



***Integrated Numerical Modeling of Oil Spills, Sedimentation and
Transport of Oil in Sediment Laden in Marine Waters***

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ABSTRACT

An Integrated 2DH numerical model based on Eulerian approach including hydrodynamic, suspended sediment transport, oil transport and combined oil slick-sediment transport module has been developed and validated against laboratory measured values. FVM method and ADI (Alternating Direction Implicit) scheme have been employed for discretization and solving governing equations. The second order Lax-Wendroff and second order central difference schemes have been used for advective and diffusive terms respectively. Multiphase oil spill model (MOSM) approach has been taken to simulate oil slick and flow interaction. All three modules of the numerical model have been validated against experimental data. The model capability for simulation, oil spill and suspended sediment transport, has been examined and the predictions show reasonable accuracy compared with analytical solutions and measured values reported in the literature. As an application the effect of oil in suspended sediment transport has been investigated for alternative concentrations which show increase of concentration of suspended sediment with the increase of oil entered in water column.

1- INTRODUCTION

The increasing development of economy has considerably raised the demand for fossil fuels all over the world. Consequently, oil spill disasters in coastal areas, which may be the result of oil production or transportation, have become one of the most serious threats against marine environment. Understanding the nature of oil spills in coastal areas plays a crucial role in alleviating destructive impacts of oil spill disasters on marine environment. Oil distribution in the water column and its mixture with suspended and bed sediment, is followed by approaching the seashore, and interaction of the contaminants with shoreline. Secondary mixing contaminants with the shoreline sediments due to oscillatory back and forth water flow, results in the change of nature and properties of sediments such as adhesiveness and specific gravity [1].

A better understanding of the fate of oil spills and the nature of sediment transport together with the interacting processes of them has been the aim of this study. Therefore advection and diffusion processes have been implemented in the new model and prediction show the interactly transport process of oil spills and sediment for tidal currents.

2- MODEL DESCRIPTION