XI International Conference on Computational Methods in Marine Engineering

Covering submarine pipelines: numerical analysis of the influence of subsea currents in falling granular material

Gabriel Barajas[1,*], Javier L. Lara[1], Alessandro Romano[1,2] and Iñigo J. Losada[1]

[1] IHCantabria - Instituto de Hidráulica Ambiental de la Universidad de Cantabria, Calle Isabel Torres 15, Santander 39011, Spain.

[2] Roma Tre University, Engineering Department, Rome 00146, Italy.

[*] barajasg@unican.es.

ABSTRACT

Submarine pipelines are critical seafloor installations often deployed for efficient transportation of resources from the offshore production fields, and their survivability is a major challenge that needs to be overcome for industry which is encountering failures due to different reasons during installation and operation.

The study of underwater infrastructure failures relies on complicated and expensive physical experiments. Using Computational Fluid Dynamics (CFD) has become very popular in industry and academia to accurately simulate multiple extreme events at the same time, as a complement to laboratory tests. Therefore, this work presents numerical investigations of the influence of the underwater sea conditions when covering submarine pipelines with falling granular material.

The objective of the present work is to assess the importance of subsea currents when covering submarine pipelines by pouring granular material from an offshore structure. By means of the OpenFOAM® framework, granular material is modelled using a Coulomb viscoplastic rheology. A numerical wave tank (NWT) is presented to model falling granular material from an offshore structure when it is poured to cover submarine pipelines. Qualitative and quantitative descriptions of the numerical results will be provided.

References

Romano, A., Lara, J.L., Barajas, G., ´Ĩnigo J. Losada, 2023. Numerical modeling of tsunamis generated by granular landslides in openfoam®: coulomb viscoplastic rheology. Coastal Engineering 186, 104391.

Domnik, B., Pudasaini, S.P., 2012. Full two-dimensional rapid chute flows of simple viscoplastic granular materials with a pressure-dependent dynamic slip-velocity and their numerical simulations 173, 72–86.