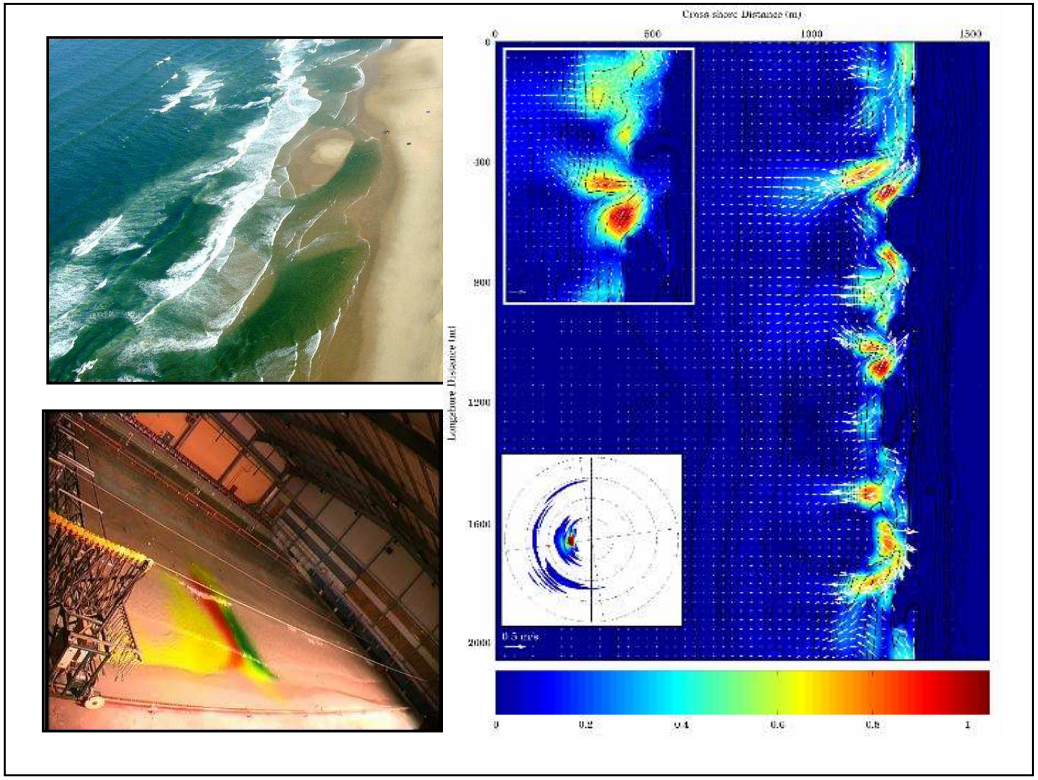
MODLIT

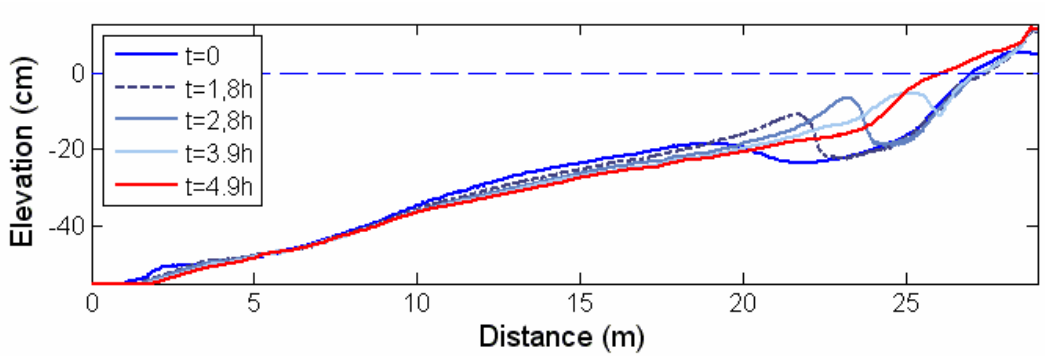
Physical and numerical modeling of sandy beach morphodynamics

Conclusion and perspectives

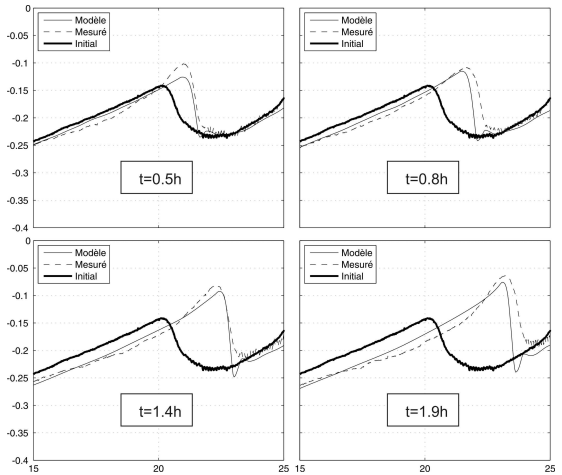


Cross-shore sediment transport and beach profile evolution

- ✓ A better understanding of cross-shore processes that control sand bar formation and migration
- ✓ Surface grain size sorting is clearly observed at the timescale of storm events
- ✓ Sediment transport is strongly affected by wave shape effects
  - → For irregular waves: combination of wave asymmetries can result in onshore and offshore sediment transports
- ✓ 1DH models present encouraging results to simulate cross-shore sediment transport and bar migration



Physical modeling of onshore bar migration



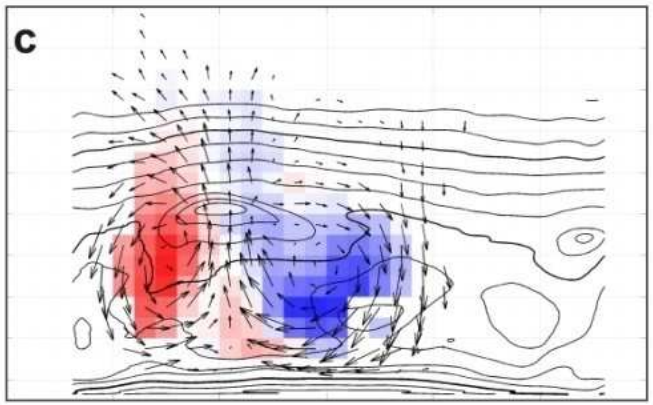
Numerical modeling of onshore bar migration

Topographically-controlled wave-driven circulations and 3D sand bar morphodynamics

✓ An original large-scale laboratory experiment for rip current dynamics and beach morphodynamics

⇨ an unique database

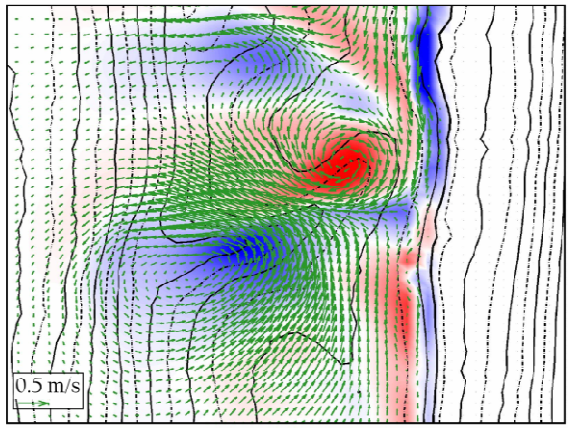
✓ First quantification of rip current circulation for a full morphological down-state sequence



LHF experiment

✓ Coupling mechanisms in double sandbar systems

✓ Improvements and validations of 2DH wave-induced current and morphodynamics models



MARS-SWAN model

Scientific production: 25 articles (2008-2010)

- high-quality journals:

  JGR, ESPL, CSR, Coastal Eng., EJM/B, …

- most of them involve several MODLIT teams

✓ To carry on the exploitation of the large-scale laboratory experiment database and to open it to a large community

✓ To test and validate the wave shape effects on sediment transport in natural conditions

✓ To explore nonlinear sandbar behaviors on timescales from weeks to months through numerical 2DH morphodynamic modeling

✓ To progressively implement improved cross-shore sediment transport formulations in 2DH models

✓ To further develop data assimilation methods: from the lab to the field

✓ Improve the models in:

→ coupling beach face and shoreline changes

→ sediment flux calculation close to the shoreline

→ including wave shape effects (phase-lag effects)

→ developing remote sensing data assimilation in morphodynamics models

→ developing 2DH fully-nonlinear Boussinesq approches

→ extending phase-averaged approaches to 3D

⇨ **Toward accurate predictive beach morphodynamics models**