Supplementary material

Recoil of a liquid filament: escape of the pinching through vortex ring inception

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Below is the parameter file for the Gerris flow solver.

Please install the open source solver from sourceforge at the URL: http://gfs.sourceforge.net. The instalation of the software is easiest on Linux Ubuntu.

Save the text below in the text file "cylindre.gfs" then start the simulation with the shell command : "gerris2D cylindre.gfs ". The data is writen to the disc in the files cylinder-[time].gfs. You may then visualize the flow data using the command "gfsview2D cylinder-[time].gfs, replacing [time] with the value you whish. Here the data is saved with a time period of 0.1.

Here the resolution is setat a low value to get faster some results, you may increase it by increasing "Refine", and the the "maxlevel" option in the mesh adaptivity commands below. Red text is explaining comments, starting with #, and bold text are the names of gfs functions.

```
------------------------------------------------------------------
10 9 GfsAxi GfsBox GfsGEdge {} {
Time {end =25}

# define a tracer for the two-phases
VariableTracerVOF T

# define the density and computational box size
PhysicalParams {alpha = 1./(T + (1. - T)*0.01) L = 5}

# define the viscosity
SourceViscosity ((0.001)*T + 0*(1. - T))

# define a variable to trace the interface curvature
VariableCurvature K T

# define the surface tension
SourceTension T 1. K

# initial refinement of the mesh
Refine 8

# the definition of the initial condition: T is one where the liquid is
InitFraction T ((x>=1)? (1-y):1-(x-1)*(x-1)-y*y)

# definition of the vorticity for mesh refinement
Variable F
Init {istep=1} {F= (dx("V")-dy("U"))*T}
```

```
# automatic mesh refinement based on interface curvature and vorticity
AdaptGradient { istep = 1} { cmax = 1e-2 minlevel = 3 maxlevel =7} T
GfsAdaptFunction { istep = 1 } { minlevel = 3 maxlevel =7 cmax = 0.01 }
(T > 0 && T < 1 ? 1. : fabs(F)*ftt_cell_size (cell))
AdaptFunction { istep = 1 } { cmax = 0.1 maxlevel =7   minlevel = 3 }
{ return (T > 0. && T < 1.) ? ftt_cell_size (cell)*fabs (K) : 0.; }

# output the data and information:
OutputTime{step = 0.1}  stderr
OutputSimulation {step = 0.1 } cylinder-%3.1f.gfs


# now define the boxes and box connectivity, here 10 boxes
}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}
GfsBox {}

1 2 right
2 3 right
3 4 right
4 5 right
5 6 right
6 7 right
7 8 right
8 9 right
9 10 right
-------------------------------------------------------------
```