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An efficient parallel flow solver for two-way coupled turbulent flows with deformable bodies ROBERTO VERZICCO, University of Rome "Tor Vergata", VAMSI SPANDAN, Physics of Fluids, University of Twente, VALENTINA MESCHINI, University of Rome "Tor Vergata", DETLEF LOHSE, Physics of Fluids, University of Twente, MARCO D DE TULLIO, Politecnico di Bari — There are countless examples in Nature and technology in which a flow and a deformable structure interact dynamically and determine each other's behaviour. Among many, two contexts in which this is particularly relevant is in two-phase flows with finite size deformable bubbles or immiscible drops and in cardiovascular flows of heart valves and deformable vessels. Since the standard methods become terminally expensive when the number of deformable bodies become large or the set-up has a complex geometric configuration, in this work, we discuss a simple yet effective approach to cope with the above problems. The main ingredients are: i) an efficient Navier-Stokes solver, ii) an interaction potential approach for the dynamics of a deformable structure, iii) an immersed boundary procedure to deal with the geometrical complexity iv) a set of fluid/structure interaction approaches (strong or loose) and v) a simple and efficient parallelisation strategy to handle large-scale simulations. Several complex examples will be shown and discussed with the results validated either by ad-hoc experiments or by comparisons with results from the literature.

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