

Visão Global

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Visão Global do Projecto

Referência do projecto Project reference

POCI/AMB/59262/2004

1. Identificação do projecto
1. Project description

-

Financiamento solicitado Requested funding

100.000,00 Euros

Área científica principal Main Area

Environmental Sciences and Technologies

No caso de considerar imprescindível a avaliação do seu projecto numa outra área científica proponha qual:

Área científica Secundária Secondary area

Proposals for Research and Development Projects in all Scientific Domains - 2004

Título do projecto (em português) Project title (in portuguese)

Efeitos da bioturbação nos ciclos de erosão-deposição de sedimentos estuarinos (ERODES)

Título do projecto (em inglês) Project title (in english)

Density-dependent effects of bioturbation on erosion-deposition cycles of estuarine sediments (ERODES)

Palavra-chave 1

bioturbação

Keyword 1

bioturbation

Palavra-chave 2

erosão-deposição

Keyword 2

erosion-deposition

Palavra-chave 3

modelação

Keyword 3

modelação

Palavra-chave 4

sedimentos estuarinos

Keyword 4

estuarine sediments

Objectivos sócio-económicos Socio-economic objectives

Environment

Data de início do projecto Starting date

17-05-2004

Duração do projecto em meses Duration in months

30

2. Instituições participantes
2. Participating institutions

-

Instituição Proponente Principal Contractor

Instituto do Mar (IMAR)

Departamento de Zoologia - Faculdade de Ciências e Tecnologia da Universidade de Coimbra
3004-517Coimbra

Instituições Participantes**Participating Institutions****Centro de Ambiente e Tecnologia Marítimos (MARETEC/IST/UTL)**

Avenida Rovisco Pais
1049-001Lisboa

Unidade de Investigação**Principal Research Unit****Centro de Modelação Ecológica (CME/IMAR)**

Quinta da Torre
2829-516Monte de Caparica

Instituição de Acolhimento**Host Institution****Faculdade de Ciências e Tecnologia (FCT/UNL)**

Quinta da Torre
2829-516Monte de Caparica

3. Orçamento da Candidatura

3. Proposal Budget

-

Instituição Proponente**Principal Contractor****Instituto do Mar**

DESCRIÇÃO

DESCRIPTION

Recursos Humanos

Human resources

Missões

Missions

Consultores

Consultants

Aquisição de serviços e manutenção

Acquisition of services and maintenance

Outras despesas correntes

Other current expenses

Despesas gerais

Overheads

Total despesas correntes

Total current expenses

Equipamento

Equipment

TOTAL

	2004	2005	2006	2007	2008	TOTAL
Recursos Humanos	0	5960	8940	1490	0	16390
Human resources	0	5960	8940	1490	0	16390
Missões	0	1500	3000	2110	0	6610
Missions	0	1500	3000	2110	0	6610
Consultores	0	0	1000	0	0	1000
Consultants	0	0	1000	0	0	1000
Aquisição de serviços e manutenção	0	4200	6000	1000	0	11200
Acquisition of services and maintenance	0	4200	6000	1000	0	11200
Outras despesas correntes	0	7500	6750	2000	0	16250
Other current expenses	0	7500	6750	2000	0	16250
Despesas gerais	0	5200	5050	1300	0	11550
Overheads	0	5200	5050	1300	0	11550
Total despesas correntes	0	24360	30740	7900	0	63000
Total current expenses	0	24360	30740	7900	0	63000
Equipamento	0	7000	0	0	0	7000
Equipment	0	7000	0	0	0	7000
TOTAL	0	31360	30740	7900	0	70000

Instituições Participantes**Participating Institutions****Centro de Ambiente e Tecnologia Marítimos**

DESCRIÇÃO

DESCRIPTION

Recursos Humanos

Human resources

Missões

Missions

Consultores

Consultants

	2004	2005	2006	2007	2008	TOTAL
Recursos Humanos	0	3000	3000	1500	0	7500
Human resources	0	3000	3000	1500	0	7500
Missões	0	1000	1000	500	0	2500
Missions	0	1000	1000	500	0	2500
Consultores	0	0	0	0	0	0
Consultants	0	0	0	0	0	0

Aquisição de serviços e manutenção	0	2000	2000	1000	0	5000
Acquisition of services and maintenance						
Outras despesas correntes	0	3000	3000	1150	0	7150
Other current expenses						
Despesas gerais	0	2300	1750	800	0	4850
Overheads						
Total despesas correntes	0	11300	10750	4950	0	27000
Total current expenses						
Equipamento	0	3000	0	0	0	3000
Equipment						
TOTAL	0	14300	10750	4950	0	30000

Orçamento Global**Global budget**

DESCRIÇÃO

DESCRIPTION	2004	2005	2006	2007	2008	TOTAL
Recursos Humanos	0	8960	11940	2990	0	23890
Human resources						
Missões	0	2500	4000	2610	0	9110
Missions						
Consultores	0	0	1000	0	0	1000
Consultants						
Aquisição de serviços e manutenção	0	6200	8000	2000	0	16200
Acquisition of services and maintenance						
Outras despesas correntes	0	10500	9750	3150	0	23400
Other current expenses						
Despesas gerais	0	7500	6800	2100	0	16400
Overheads						
Total despesas correntes	0	35660	41490	12850	0	90000
Total current expenses						
Equipamento	0	10000	0	0	0	10000
Equipment						
TOTAL	0	45660	41490	12850	0	100000

Plano de financiamento**Finance plan**

DESCRIÇÃO

DESCRIPTION	2004	2005	2006	2007	2008	TOTAL
Financiamento solicitado à FCT	0	45660	41490	12850	0	100000
Requested funding						
Financiamento próprio	0	0	0	0	0	0
Own funding						
Outro financiamento público	0	0	0	0	0	0
Other public-sector funding						
Outro financiamento privado	0	0	0	0	0	0
Other private funding						
Total do Projecto	0	45660	41490	12850	0	100000
Total of the project						

4. Justificação do orçamento

4. Budget justification

-

4.1. Justificação dos recursos humanos**4.1. Human resources justification**

Tipo	Nº de pessoas	Duração	Custo envolvido (€)
(BI) Bolsa de Investigação (Lic. ou Bacharel)	1	22	16390
Justificação			

One young researcher (BI) will be working with the CEM team during 22 months. His/her help is essential in field and lab work, in what he/ she will get good training. Field work will consist in sediment sampling. In the lab he/she will assist with the flume experiments, learn and practice analytical techniques (grain size analysis, organic matter, chlorophyll and extracellular polymeric substances).

Tipo	Nº de pessoas	Duração	Custo envolvido (€)
(C) Contrato	1	10	7500

Justificação

A researcher under contract will be working with the MARETEC team for 10 months to integrate new formulations into the existing model.

Custo total: 23890

4.2. Justificação de missões

4.2. Mission justification

Tipo	Local	Nº de deslocações	Custo envolvido (€)
Participação em congressos	Portugal and abroad	5	4900

Justificação

Includes meeting fees, travel and subsistence to present results in national and international meetings. Within Portugal (1) - 400 €; International (4) - 4500

Tipo	Local	Nº de deslocações	Custo envolvido (€)
Trabalho de campo	Estuario do Tejo	20	4210

Justificação

Includes field trips to select sites, collect sediment and animals and deployment and retrieval of field equipment during 24 months. Funding will be used to pay for travel expenses boat fuel and day subsistence of the team members.

Custo total: 9110

4.3. Justificação de consultores

4.3. Consultants justification

Nome	Instituição	Fase do projecto	Custo envolvido (€)
John Widdows	Plymouth Marine Laboratory	2nd year	1000

Justificação

The advice of John Widdows is an added value to this project due to his long experience in the area of biological processes of the interface sediment-water. CEM-IMAR and PML use similar equipment and that will allow comparison of results and eventually easier resolution of problems/faults that may arise.

Custo total: 1000

4.4. Justificação de aquisição de serviços e manutenção

4.4. Acquisition of services and maintenance justification

Tipo	Custo envolvido (€)
Construction of flume sections for coring	2000

Justificação

Two flumes are currently in operation at CEM-IMAR. In order to be able to collect undisturbed sediments, flume sections will be cored into the sediment and then brought back to the lab and inserted in the flumes without disturbance. Two sets of these special stainless steel core boxes with adjustable bottom will be needed, 4 quarter sections and a spare one for each flume, total 10.

Tipo	Custo envolvido (€)
Field work	6500

Justificação

Activities related to acquisition of services for general field work and management are estimated as 5000 €.

A car suitable to access the sampling sites along the estuary will be rented from a local company (estimated 1500€)

Tipo	Custo envolvido (€)
Maintenance of equipment	3500

Justificação

Maintenance of the essential equipment for field and lab work, i.e., flumes, temperature controlled seawater system, air conditioned, ADV current meter and PC, OBS sensors and general analytical equipment used within the project (e.g. centrifuge, muffle, oven, UV - spectrophotometer)

Tipo	Custo envolvido (€)
Washing of cleaning of labware	4200
Justificação	
CEM-IMAR cannot provide washing and cleaning of labware, which is a course essential to the project.	
A cleaner under contract will be needed (35h month x 24 months = 4200 €)	
Custo total: 16200	

4.5. Justificação de outras despesas correntes

4.5. Current expenses justification

Tipo de despesa	Custo envolvido (€)
Books	2000
Justificação	
Acquisition of books and other works of reference for the project	
Tipo de despesa	Custo envolvido (€)
Consumables	21400
Justificação	
General field and laboratory work consumables.	
(Reagents, filters, general glassware and plasticware for analytical procedures. Water filters, plastic tanks, tubing, lab organizers, mounting and setting up of experimental devices, electricity parts, cleaning and washing products and equipment.	
Computer related consumables and small parts.	
Custo total: 23400	

4.6. Justificação do Equipamento

4.6. Equipment justification

4.6.1. Equipamento já disponível para a execução do projecto

4.6.1 Available equipment

Tipo de equipamento	Fabricante	Modelo	Ano
Annular flumes (2)	n.a.	n.a.	2004
ADV current meter	Sontek	Micro-ADV (10hZ)	2003
Portable PC with ADV logging interface	Fujitsu	Amilo	2003
Seawater facility with controlled temperature	F. Ribeiro	n.a.	1995
General analytical equipment	several	several	1990
UV spectrophotometer	Pharmacia	n.a.	1998
Boat (6.7m) with cabin and in board motor	n.a.	n.a.	2002
Multiprobe	Hydrolab	n.a.	1998
Acoustic currentmeter	Nortek	n.a.	2001

4.6.2. Discriminação do equipamento a adquirir

4.6.2. List of new equipment requested

Tipo de equipamento	Fabricante	Modelo	Custo envolvido (€)
Turbidity sensor	D&A Instruments	OBS-3	7000
Justificação			
Optical backscatterance probes are now currently used for turbidity measurements either in the field or in the lab. We need 2 OBS probes to equip both flumes in order to get simultaneous measurements of resuspension/deposition of a given sediment condition against a control sediment.			
They will be mounted on the flume walls and suspended particulate matter monitored continuously.			
Computer (2GB RAM)	n.a.	n.a.	3000
Justificação			
Essential to run the model. Includes assembled computer with the best quality: price rate processor and its upgrade during the 2nd year of the project.			
Custo total: 10000			

5. Equipa de investigação

5. Research team

-

5.1 Lista de membros (5)**5.1. Members list (5)**

Nome	Função	Grau académico	%tempo
Name	Role	Academic degree	%time
Maria Paula de Oliveira Sobral	Inv. Responsável	DOUTORAMENTO	40
Luís Daniel Fachada Fernandes	Investigador	LICENCIATURA	30
Sandra Cristina dos Reis Borges Fernandes	Investigador	DOUTORAMENTO	25
Ramiro Joaquim Jesus Neves	Investigador	DOUTORAMENTO	5
Maria Helena Ferrão Ribeiro da Costa	Investigador	DOUTORAMENTO	10

(O curriculum vitae de cada membro da equipa está disponível clicando no nome correspondente)

(Curriculum vitae for each research team member is available by clicking on the corresponding name)

5.2. Lista de membros a contratar durante a execução do projecto (2)**5.2. Members list to hire during project's execution (2)**

Membro da equipa	Função	Duração	%tempo
Team member	Role	Duration	%time
(BI) Bolseiro de Investigação (Lic. ou Bacharel) 1	Bolseiro	22	100
(C) Contratado 1	Outro	10	100

6. Projectos financiados

6. Funded projects

-

Lista de projectos financiados (6)**Funded projects list (6)**

Referência	Título	Estado
EVR1-2001-00021	Rede europeia de laboratórios que utilizam canais para o estudo da camada limite	Em curso
POCTI/BSE/33735/2000	Integração dos processos de bioturbação e biodeposição nos modelos hidrodinâmicos e de transporte de sedimentos contaminados (MOBIDYCS)	Em curso
POCTI/BSE/35137/2000	Desenvolvimento de um sistema de informação e gestão ambiental para o Estuário do Sado	Em curso
POCTI/BSE/41967/2001	Integração de respostas moleculares e fisiológicas à contaminação. Aplicação para a biomonitorização de ambientes costeiros.	Em curso
PDCTM/P/ MAR/ 15263/1999	Efeito das alterações dos caudais dulçaquícolas nas comunidades ictícas dos estuários do Douro, Tejo e Guadiana e das zonas costeiras adjacentes: Previsões ecológicas e socioeconómicas	Em curso
DG Research (FP5)	Gestão de ecossistemas benticos em realção aos constrangimentos físicos e ambientais (MaBenE)	Em curso

(Os detalhes de cada projectos estão disponíveis clicando na referência correspondente)

(Details for each project are available by clicking on the corresponding reference)

7. Indicadores previstos

7. Expected indicators

-

Indicadores de realização previstos para o projecto**Expected output indicators**

DESCRIÇÃO

DESCRIPTION

A - Publicações**Publications**

Livros

Books

Artigos em revistas internacionais

Papers in international journals

Artigos em revistas nacionais

Papers in national journals

B - Comunicações**Communications**

	2004	2005	2006	2007	2008	Total
	0	0	0	0	0	0
	0	0	2	2	0	4
	0	0	1	1	0	2

Comunicações em encontros científicos internacionais	0	0	2	2	0	4
Communications in international meetings						
Comunicações em encontros científicos nacionais	0	0	1	0	0	1
Communications in national meetings						
C - Relatórios	0	1	1	1	0	3
Reports						
D - Organização de seminários e conferências	0	0	0	0	0	0
Organization of seminars and conferences						
E - Formação avançada						
Advanced training						
Teses de Doutoramento	0	0	0	1	0	1
PhD theses						
Teses de Mestrado	0	0	0	0	0	0
Master theses						
Outras	0	0	0	0	0	0
Others						
F - Modelos	0	0	0	1	0	1
Models						
G - Aplicações computacionais	0	0	0	0	0	0
Software						
H - Instalações piloto	0	0	0	0	0	0
Pilot plants						
I - Protótipos laboratoriais	0	0	0	0	0	0
Prototypes						
J - Patentes	0	0	0	0	0	0
Patents						
L - Outros						
Other	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0

Ações de divulgação da actividade científica**Scientific activity spreading actions**

(Estimula-se a apresentação e propostas neste âmbito que possibilitem a aproximação da actividade científica ao grande público)

(It is strongly desired the presentation of proposals within this subject that will approach science to the general public.)

We will encourage the diffusion of results that might be related to the uses that communities around the estuary make of its resources (erosion of margins, effects on living resources).

Institutions to be considered are municipalities, fishermen associations for example

8. Anexo técnico

8. Technical addendum

8.1. Resumo**8.1. Abstract****Resumo (em português)****Abstract (in portuguese)**

Propomos investigar os processos biológicos que controlam os ciclos de erosão/deposição na zona intertidal do estuário do Tejo e os seus efeitos na dinâmica sedimentar estuarina.
Estudaremos os efeitos da hidrodinâmica na erosão/deposição de sedimentos naturais durante repetidos ciclos de maré e o papel de duas densidades de organismos de diferentes grupos funcionais e estratégias de bioturbação na estabilidade/erodibilidade desses sedimentos.
Os resultados das experiências efectuadas no laboratório serão validados no campo em locais seleccionados. Nestes locais serão instalados correntómetros e turbidímetros de acesso remoto que efectuaram medidas junto ao fundo durante repetidos ciclos de mare e estacas que medirão a erosão/acrecção. Far-se-ão perfis das propriedades físicas e biogeoquímicas dos sedimentos (granulometria, teor em água, compactação medida como força de corte, clorofila a e substâncias poliméricas extracelulares) e a comunidade de macrofauna será caracterizada numa base sazonal.
Sedimento não perturbado dos mesmos locais com adição de organismos em duas densidades serão testados quanto à erodibilidade (ressuspensão, velocidade crítica de erosão e massa erodida) e deposição/biodeposição num canal circular equipado com um correntómetro de tecnologia ADV, contra o mesmo sedimento sem adição de organismos num segundo canal em simultâneo.
Cerastoderma edule, bivalve filtrador que remexe o sedimento; Scrobicularia plana, bivalve depositívoro, que retira partículas da superfície do sedimento e um poliqueta construtor de galerias, Nereis diversicolor, predador e filtrador, serão as espécies utilizadas desde que as suas densidades no campo o justifiquem. Serão testados separadamente e numa combinação de grupos funcionais para avaliar os efeitos da comunidade bioturbadora nos ciclos de erosão-deposição. As velocidades de corrente simuladas representarão as observadas no campo para o ciclo de maré, incluindo mares vivas e mortas e a material em suspensão

monitorizada com sondas OBS. Experiências anteriores com *N. diversicolor* indicam que a velocidade crítica de erosão não está sempre relacionada com a massa erodida, e que a destruição do biofilme superficial e a erosão das camadas adjacentes são dois aspectos diferentes do processo de erosão. Isto será investigado com maior detalhe neste projecto.
Após validação no campo os resultados serão extrapolados para o estuário, de acordo com a caracterização de habitats no estuário retirada da literature. Serão incluídos num modelo hidrodinâmico e de transporte de sedimentos para o estuário do Tejo. Daqui resultará um modelo predictivo mais fiável e útil para os gestores das zonas costeiras.
Aspectos inovadores desta proposta são o estudo da co-variação de factores como a densidade de organismos e os grupos funcionais, relativamente aos ciclos de erosão/deposição, às correntes junto ao fundo e à turbidez
Este projecto assegura a continuação da interacção entre as equipas do IMAR da FCT-UNL e do IST-UTL.

Resumo (em inglês)

Abstract (in english)

This proposal investigates biological processes controlling sediment erosion/deposition and their effects on estuarine sedimentary dynamics in tidal areas of the Tagus estuary.
We will assess hydrodynamic effects on erosion and sedimentation processes of natural estuarine sediments over repeated tidal cycles and the role of two densities of organisms of different functional groups and bioturbation strategies on the stability/erodibility of these sediments.
These experiments, investigating density-dependent effects of bioturbation, will be performed in the laboratory and validated in the field at selected sites. At these sites near-bottom current velocity and turbidity sensors with remote access will be deployed over repeated tidal cycles and poles used to assess erosion/accretion. Profiles of physical and biogeochemical properties of the sediment (grain size, water content, compaction as shear strength, chlorophyll a and extracellular polymeric substances) will be evaluated and macrofauna will be characterized seasonally.
Undisturbed sediment from these sites with added macrofauna, will be tested for erodibility (resuspension rates, critical erosion velocity, eroded mass) and deposition in an annular flume equipped with a ADV current meter, against the same sediment without added macrofauna, using a second flume simultaneously. *Cerastoderma edule*, suspension feeding bivalve, plows the sediment; *Scrobicularia plana*, deposit-feeding bivalve, picks up particles from the surface and *Nereis diversicolor*, a gallery builder polychaete, predator and filter feeder will be the test species, provided their densities in the field are considered relevant. They will be tested separately and in combining functional groups to evaluate community effects. Current velocities will be simulated according to field velocities over tidal cycles, including neap and spring tides and suspended particulate matter concentrations will be monitored with OBS-probes. Previous experiments with *N. diversicolor*, showed that critical erosion velocity is not always correlated with eroded mass, indicating that disruption of the surface biofilm and erosion of the adjacent layers are two different aspects of the erosion process. This will be looked in more detail in this new proposal.
Validated data will be scaled-up to the whole estuary, according to habitat characterization of the margins taken from previous studies in the literature and included in an hydrodynamic and mass transport model for the Tagus estuary, This will result in a more reliable prediction model that will be useful to coastal managers. Examining co-variation of density dependent bioturbation processes that stabilise/destabilise sediment, near-bottom current velocities and suspended particulate matter is an innovative aspect of this proposal. Assessing community effects on erosion-deposition cycles and comparing field and laboratory data on sediment stability has seldom been done.
This project promotes interaction between IMAR teams from different universities

8.2. Objectivos

8.2. Objectives

Descrição dos Objectivos do Projecto

Project Objectives (description)

Improve the knowledge on estuarine sedimentary dynamics, through quantification of the effects of macrofauna on erosion/deposition cycles(critical erosion velocity, resuspension, eroded mass, deposition and compaction of sediments).

Investigate the way functionally diverse macrofauna control erosion once the surface biofilm is disrupted.

Improve the existing hydrodynamics and mass transport model for the Tagus estuary

We will investigate to what extent is biological activity important for the sediment stability and compaction, under different current velocities, and specially density-dependent effects of bioturbation by different functional groups of the macrofauna and their interplay with the biogeochemical properties of the sediments, on controlling surface sediment resistance to erosion and erosion of subsurficial layers.

Validation of results in the field and scaling up to the estuarine system through the above mentioned model will create a predictive realistic tool for estuarine management

This proposal is a follow-up of the project MOBIDYCS ending September 2004.

Descrição dos Objectivos do Investigador Responsável

Principal Investigator Objectives (description)

The principal investigator has developed research in bivalve ecophysiology and adaptation to environmental change, using scope for growth as a biomonitoring tool to evaluate stress and its implications at population level for bivalves. She has been involved in two projects examining processes in the water sediment interface, bioturbation and sediment stability, and physiological responses to tide-induced variation of sediment properties. In an earlier collaboration with PML, UK she became interested in the biological processes that influence sediment transport and is now directed to the elucidation of these processes including them in models that can better predict sediment mobility and functional responses of marine and estuarine coastal ecosystems to turbidity This integrated approach is an important step in the long term objective of improving ecosystem management. The project MOBIDYCS ending 2004 was the first attempt to pursue this interest. She has supervised a MSc thesis and a PhD thesis (due 2005) on the subject.

8.3. Estado da Arte

8.3. State of the Art

Descrição do Estado da Arte

State of the Art (description)

Estuarine intertidal mudflats are morphologically dynamic, with sediment being eroded-deposited over tidal cycles and over neap-spring cycles. Some estuaries can hold several million tonnes of suspended mud, which is thought to cycle between suspension and deposition on the intertidal mudflats (Viles & Spencer 1995).

The erodibility of sediments is dependent on the interaction of physical and biological processes of stabilization and destabilisation (Widdows et al. 2000, Rose & Widdows, 2002). Sediment erodibility show variability over emersion-submersion cycles and mucus produced by the biota in the sediment-water interface aids accretion of the mud surface. The impact of the biota on sediment stability/erodibility has been emphasized by many authors (Jumars & Nowell 1984, Meadows & Meadows 1991, Davis 1993, Paterson 1997, Sutherland et al. 1998, Widdows et al. 1998a, b, Willows et al. 1998, de Brouwer et al, 2000, Jie et al, 2001), but there is only a limited amount of experimental analysis either in the field or in the laboratory. Bioturbation processes not only modify the properties of the surface film but can also modify the geochemistry and cohesion profiles of sediments, redistributing particles Gilbert et al. (1996) and promoting mineralization processes of particulate organic matter throughout the benthic community (Oliver et al.1996). The biological control of sediment stability is therefore of great relevance in the dynamics of erosion/accretion of the mudflats that act as an important transitional element for sediments and nutrients (Bally 2004). Most studies have dealt with surface stability provided by microphytobenthic community and very few have addressed the role of the macrofauna in controlling erosion of the subsurficial layers of sediments. To our knowledge bioturbation by macrofauna communities has never been investigated.

Previous experiments with *N. diversicolor*, within the scope of a project ending in 2004 (Fernandes & Sobral subm., Sobral & Figueiredo in prep), indicate that disruption of the surface biofilm and erosion of the adjacent layers are two different aspects of the erosion process. This needs to be addressed more thoroughly using functionally different groups.

Several simple models have been developed for sediment mixing caused by bioturbation (Boudreau,1997), but none of them can be considered satisfactory. Irregularity and complexity of the processes involved in bioturbation lead to the widespreading of straightforward models. The most common model is to treat bioturbation as random mixing and describe it in terms of a fixed biodifusional coefficient (Tromp et al. 1995). On the other hand, the "box-model" approach (Berner 1980) assumes fast mixing until a certain sediment depth, were all sediment properties are considered uniform. Therefore bioturbation is zero. Until now, in the biogeochemical model that will be used to simulate bioturbational movements, bioturbation has been simulated using several empirical relations found in bibliography (Berner 1980; Tromp et al. 1995).

The hydrodynamic and sediment transport model as been applied and validated to the Tagus estuary for several times in the last years (Portela 1996; Clippele 1998; Pina 2001) but still it does not consider the biological processes that modify sediment properties and therefore resuspension/deposition rates. On the other hand, bioturbation processes have mostly been assessed separately, ignoring co-variation with near-bottom current velocities and suspended particulate matter. In this proposal biological and physical data are put together to produce a more reliable prediction model of sediment transport in the Tagus estuary. By collecting information both on lab and on the field, we will be able to improve model results in terms of erosion and deposition processes, therefore allowing to improve ecological modelling of the estuary, through a better description of turbidity. Management of the estuary will directly benefit all those developments.

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8.4. Resultados e Repercussões

8.4. Results and Repercussions

Divulgação de Resultados (descrição)

Diffusion of Results (description)

Erosion/deposition profiles of natural estuarine intertidal sediments.

Sediment responses to current velocity. Modification of erodibility of surface sediments from effects of different densities of macrofauna with different bioturbation strategies Resuspension/deposition profiles of turbidity resulting from bioturbation.

Biological responses to deposition of sediment, rates of compaction under repeated tidal cycles.

Integrated model comprising hydrodynamics, sediment transport, bioturbation processes with improved parametrization of bioturbation and erosion/ deposition processes in low depth areas.

Results will be presented at national/ international conferences either as oral communications or posters and published in peered scientific

journals.

Repercussões (descrição)

Repercussions (description)

The elucidation of the role played by bioturbation in controlling erosion and deposition of sediments in estuarine systems it is a step towards high quality managing of the marine environment .

The project will contribute strongly to the study of sustainable marine ecosystems through the better understanding of the dynamics of sediment erosion/deposition and the system functional responses to turbidity, an increasing problem in the context of global change. The integration of the experimental research findings into a model and field validation improve performance and can be used as a predictive tool for natural ecosystems on a local scale.

8.5. Regionalização

8.5. Regionalization

Região	Percentagem
Region	Percent
Região Autónoma dos Açores	0
Lisboa e Vale do Tejo	100
Norte	0
Região Autónoma da Madeira	0
Alentejo	0
Algarve	0
Centro	0

Descrição

Description

The proposal will be developed at intertidal selected sites of the Tagus estuary.

The Tagus estuary is the largest Portuguese estuary and one of the largest European estuaries, located near Lisbon (38°44'N, 9°08'W) and covering an area of about 300 km² at low tide and 340 km² at extreme high tide. The estuary is composed of a deep, straight and narrow inlet channel and a broad, shallow inner bay. The inlet channel, allowing the entrance of seawater in the estuary, is about 15 km long and 2 km wide, while the bay is about 25 km long and 15 km wide. Upstream, a single narrow channel marks the entrance of the Tagus river. The morphology of the Tagus estuary fits better into the category of tidal lagoons. It is a mesotidal estuary and the tides are semi-diurnal, with a tidal range in Lisbon varying from about 1m at neap tide to about 4 m at spring tide. The tidal effect reaches 80 km landward of Lisbon. The Tagus River is the main source of fresh water of the estuary and its discharge pattern clearly reflects the dry and wet seasons.

The importance of a better estuarine management for the communities living around the estuary, some of which still depend on its living resources, is beyond doubt. With an improved realistic model of sediment transport we are contributing to better decisions in estuarine management, not only with this particular application, but using its improvements to develop further applications to other estuaries.

8.6. Tarefas

8.6. Tasks

Lista de tarefas (4)

Task list (4)

Designação da tarefa	Data de início	Data de fim	Pessoas * mês
Task denomination	Start date	End date	Person * months
Selection of field sites. Physical and b...	01-01-2005	30-06-2005	13,1
Density dependent effects of bioturbation	01-07-2005	31-12-2006	33
Field validation of experimental results	01-07-2005	31-12-2006	5,6
Modelling at the estuary scale	01-01-2007	30-06-2007	12,8

(Os detalhes de cada tarefa estão disponíveis clicando na designação correspondente)

(Details for each task are available by clicking on the corresponding denomination)

8.7. Referências Bibliográficas

8.7. Bibliographic references

Ano Publicação

Year Publication

2000	Sobral, P. Widdows, J. 2000. Effects of increasing current velocity, turbidity and particle size selection on the feeding activity and scope for growth of <i>Ruditapes decussatus</i> from Ria Formosa, southern Portugal. <i>Journal of Experimental Marine Biology and Ecology</i> , 245:111-125.
2004	Fernandes S, Sobral P, Costa MH. The dynamic functional role of <i>Nereis diversicolor</i> on the stability of cohesive sediments considering flow conditions (submitted to <i>Aquatic Ecology</i>).
2000	Correia A.D. and Costa M.H. 2000. Effects of sediment geochemical properties on the toxicity of copper-spiked sediments to the a marine amphipod <i>Gammarus locusta</i> . <i>Sci. Total Environ.</i> 247: 99-106

- 2003 Braunschweig F., Martins, F., P. Leitão e R. Neves 2003 A methodology to estimate renewal time scales in estuaries: the Tagus Estuary case. Ocean Dynamics. Volume 53, Number 3; Pages: 137 ^ 145, September 2003.
- 2002 R. Neves, H. Coelho, R. Taborda and P. Pina 2002: Physical processes and modelling at ocean margins. From Weffer et al. (eds), Ocean Margin Systems. Spinger ^ Verlag Berlin, pp99-124

8.8. Artigos Anteriores

8.8. Previous Articles

Ano	Artigo (endereço na <i>Internet</i> - URL)
Year	Paper (Link in the Internet - URL)
2004	http://mares.dcea.fct.unl.pt/publications/42.pdf
2000	http://mares.dcea.fct.unl.pt/publications/3.pdf
2000	http://mares.dcea.fct.unl.pt/publications/18.pdf
1999	http://www.uc.pt/imar/rneves/RNeves1.pdf
1999	http://www.uc.pt/imar/rneves/RNeves2.pdf

9. Ficheiros Anexos

9. Attachments



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