C. R. Geoscience 348 (2016) 409–410

Contents lists available at ScienceDirect

Comptes Rendus Geoscience

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Foreword

Coastal sediment dynamics: Introduction to the thematic issue

This thematic issue of *Comptes rendus Geoscience* gives an overview of the works presented in the frame of a session dedicated to "Coastal sediment dynamics" at the 14th Congress of the French Association of Sedimentologists, held in Paris, France, from 5 to 7 November 2013. In total, 23 papers were presented in this session, both in the form of oral communications and posters. This national conference is traditionally a gateway for PhD and Master students to share their first results and sharpen their oral skills in front of an audience of specialists.

The diversity of papers presented in this session reflects the natural diversity of the French coasts that open on the English Channel, the Atlantic Ocean and the Mediterranean Sea, both in terms of morphology (sedimentary and igneous rocky coasts, sandy beaches and subtidal prisms, bays and estuaries) and hydrodynamic processes (wave versus tide-dominated environments).

The main scientific issues addressed in the communications focused on:

- understanding the evolution of constructional and erosional coasts at both long (Neogene to Quaternary) and short-terms (Holocene) through the stratigraphic architecture of sedimentary systems and remnant morphology of rocky platforms;
- refining our vision of modern coastal systems in terms of sedimentary facies and heterogeneity, geomorphology and hydrodynamic processes, in order to better constrain the interpretation of fossil systems;
- quantifying sedimentary fluxes and relating hydrodynamic processes to morphodynamics of sedimentary bodies in tide-dominated environments (estuaries and tidal channels, subtidal platforms);
- learning from natural hazards (tsunamis, tidal flooding and storms) by studying the record of extreme events in the sediment archive, and anticipating future evolutions in the scope of climate change and rising sea-level through refined numerical models of sediment transport and morphodynamic evolution;
- monitoring and anticipating the changes in sediment patterns and transport due to human activities (sediment dredging, installation of marine renewable energy facilities...).

The different studies presented gave an interesting outlook on the variety of tools deployed by the community of coastal sedimentologists, and raised a number of questions on the sensitivity, calibration and limits of use of the measurement systems. Subtidal morphologies are generally investigated using multi-swath bathymetry and side-scan sonar, sometimes on vessels specially designed for shallow water; intertidal and subtidal environments are surveyed using air-borne and terrestrial laser scanner, or by man-made surveys using differential GPS (beach profiles). Hydrodynamics and sediment fluxes are quantified using optic (OBS) and acoustic (ADV, ADCP) probes. While a very high-resolution seismic has proven its efficiency to investigate the stratigraphy of subtidal bodies and sediment infilling of bays and estuaries, ground-penetrating radar is becoming increasingly popular in the community to characterize the architecture of dunes and beach ridges. Finally, original tools such as magnetic susceptibility and X-ray microtomography enrich the classical package of sedimentological lab analyses.

Six papers were selected for this thematic issue, which illustrate the diversity of methods and objects embraced by the community of sedimentologists working on coastal environments.

Sandy beaches are subject to erosion, especially during winter storms, and the French coasts are globally retreating under the action of rising sea-level. Due to this loss of recreational areas and to the damages on infrastructures on the seaside, engineering solutions are sometimes required to fight against erosion. Bain et al. (2016) report a 5-year monitoring of a sandy beach in northern France following the installation of a beach drainage system. This soft engineering solution lowers the beach watertable, and reduces the erosive potential of the backwash. The survey reveals a landward displacement of the sediment stock and a stabilization of the beach profile, although the system is vulnerable to damages by strong winter storms.

http://dx.doi.org/10.1016/j.crte.2016.05.001
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Duperret et al. (2016) present a new dataset of high-resolution shallow-water bathymetry coupled with aerial lidar topography. The digital elevation models of land–sea transition zones offer a unique opportunity to study the development of rocky shore platforms. A comparison between a chalky coast along the English Channel and a granitic coast in Brittany highlights the role of lithology and of the tectonic heritage as control factors of shore platform development in response to past sea-level fluctuations.

Quantifying sediment fluxes is essential to understand long-term evolution and infilling of estuaries. However, measuring suspended sediment concentration in highly turbid and turbulent flow is not straightforward. Furgerot et al. (2016) address this issue by performing a detailed comparison of suspended sediment concentration values during the passage of a tidal bore using: (i) in-situ sampling, (ii) optical back-scatter sensor measurements. The quantification of the tidal bore hydrodynamics performed with ADV and ADCP measurements, coupled with turbidity measurements, allowed them to calculate instantaneous vertical sediment concentration profiles during the passage of a tidal bore, which plays a significant role in resuspended sediments from the channel bed.

Lesourd et al. (2016) present a new map of superficial sediments in and around the mouth of the Seine estuary, based on an interpolation of 561 grab samples. The comparison of these data with four other superficial sediment maps gives an overview of the sedimentary evolution of the Seine estuary since the late 19th century. The observations reveal an increasing content of muddy sediment in the mouth of the estuary. Although in a mega-tidal context, the man-induced alteration of the estuary by engineering works for navigation has transformed the estuary from a sandy tide-dominated environment to a muddy river-dominated system.

The silting of the Seine estuary requires a continuous dredging of the channels to ensure a minimum water depth for navigation. The dredged material is generally dumped on specific sites in the bay of Seine. Nizou et al. (2016) propose an original method to monitor the dispersal of the dredge material. Because terrigenous sediment contains a higher fraction of ferromagnetic minerals than marine sediment does, magnetic susceptibility analysis of grab samples is an efficient tool to map the dispersion of dredge-dumped sediment on the sea floor, in complement to classical grain size analysis.

Van Vliet-Lanoë et al. (2016) investigate the historical development of coastal dunes in Brittany. Dune building is conditioned by the sediment budget, which increased in the Late Holocene due to the slowing down of the marine transgression and the development of agriculture, and to stormy conditions that are more favourable during dominantly negative NAO periods. However, modern conditions of rising sea-level and sediment starvation might weaken coastal dunes that protect lowlands from marine submersion.

Acknowledgements

We wish to thank the authors for their contributions, and all the participants in the "Coastal sediment dynamics" session during the conference.

We are indebted to the numerous referees for their conscientious and constructive reviews of the manuscripts: Rémi Belon (BRGM, France), Benoît Camenen (IRSTEA, France), Christian Crouzet (Savoie Mont-Blanc University, France), Daidu Fan (Tongji University China), Christine Franke (MINES ParisTech, France), Sophie Lebot (University of Rouen, France), Barbara Mauz (University of Liverpool, UK), Steve Mitchell (University of Portsmouth, UK), Christophe Morhange (Aix-Marseille University, France), Cherith Moses (Univ. of Sussex, UK), Aldo Sottolichio (University of Bordeaux), and Wayne Stephenson (University of Otago, New Zealand).

We are grateful to Sylvie Bourquin, associate editor of *Comptes rendus Geoscience*, who offered us the opportunity to publish this thematic issue, and who helped us in the reviewing and editorial processes.

References

Bain, O., Toullec, R., Combaud, A., Villemagne, G., Barrier, P., 2016. Five years of beach drainage survey on a macrotidal beach (Quend-Plage, northern France). C. R. Geoscience 348, (this issue).

Duperret, A., Raimbault, C., Le Gall, B., Authemayou, C., van Vliet-Lanoë, B., Regard, V., Dromelet, E., Vandycke, S., 2016. High-resolution onshore–offshore morpho-bathymetric records of modern chalk and granitic shore platforms in NW France. C. R. Geoscience 348, (this issue).

Furgerot, L., Mouazé, D., Tessier, B., Perez, L., Haquin, S., Weill, P., Crave, A., 2016. Sediment transport induced by tidal bores. An estimation from suspended matter measurements in the Sée River (Mont-Saint-Michel Bay, northwestern France). C. R. Geoscience 348, (this issue).

Lesourd, S., Lesueur, P., Fisson, C., Dauvin, J.-C., 2016. Sediment evolution in the mouth of the Seine estuary (France): A long-term monitoring during the last 150 years. C. R. Geoscience 348, (this issue).

Nizou, J., Demory, F., Dubrulle-Brunaud, C., 2016. Monitoring of dredged-dumped sediment dispersal off the Bay of the Seine (northern France) using environmental magnetism. C. R. Geoscience 348, (this issue).

Van Vliet-Lanoë, B., Goslin, J., Hénaff, A., Hallégouët, B., Delacourt, C., Le Cornec, E., Meurisse-Fort, M., 2016. Holocene formation and evolution of coastal dunes ridges, Brittany (France). C. R. Geoscience 348, (this issue).

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Available online 1 June 2016