3D CFD MODELLING OF SEDIMENT EROSION IN HABITAT IMPROVEMENT GRAVEL

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Erosion of habitat-improving gravel in a reach of the Norwegian river Gråelva was computed using a 3D CFD model. The model solved the Navier-Stokes equations on a 3D non-orthogonal grid (Fig. 1) using the SIMPLE method to compute the pressure and the k-epsilon model to compute the turbulence. The sediment transport was computed solving the convection-diffusion equation for suspended sediments together with the bed load (Olsen, 2004). Empirical formulas by van Rijn (1987) were used as boundary conditions at the bed. Sediment continuity for the bed cells was used to compute the bed elevation changes. The results were compared with field measurements of the changes in water depths at two parallel patches of artificial sediment depositions in the river Gråelva, see Fig. 2. The patch with the coarser sediments did not show any significant changes, both in the results from the CFD model and the field data. The patch with the finer sediments had an eroded scour hole. The location of the scour hole was computed at a slightly different position compared with the field measurements, but its horizontal magnitude and the scour depth was predicted well. The CFD model was believed to be able to give useful information about the stability of artificial habitat-improving gravel in a river.

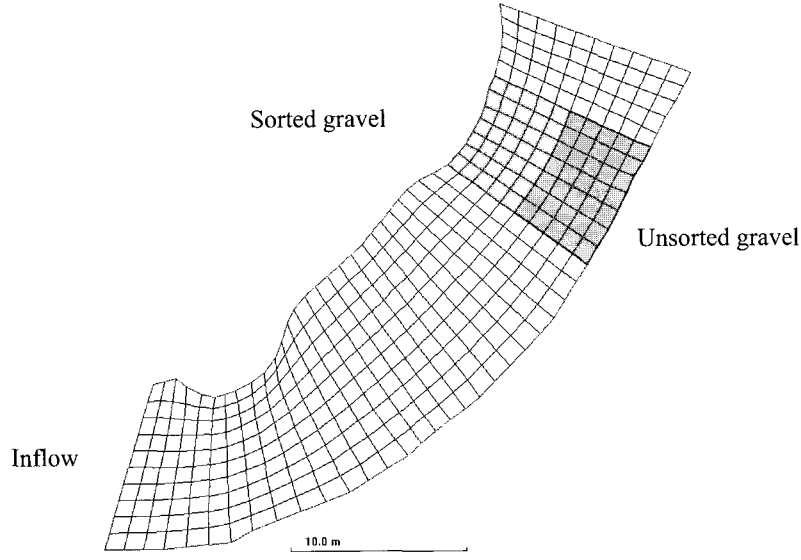

Fig. 1 Computational grid seen from above and location of gravel.

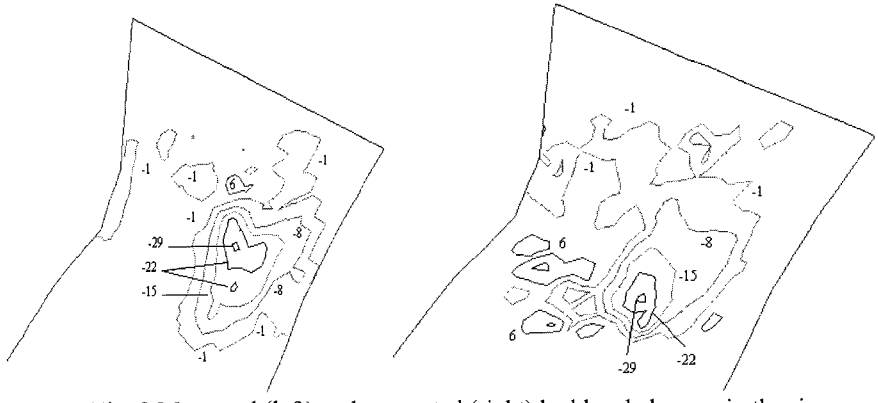

Fig. 2 Measured (left) and computed (right) bed level changes in the river. The values are in cm.

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