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**Fractional step methods for the Navier-Stokes equations on non-staggered grids.** (English)

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ANZIAM J. 42C, C134-C156 (2000).

Summary: The Navier-Stokes equations are solved on a non-staggered grid using a semi-implicit fractional step method in both iterative and non-iterative form. It is shown that the iterative scheme in standard form is second-order accurate in time, but is very slow to integrate as a result of the non-elliptic pressure coupling at the grid scale. Inclusion of additional terms into the pressure correction equation for the iterative scheme ensures an elliptic pressure coupling at the grid scale, but introduces a first order in time error into the scheme, leading to a reduction in solution accuracy. The non-iterative scheme is shown to be second-order accurate in time in standard form and to be considerably more efficient than the iterative scheme.

**MSC:**

- [76M20](#) Finite difference methods applied to problems in fluid mechanics
- [76D05](#) Navier-Stokes equations for incompressible viscous fluids
- [65M06](#) Finite difference methods for initial value and initial-boundary value problems involving PDEs

Cited in **3** Documents

**Keywords:**

[Navier-Stokes equations](#); [non-staggered grid](#); [semi-implicit fractional step metho](#); [iterative scheme](#); [non-iterative scheme](#)