Faculty Engineering Technology
Program Sustainable Energy Technology

UNIVERSITY OF TWENTE.

COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of his MSc thesis assignment

L.M. Eilders

will give a presentation, entitled:

Simulation of Dredging Flows using Models Based on Granular Temperature

Date: Wednesday October 16, 2013

Time: 14.00

Room: Horstring N109

Summary:
Dredging is the excavation of bottom sediments from shallow seas or fresh water areas, with the objective of removing bottom sediments and disposing them at a different location. This can be carried out with a trailing suction hopper dredger. These hoppers create overflow plumes with high suspended sediment concentrations in the surface layers in which marine species are vulnerable to the effect of light reduction.

Increasing the sand volume fraction of the suction flow could lower the turbidity of these overflow plumes, thereby increasing the sustainability of dredging operations. To accomplish the required modifications to dredging equipment, detailed information on the water-sediment flow is required, which can be provided by numerical simulations using CFD-methods.

The focus of this study is on the suitability of CFD methods employing so-called granular temperature models that describe these water-sediment flows. Such models are similar to the kinetic theory of gases. The granular temperature corresponds to the kinetic energy of the fluctuations, relative to the mean flow field. Momentum transport occurs also through inter-particle collisions.

The open-source software package MFiX has been developed for fluidized beds. It incorporates a granular temperature model, here used to simulate water-sediment flow. Numerical simulations of the settlement of glass beads have been performed. The influence of the relevant parameters on the settlement velocity has been determined. The results have been compared to those from experiments, using a Plexiglas box filled with water-sediment. Results show that the particle settlement in the experiments and numerical simulations are qualitatively similar.

Assessment committee:

Prof.dr.ir. H.W.M. Hoeijmakers (chairman)
Dr.ir. N.P. Kruyt (mentor)
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