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FACULDADE DE CIÊNCIAS DO MAR E DO AMBIENTE

OVERWASH SEDIMENTARY DYNAMICS IN THE RIA FORMOSA BARRIER ISLANDS

(Tese para a obtenção do grau de doutor no ramo de Ciências do Mar,
especialidade de Geologia Marinha)

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TÍTULO DA TESE: Dinâmica Sedimentar de Galgamentos Oceânicos nas Ilhas Barreira da Ria Formosa

Resumo

O objectivo principal desta tese é o estudo da dinâmica sedimentar de galgamentos oceânicos. A área de estudo foi o sistema de ilhas barreira da Ria Formosa, e os principais aspectos abordados nesta tese foram: (a) transporte sedimentar induzido por galgamentos; (b) factores que governam a sedimentação de galgamento e o papel relativo dos galgamentos na dinâmica das ilhas barreira; (c) assinatura textural dos cortes de galgamento, e (d) classificação da dinâmica dos cortes de galgamento. Foi determinado o transporte sedimentar sob fluxos de galgamento confinados e não-confinados, incluindo variações morfológicas, remobilização e padrões de transporte. Os factores que governam a sedimentação de galgamento, incluindo condições de tempestade e de não-tempestade, bem como o papel relativo dos processos de galgamento, foram estabelecidos com base num estudo de médio-termo de uma barreira frequentemente galgada. A assinatura textural dos cortes de galgamento foi determinada e relacionada com os processos costeiros, num estudo comparativo com amostras de ambientes sedimentares adjacentes (duna, praia e barra de maré). A classificação da dinâmica de cortes de galgamento foi desenvolvida com base na interpretação de fotografia aérea. A classificação assenta na identificação dos mecanismos responsáveis pela formação e desaparecimento dos cortes, bem como na tendência evolutiva dos galgamentos.

Palavras-chave: galgamento; corte de galgamento; ilhas barreira; transporte sedimentar; classificação costeira; granulometria.

Abstract

The main objective of this thesis is to study the overwash sedimentary dynamics. The study area was the Ria Formosa barrier island system, and the main issues addressed in this thesis were: (a) overwash sediment transport; (b) the factors governing overwash sedimentation, and the relative role of overwash in barrier island dynamics, (c) the washover textural signature, and (d) the classification of washover dynamics. Overwash sediment transport was determined for both confined and unconfined overwash flows, and include morphologic variations, mixing depth, and transport patterns. The factors governing overwash sedimentation, including storm and non-storm conditions and the relative role of overwash processes were established based on a medium-term study of a frequently overwashed barrier. The textural signature of washovers was determined in relation with the associated coastal processes in a comparative study with samples from the adjacent sedimentary environments (dune, beach, and tidal inlet). The classification of washover dynamics was developed based on the interpretation of a set of aerial photographs. The classification relays in the identification of the mechanisms responsible for the formation and disappearance of washovers, and on the overwash evolutionary trend.

Key-words: overwash; washover; barrier islands; sediment transport; coastal classification; grain-size.

Para o Miguel,
porque somos “nós”,

Para a Mariana e o Pedro,
porque iluminam o mundo quando sorriem para “nós”

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HOW THIS THESIS BECAME POSSIBLE:

I like mind challenges and I like to be outdoors. This probably explains why I found the overwash an interesting issue. Working under rough weather, around the clock sounded OK to me. However, when I realised that I needed to put my colleagues under these conditions, I knew that I probably had a lot of acknowledgments to make. Therefore, my first acknowlegments are for the people that made fieldwork for this thesis: Alexandre Braga, Ana Vila, André Pacheco, Brad Morris, Carla Garcia, Catarina Sá Pires, Francisco Plaza, Isabel

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It was a little crazy to set myself to do all this challenging work, but I was in my late 20's; it was much more surprising to me that my supervisors made a smile when we spoke about deploying our equipment on the beach during an overwash event. My second acknowledgements is then to my supervisors who encouraged and supported me.

Prof. Alveirinho Dias was the first person I met from the University of Algarve. We arrange a meeting in a coffee shop in front of the Museum of Natural History, in Lisboa, and he asked me a lot of questions about what were my expectations, what I would like to do after finishing my degree. When I started to work in his own office, at Gambelas, a few months later, his priority was to teach me “Team Work”. I think he can be proud of that, maybe I even learned it a bit too well...

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My supervisors work at the University Campus of Gambelas, but I developed my own work in CIACOMAR, in Olhão, 15 km apart. The ones that mostly suffered with my bad temper were my colleagues in CIACOMAR. To them goes my profound appreciation for the companionship. Because I'm the dinosaur of CIACOMAR, I shared the space with many different persons, and just to mention the ones that immediately came to mind: Ana Vila, Isabel, Rita, André, Brad, Ricardo, Margarida, Célia, sr. Cunha, Tiago, Ramon, Carla,

Catarina, Amélia, Marcos,...CIACOMAR is that special place where Ramon walked with no shoes on, sr. Cunha tells his old adventures at IH, everybody enjoys Margarida's cakes, Tiago listens loudly to U2, André constantly walks around the place trying to find something, Isabel plays in the lab with pink tiny bugs, Rita stinks the place with smelly lagoon stuff, Ricardo played with a strange torpedo that made an annoying bip-bip, Paco couldn't look straight at his strange long sheets full of lines, and Amélia used to say people at CIACOMAR are "different". I wonder why...

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Index

Resumo.....	i
Abstract	ii
Acknowledgments.....	v
Index	ix
List of figures	xiii
List of tables.....	xix
Chapter 1. Introduction.....	1
1.1. Motivation to study overwash.....	2
1.2. Questions and objectives.....	4
1.3. Outline of the thesis.....	7
Chapter 2. Review of overwash processes in barrier islands	9
2.1. Definition of overwash processes and morphologies.....	10
2.2. Driving mechanisms and occurrence conditions.....	13
2.3. Overwash sedimentary dynamics.....	18
2.4. Washover sediments characteristics.....	24
2.5. Overwash processes in the Ria Formosa.....	27
Chapter 3. Study area.....	31
3.1. Location of the study area.....	32
3.2. Forcing mechanisms.....	33
3.2.1. Climatic setting.....	33
3.2.2. Oceanographic setting.....	35
3.3. Geology and geomorphology.....	37
3.3.1. Ria Formosa general characteristics.....	37
3.3.1.1. Tidal inlets.....	37
3.3.1.2. Barrier islands.....	38
3.3.2. Barreta Island.....	41
Chapter 4. Overwash sediment transport: detailed field studies.....	45
4.1. Introduction.....	46
4.2. Methods.....	47
4.2.1. Fieldwork data collection.....	47
4.2.1.1. Forcing mechanisms.....	51
4.2.1.2. Overwash flow.....	51
4.2.1.3. Topography.....	52
4.2.1.4. Mixing depth.....	52
4.2.1.5. Grain-size.....	53
4.2.1.6. Tracers.....	53
4.2.2. Data processing and laboratory procedures.....	54
4.2.2.1. Forcing mechanisms.....	54
4.2.2.2. Overwash flow.....	55
4.2.2.3. Topography.....	56
4.2.2.4. Mixing depth.....	57
4.2.2.5. Grain-size.....	57

4.2.2.6. Tracers.....	58
4.3. Results.....	60
4.3.1. Forcing mechanisms.....	60
4.3.2. Overwash flow.....	62
4.3.3. Morphologic variations.....	67
4.3.4. Mixing depth.....	69
4.3.5. Grain-size.....	70
4.3.6. Sediment transport patterns.....	71
4.4. Discussion.....	76
4.4.1. Washover short-term dynamics.....	76
4.4.1.1. Washover plain dynamics.....	76
4.4.1.2. Washover lobe dynamics.....	79
4.4.2. Main factors governing non-storm overwash.....	81
4.4.3. Non-storm overwash importance.....	85
4.5. Conclusions.....	89
Chapter 5. Factors governing overwash sedimentation and its role in barrier island dynamics.....	93
5.1. Introduction.....	94
5.2. Methods.....	95
5.2.1. Oceanographic data.....	95
5.2.2. Fieldwork data collection.....	96
5.2.3. Morphologic data processing and analysis.....	98
5.3. Results.....	102
5.3.1. Hydrodynamics.....	102
5.3.2. Washover morphology.....	107
5.3.2.1. Spatial variability of the morphologic parameters.....	107
5.3.2.2. Volumetric evolution of the barrier.....	112
5.4. Discussion.....	117
5.4.1. Relative role of processes in barrier dynamics.....	117
5.4.2. Overwash sedimentation: governing factors and thresholds.....	125
5.5. Conclusions.....	134
Chapter 6. Washover textural signature and associated sedimentary dynamics..	137
6.1. Introduction.....	138
6.2. Methods.....	139
6.2.1. Sample collection.....	139
6.2.2. Grain-size analysis.....	144
6.3. Results.....	149
6.3.1. Barrier island environments.....	149
6.3.2. Tidal inlet environments.....	153
6.4. Discussion.....	155
6.4.1. Barrier island textural signature.....	155
6.4.1.1. Definition of textural groups.....	155
6.4.1.2. Sedimentary dynamics and driving mechanisms of textural groups..	163
6.4.2. Washover sedimentary dynamics.....	168
6.4.2.1. Deposition under overwash flow.....	168
6.4.2.2. Textural grading.....	171
6.4.2.3. Post-overwash evolution of sedimentary surface.....	172
6.5. Conclusions.....	175

Chapter 7. Classification of washover dynamics in barrier island systems.....	179
7.1. Introduction.	180
7.2. Classification of washover dynamics.	181
7.2.1. Methods.	181
7.2.1.1. Photo-interpretation and geomorphologic criteria.	181
7.2.1.2. Development of the classification.	185
7.2.2. Description of the proposed classification.	186
7.2.2.1. Washover formation mechanisms.	188
7.2.2.2. Washover disappearance mechanisms.	191
7.2.2.3. Overwash evolutionary trend.	195
7.2.3. Discussion of the classification.	197
7.2.3.1. Limitations of the aerial photograph interpretation.	197
7.2.3.2. Classification guidelines and limitations.	198
7.3. Case study: Ria Formosa barrier islands.	205
7.3.1. Methods of application of the classification.	205
7.3.2. Results of the case study.	210
7.3.2.1. Formation mechanisms.	210
7.3.2.2. Disappearance mechanisms.	213
7.3.2.3. Overwash evolutionary trend.	216
7.3.3. Discussion of the case study.	221
7.4. Conclusions.	225
Chapter 8. General conclusions	229
References	235

List of figures

Figure 2.1. Washover morphologies terminology for (a) washover plain, and (b) washover lobe..... 11

Figure 2.2. (a) Definition sketch describing variables used in scaling the impact of storms on barrier islands; (b) Delineation of four different regimes important to categorizing storm impacts on barrier islands. From Sallenger (2000) 15

Figure 2.3. The continuum of overtop-washover sedimentation as a function of the increasing water volume passing landward over a barrier crest during a severe storm. With an increasing volume of swash or surge water passing over the crest, net vertical aggradation associated with beach crest overtopping (A) is superseded by distinctive washover fans emanating from throats (B). With major surge volumes the crest is often relocated landwards by overwash, and near continuous washover lobes merge laterally into a washover terrace (C). From Orford and Carter (1982), with the nomenclature of washover morphologies adapted to the definitions of section 2.1..... 16

Figure 2.4. Example of a cross-shore profile before and after overwash. Profile on the centre of a washover on Assateague Island, Maryland (USA), before and after Hurricane Belle, August 9, 1976. From Fisher and Stauble (1977) 18

Figure 2.5. Probability curve fitted to the washover intrusion measurements (n = 717) including Hurricanes Hugo (n = 131), Camille (n = 30), Carla (n = 167), Alicia (n = 74), Frederic (n = 31), the 1985 Louisiana hurricanes (n = 84), and the 1962 northeaster (n = 200). Numbers in parentheses represent storm intensity. From Morton and Sallenger (2003), modified with the definitions of section 2.1 21

Figure 2.6. Schematic diagram of small-scale washover lobe and their internal sedimentary structures. The sectional views represent the upper meter of the sand-body complex, from Schwartz (1982) that based the scheme in studies made on Outer Banks, North Carolina; Presque Isle Peninsula, Pennsylvania; Arnold Road Beach, California, U.S.A. 25

Figure 2.7. Overwash susceptibility maps of the Ria Formosa barrier islands. From Andrade (1990) 28

Figure 3.1. Location of the Ria Formosa barrier islands and tidal inlets (names in *italic*), mainland cities (underlined) and bathymetry of the adjacent continental shelf (in meters). P.=Peninsula; I.=Island 32

Figure 3.2. Location of the washover plain on the western part of Barreta Island, and Ancão Inlet channel and eastern deltas. Vertical aerial photograph date: August 2001	42
Figure 3.3. Overwash on the washover lobes and washover plain, on western Barreta Island (date: September, 2001).....	43
Figure 3.4. Examples of washover morphologies on Barreta Island. (a) Washover crest with an erosion bluff (date: February 2002); (b) washover terrace with pioneer vegetation communities (date: February 2005); (c) washover channel (date: February 2001); and (d) washover fan (date: February 2003).....	44
Figure 4.1. Location of fieldwork campaigns GO.1, GO.2 and GO.3 on Barreta Island. The vertical aerial photograph was taken in August 2001. The GO.2 and GO.3 fieldwork campaigns were made on washover lobes which did not exist at the time of this photograph	48
Figure 4.2. Photographs of the GO.3 washover lobe, without and with overwash flow	48
Figure 4.3. Setting of the GO.1 fieldwork campaign	49
Figure 4.4. Setting of the GO.3 fieldwork campaign	50
Figure 4.5. Tidal levels for oceanic and lagoon waters: (a) for GO.1, and (b) for GO.3.....	61
Figure 4.6. Variation of significant wave height at breaking (H_{sb}) during GO.1, and GO.3 fieldwork.....	62
Figure 4.7. Example of a 10-min block of the water height above sensor (h-PT) of (a) GO.1, and (b) GO.3, and the indirect counting of overwash flows	64
Figure 4.8. Frequency of overwash and complete overwash (right axis), tidal levels and significant wave height (left axis) for (a) GO.1, and (b) GO.3	65
Figure 4.9. Frequency of overwash flow velocities for GO.3 fieldwork	66
Figure 4.10. Washover plain morphologic variations for an average cross-shore profile (profiles 1 to 6 of Figure 4.3), during GO.1 fieldwork campaign.....	67
Figure 4.11 Morphologic variations during GO.3 fieldwork for cross-shore profiles: (a) washover lobe central profile, and (b) washover plain average profile (profiles 4 to 6 of Figure 4.4)	68
Figure 4.12. Mixing depth distribution in the study area for (a) GO.1, and (b) GO.3.....	70

Figure 4.13. Fluorescent tracer (FT) distribution map integrating all sampled layers (0 to 25 cm depth), for GO.1 fieldwork. The mass centroid location is also represented, both for each of the sampled layers (0-5 cm, 5-10 cm, 10-15 cm, 15-20 cm, and 20-25 cm depth), and for the sum of all layers (global)	72
Figure 4.14. Fluorescent tracer (FT) distribution map for all sampled layers, for GO.3 fieldwork: (a) 0-5 cm, (b) 5-10 cm, (c) 10-15 cm, (d) 15-20 cm, and (e) 20-25 cm depth. The mass centroid location of each layer is also represented	74
Figure 4.15. Factors governing non-storm overwash, and the sedimentary dynamics of washovers	84
Figure 5.1. Location of the cross-shore profiles, represented by the start and end points. Aerial photograph from 2001	97
Figure 5.2. Examples of volume variation computation in case of (a) complete overwash, and (b) incomplete overwash. WSH=Washover.....	100
Figure 5.3. Wave and tidal conditions for the study period: (a) significant wave height; (b) peak period; (c) wave direction at peak period; and (d) tidal range	103
Figure 5.4. Wave power (P) for: (a) W-SW direction, and (b) E-SE direction.....	104
Figure 5.5. Average positions of ocean MSL (white circle), lagoon MSL (black circle), washover crest (white square), and washover terminus (black square), for the 13 profiles. The reference line used to determine the relative exposures is also represented	107
Figure 5.6. Quantitative morphologic criteria used for profile grouping. The average, maximum, and minimum values were represented for each of the criteria	109
Figure 5.7. Vegetation criteria for profile grouping: (a) Group A, view to SE, date: 26 th July 2002; (b) Group B, view to NE, date: 8 th April 2004; and (c) Group C, view to SE, date: 8 th April 2004	110
Figure 5.8. Examples of barrier cross-shore profiles and envelopes for the studied period: (a) profile P3, of Group A; (b) profile P9, of Group B; and (c) profile P13, of Group C.....	111
Figure 5.9. Cumulative barrier volume variation during the monitoring period.....	112
Figure 5.10. Cumulative volume variation for Groups A, B and C, due to (a) swash processes; (b) overwash processes; (c) aeolian processes; and (d) lagoon processes. Note that (a) and (b) have different graphic volume scales than (c) and (d).....	114

Figure 5.11. Volume variation of the barrier and component of volume variation due to swash, overwash, aeolian and lagoon processes	118
Figure 5.12. Aerial photograph of Ancão Inlet, from 2001, where swash bars related with the Ancão Inlet are visible. The swash bar is almost welding to the beach seawards of the studied washover plain.....	120
Figure 5.13. Wave power for the waves from W-SW, tidal range, survey dates, and periods with OSs, during the study period. Note that only the spring tides (tidal range>3.0m) were represented.....	126
Figure 5.14. Plunging breaker waves with about 2 m height, at Ancão Peninsula (2,500 m NW of the study area), at September 18 th 2001	127
Figure 5.15. Examples of the 13 barrier profiles corresponding to the initial morphological conditions, with the distinction between the ones where (a) OSs occurred between survey #3 and #5 (September 2001); and (b) OSs occurred between survey #17 and #18 (February 2003)	130
Figure 5.16. Overwash sedimentation <i>versus</i> beach slope, beach volume, washover terrace width, and washover elevation	131
Figure 6.1. Diagram representing direct spatial relationships (represented by arrows) between the geomorphologic units (tidal inlet and barrier island), the sedimentary environments for each of the geomorphologic units, and the sedimentary sub-environments.....	140
Figure 6.2. Location of profiles on the Barreta Island washover plain. The square (D) encloses the mature dune samples location, and the triangle (de) encloses the embryonic dune samples location	141
Figure 6.3. Sample collection scheme for the washover area of Barreta Island. Elevation is relative to MSL.....	142
Figure 6.4. Sample locations at the Ancão Inlet. Elevation in meters, referred to Portuguese Hydrographic zero (2m below MSL), with bathymetry represented by negative values. FD – Flood delta; EDA – Ebb delta on Ancão Peninsula, EDB – Ebb delta on Barreta Island, CH – Inlet Channel. Note: the swash platform samples correspond to the crosses on the ebb delta on Ancão Peninsula, above the level +1m. Map dated May 1999 (<i>adapted from Vila-Concejo et al., 2003</i>)	143
Figure 6.5. Examples of frequency curves of sedimentary sub-environments (thinner black line), outlier curves (thicker black line) and composite curve excluding outliers (thicker grey line). (a) Dune sub-environments (outlier curve displaced towards the coarser grain sizes), and (b) Ebb delta on	

Barreta side sub-environment (outlier curve displaced towards the coarser grain sizes and addition of coarser-grained population)	145
Figure 6.6. Moment measures (mean, sorting, skewness, kurtosis) for (a) barrier sedimentary sub-environments, and (b) inlet sedimentary sub-environments. Note that some classification limits are represented in the left and right margins of the graphs	150
Figure 6.7. Composite grain size curves for: (a) barrier sub-environments, and (b) inlet sub-environments	151
Figure 6.8. Specific grain-size contents for all analysed sedimentary sub-environments represented as box-plots: (a) gravel content (GC) maximum, minimum, and quartiles Q_1 and Q_3 ; (b) fine and very fine sand content (FVFC) maximum, minimum, and quartiles Q_1 and Q_3 . Note that the swash platform was not included	152
Figure 6.9. Distinctive average grain size contents for all analysed sedimentary sub-environments: (a) FVFC <i>versus</i> GC, and (b) MC <i>versus</i> VCC. The ellipses enclose the defined textural sedimentary groups. Ellipses with solid lines represent barrier textural groups and ellipses with dashed lines represent inlet textural groups.....	159
Figure 6.10. Schematic block diagram of the textural groups identified for the barrier island sedimentary environments and its qualitative more relevant relative grain-size contents.....	164
Figure 6.11. Variation of the mean grain-size with the distance to the washover crest. Seaward direction is to the left of the graph. Note that the phi scale is in reverse order.....	171
Figure 6.12. Composite curve for the active washover (W_a) and inactive washover (W_i) and the residual curve ($W_a - W_i$)	173
Figure 7.1. Washover formation mechanisms.....	189
Figure 7.2. Washover disappearance mechanisms.....	193
Figure 7.3. Location of the defined sectors for the Ria Formosa barrier islands	205
Figure 7.4. Criteria for the determination of washover (WSH) formation mechanism	208
Figure 7.5. Criteria for the determination of washover (WSH) disappearance mechanisms	209
Figure 7.6. Formation mechanisms of the washovers of the Ria Formosa barrier islands ...	211

Figure 7.7. Examples of washovers formed by inlet dynamics mechanisms. The washovers located on Culatra East sector, updrift of Armona Inlet, were formed by updrift accumulation. The washovers located on Barreta West sector, downdrift of Ancão Inlet, were formed by downdrift erosion. For location of barrier sectors see Figure 7.3, for location of tidal inlets see Figure 3.1	212
Figure 7.8. Example of the formation and the disappearance of washovers, on Tavira West sector. The formation mechanism was the structural erosion with interception of intra-dune depressions (circles in the photos). The washovers that disappeared by structural erosion are shown by the stars on the photos	213
Figure 7.9. Disappearance mechanisms of the washovers of the Ria Formosa barrier islands.....	214
Figure 7.10. Example of the disappearance of washovers by berm development, on Cabanas Centre sector. The washovers that disappeared are shown by the stars on the photos. Note that the three marked washovers were complete in 1989.....	215
Figure 7.11. Example of the disappearance of washovers by human interventions: (a) placement of fences on Ancão Centre sector, (b) nourishment on Armona East sector, and (c) groins and revetment on Cabanas West sector	216
Figure 7.12. Evolution of the number of washovers for the Ria Formosa barrier islands, through the study period.....	217
Figure 7.13. Density of washovers for all barrier sectors, considering the entire study period.....	218
Figure 7.14. Distribution of the washover mouth <i>versus</i> intrusion, considering all barrier sectors, for the selected georeferenced aerial photos	219
Figure 7.15. Example of the evolution of a washover, with division due to intermediate and distal dune development, on Ancão West sector. Note that in this case the washover occurrences increased but washover dimensions decreased	220

List of tables

Table 2.1. Storm parameters and estimated average overwash-induced deposition.....	20
Table 3.1. Climatic data for Faro-Airport and Tavira meteorological stations.....	34
Table 4.1. Average values of mean grain-size and sorting for the samples located on the beach and washover, and for the sand before and after dying (FT).....	71
Table 4.2. Background conditions at the start and end of overwash interval, for the GO.1 and GO.3 fieldwork campaigns.....	82
Table 5.1. Survey dates, reliable surveys and corresponding season.....	98
Table 5.2. Some characteristics of the storms that occurred during the study periods. Storms from W-SW with number in bold and from E-SE with number in italic. The duration corresponds to the consecutive time in the record with $H_s \geq 3$ m.....	106
Table 5.3. Cross-shore profiles where insignificant and significant overwash sedimentation was registered between consecutive surveys.....	115
Table 6.1. Number of collected samples, outliers and analysed samples, for the barrier island sedimentary environments.....	141
Table 6.2. Number of collected samples, outliers and analysed samples, for the tidal inlet sedimentary environments.....	144
Table 6.3. Synthesis of geomorphologic units, sedimentary environments and sub-environments, corresponding textural groups, and barrier textural groups named after main driving mechanism.....	162
Table 7.1. Coverage and scale of vertical aerial photos used for this study.....	182
Table 7.2. Classification of overwash evolutionary trend.....	196
Table 7.3. Barrier islands sectors name, length and distinctive characteristics.....	206

