Asociación Argentina de Mecánica Computacional

Mecánica Computacional Vol XXIX, págs. 8167-8167 (resumen)
Eduardo Dvorkin, Marcela Goldschmit, Mario Storti (Eds.)
Buenos Aires, Argentina, 15-18 Noviembre 2010

TURBULENCE MODULATION IN TURBIDITY CURRENTS AS A RESPONSE TO SLOPE BREAKS

Mariano I. Cantero[a], S. Balachandar[b], Alessandro Cantelli[c], Carlos Pirmez[c] and Gary Parker[d]

[a]*Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina, mcantero@cab.cnea.gov.ar, http://cabmec1.cnea.gov.ar/~mcantero/*

[b]*Department of Mechanical and Aerospace Engineering, University of Florida, United States, bala1s@ufl.edu*

[c]*Shell International Exploration and Production, alessandro.cantelli@shell.com*

[d]*Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, United States, parkerg@illinois.edu*

Abstract. Turbidity currents are flows driven by sediment in suspension, that is gravity acts to pull the sediment in suspension downslope and the sediment drags the fluid along with it. These flows are known to be one of the main mechanisms for sediment transport into deep ocean and for the emplacement of large scale sedimentary deposits called turbidities. Many if not most of the turbidities observed in outcrops and in seismic data are associated with decelerating turbidity currents. When turbidity currents traverse canyon-fan systems they flow over bed slopes that decrease in the downstream direction, which reduces the streamwise component of the driving force of the flow eventually causing the turbidity current to decelerate and enter a net-depositional mode. Sediment particles tend to settle down thus creating a vertical profile with concentration declining in the upward direction and self-stratifying the flow, which acts to damp turbulence in the flow. This work explores and explain how the turbulence structure of a turbidity current, and consequently its ability to transport sediment is suspension, is modified after the desceleration of the flow owing to slope breaks of the terrain. In order to perform a detailed analysis of the phenomenon, the flow is studied by direct numerical simulation (DNS) of the Navier-Stokes equations. A new and simplified approach to perform DNS of continuous turbidity currents is introduced.