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Supplementary Materials for

A new mass-conservative, two-dimensional, semi-implicit numerical scheme for the solution of the Navier-Stokes equations in gravel bed rivers with erodible fine sediments

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The present Supplementary Materials include:

- the numerical results for the lid-driven cavity test with erodible bed obtained using a coarser domain discretization (figure S1);
- two videos showing the vorticity field (video S1) and particle tracking (video S2) for the closest-packing arrangement. In particular, video S1 shows the evolution of the vorticity magnitude in the time interval $t \in [10, 15]$, while video S2 shows the time evolution of particle paths in the time range $t \in [10, 15]$. The numerical solution for the velocity and pressure field is taken every $dt = 0.1s$, and the particles are released every $dt_p = 0.01s$, from 10 equidistant points taken on the vertical line $x = 0.05$, $y \in [0.03, 0037]$. The videos are provided as separate files.

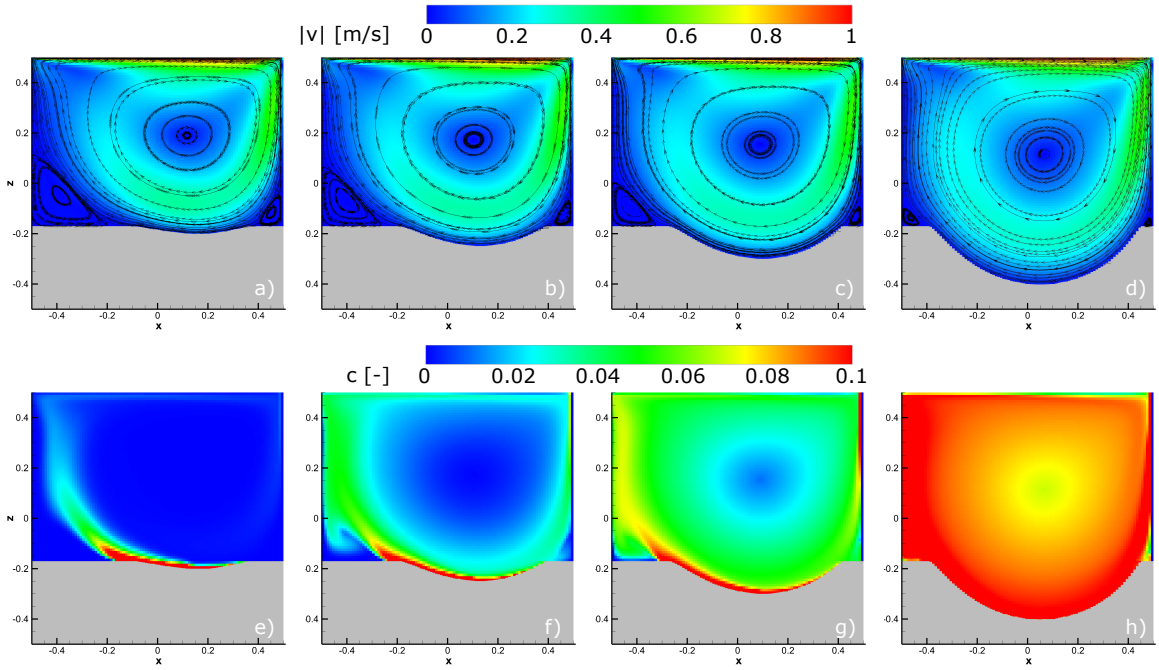

Figure S1. a)-d) Evolution of the streamlines in the cavity with the erodible bed at times $t = 20$, 50, 100, 300 coloured using velocity magnitude; and e)-h) volume concentration of suspended sediment. The figure is the same as figure 6 in the main text, but for coarser (i.e., 100 x 100) resolution (10 000 elements having horizontal and vertical dimension of $\Delta x = 1e-2$ m and $\Delta z = 1e-2$ m). Results are coherent with those obtained using a finer computational grid (400 x 400; see figure 6 in the main text), although using the $400x400$ grid, we clearly see a higher level of detail and lower numerical diffusion.