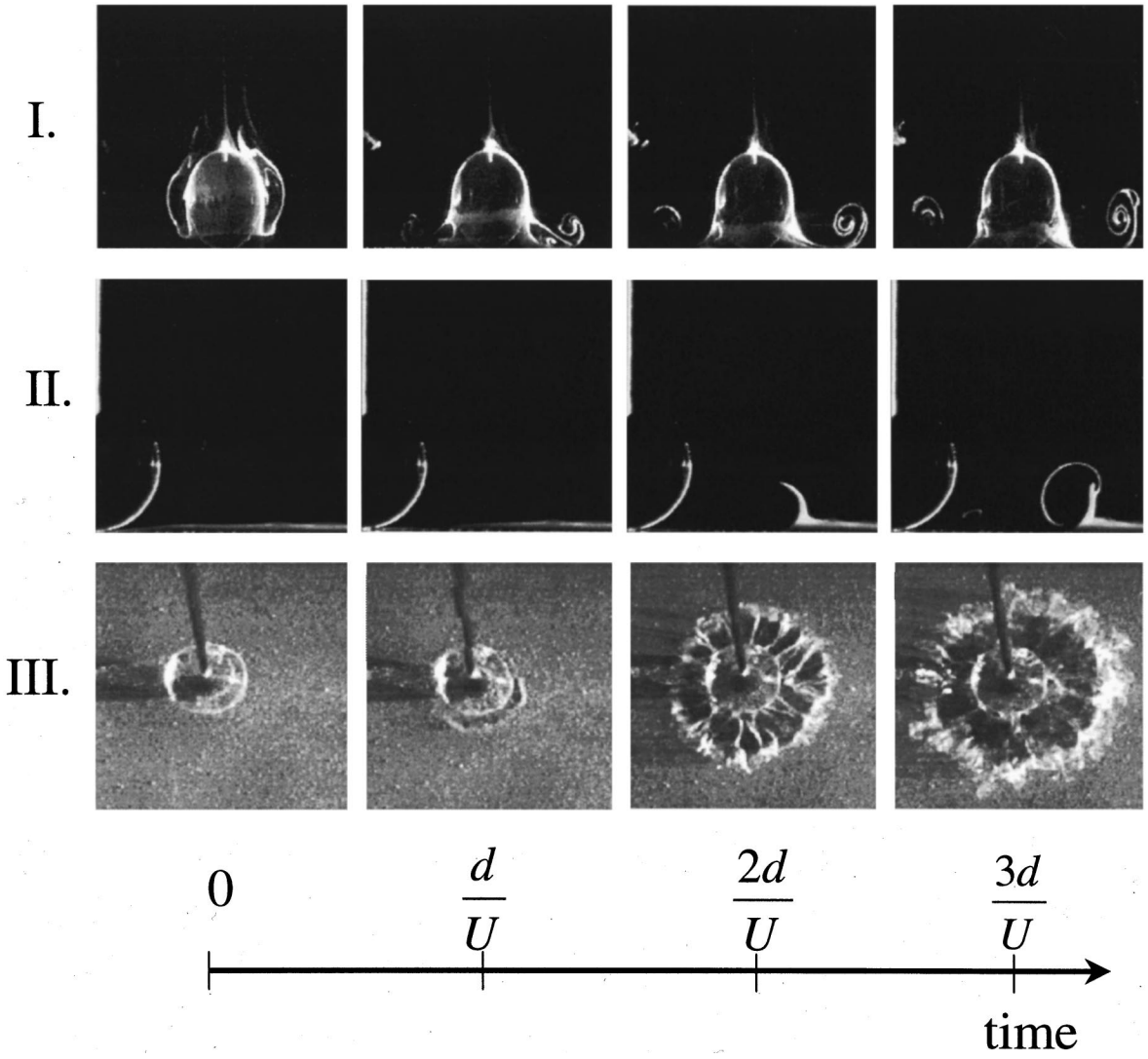

RESUSPENSION BY AN IMPACTING SPHERE

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We report on a series of experiments which show how the flow generated by a rigid sphere moving toward a wall is capable of resuspending dust. The sphere is mounted on a rigid rod, driven with a constant velocity toward the wall, and stops when contact is made between the wall and sphere. The flow is characterized by a Reynolds number $\mathrm{Re}=dU/\nu$ based on the sphere diameter d, impact velocity U and kinematic viscosity ν of the ambient fluid. The wake vortex behind a translating sphere plays an important role in resuspending dust, and sequence I (Re=850) shows the dynamics of the wake (visualized by a light sheet where the wake is rendered visible by the precipitation of tin chloride) following the sphere impact. The first image in sequence I corresponds to the sphere making contact with the wall, and the time difference between subsequent images is d/U. The wake vortex generates a secondary vortex as it passes over the surface of the sphere. The fluid adjacent to the wall is visualized in sequence II (Re=850) by introducing a thin layer of fluorescein dye, and this sequence serves to illustrate how the wake vortex pushes fluid initially adjacent to the wall to one side, which is entrained by the wake vortex, and transported away from the wall. Many aspects of this flow may be understood from studies of vortex impact on walls.[14] Sequence III (Re=3100) shows the resuspension a thin layer of dust by the wake vortex as it threads over the sphere and strikes the wall. This sequence shows the azimuthal instability of the secondary vortex which collects the dust into piles resembling the spokes on a wheel. A more comprehensive description of these flows is given by Eames and Dalziel.[15]

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