

# Linear and non-linear modelling of sediment mobility and continental shelf bedform dynamics

Déborah Idier, Carlos Oliveros

► **To cite this version:**

Déborah Idier, Carlos Oliveros. Linear and non-linear modelling of sediment mobility and continental shelf bedform dynamics. IV European Conference on computational mechanics: Solids, structures and coupled problems in engineering, May 2010, Paris, France. pp.1. hal-00509307

**HAL Id: hal-00509307**

**<https://hal-brgm.archives-ouvertes.fr/hal-00509307>**

Submitted on 11 Aug 2010

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Linear and non-linear modelling of sediment mobility and continental shelf bedform dynamics

D. Idier<sup>1</sup> and C. Oliveros<sup>1</sup>

<sup>1</sup>BRGM, Service RNSC, 3 av. C. Guillemin, 45060 Orléans Cédex, France, d.idier@brgm.fr,

<sup>1</sup>BRGM, Service RNSC, 3 av. C. Guillemin, 45060 Orléans Cédex, France, c.oliveros@brgm.fr

---

The seabed is of interest regarding many engineering applications (e.g. buried pipelines, windmills implantation, dredging). The presentation will deal with the numerical modelling of seabed sediment mobility and the seabed evolution. This will be based on three main examples.

To investigate the sediment mobility over the continental shelf, a first approach can be based on wave, sea-level and current inputs, coming from either field measurements or modelling. Based on this hydrodynamic data, a simple method has been set up to estimate the sediment mobility on continental shelf environment [1,2]. An application to the Pertuis Charentais area (Charente-Maritime, France) will be presented, based on hydrodynamic finite difference numerical models (MARS and SWAN). Such type of modelling can be useful for dredging strategy.

Then, 2DH linear and non-linear morphodynamic modelling of submarine tidal sandbanks will be presented and compared [3,4]. Linear stability analysis method appears quite useful to study sandbanks dynamics and shows a reasonable agreement with field observations. Application on the North Sea area will be presented.

To finish, the stability of pipelines is one of the applications of research on megaripples and sandwaves dynamics. Here, 3D numerical modelling of tidal megaripples and sandwaves will be presented [5], based on finite element model (TELEMAC).

The use, advantages and limits of such types of models will be discussed regarding practical engineering applications (e.g. buried pipelines, windmills implantation, dredging).

### References

- [1] Idier, D., Pedreros R., Sottolichio A., Choppin L. et Bertin X., Relative Contributions of current and waves on the hydro-sedimentary dynamics in the Pertuis Charentais, France, C.R. Geosciences, Vol. 338, 718-726, 2006.
- [2] Idier D., Romieu E., Pedreros R. and Oliveros R., A simple method to analyse non-cohesive sediment mobility in a macro-tidal environment, Continental Shelf Research, doi:10.1016/j.csr.2009.12.006, 2010.
- [3] Idier, D., van der Veen H., Hulscher S.J.M.H., Grain Size and sand bank modeling, Journal of Geophysical Research – Earth Surface, doi:10.1029/2008JF001140, 2009.
- [4] Idier, D., and Astruc, D., Analytical and numerical modeling of sandbanks dynamics, Journal of Geophysical Research, Vol. 108(C3), doi: 10.1029/2001JC001205, 2003.
- [5] Idier, D., Astruc, D., and Hulscher, S.J.M.H., Influence of bed roughness on dune and megaripple generation, L13214, doi:10.1029/2004GL019969. Geophysical research letters (ISSN 0094-8276) 31, 2004.