

START

INITIALIZATION

1. Set parameters.
2. Read in 3-ball mesh, reshape to ellipsoid.
3. Read in trajectory data.
4. Create functions and function spaces for all variables.
5. Create a UFL form for the Navier-Stokes and Gaussian gravity equations.
6. Create a FEniCS non-linear solver for the Navier-Stokes equations.
7. Create a FEniCS non-linear solver for the Gaussian gravity formulation.
8. Set $t=0$.

ROTATION CYCLE

1. Update tidal force.
2. Update gravitational force.
3. Update centrifugal force.
4. Update Coriolis force.
5. Solve Navier-Stokes equations.

Solver
converged?

No

Yes

1. Use velocity to move mesh.
2. Compute moment of inertia.
3. Update time step.

Deformation
crosses
threshold?

No

Finished
target number
of steps?

No

Yes

Average velocity over the rotation cycles.

TRAJECTORY JUMP

1. Move mesh using average velocity.
2. Update time step.

$CFL \leq C_{max}$?

No

Yes

Percent change
in distance less
than tolerance?

Yes

No

Current time
greater than the
maximum in the
trajectory?

No

Yes

FINALIZATION

1. Save final mesh state.
2. Save final forces, velocity, and pressure.
3. Save moments of inertia over trajectory.

STOP