. and Furgerot, L. (2012) The Mt St Michel bay, NW France: Facies, sequences and evolution of a macrotidal embayment and estuarine environment. In : Tidalites 2012, the 8th International Conference on Tidal Environments. Field trip booklet. Editions ASF, 72, 149-195.

Trentesaux, A., Margotta, J. and Le Bot, S. (2012) The Somme bay, NW France: a wave-dominated macro tidal estuary. In : Tidalites 2012, the 8th International Conference on Tidal Environments. Field trip booklet. Editions ASF, 72, 103-147.

Visser M.J. (1980) Neap-spring cycles selected in Holocene subtidal large scale bedforms deposits: a preliminary note. Geology, 8, 543-546.