Appendix C

Convergence Test Data

This appendix presents the results of the grid-spacing and time-step convergence tests we conducted for our numerical simulations. The data, organised in Tables C.1, C.2, and C.3, illustrate the impact of varying grid sizes (ranging from 50×15 to 800×240) and different time-step fractions (N_{mins}) on the stability and accuracy of our simulated features. The results include the type of polygon that develops, as well as instances of numerical instability, some leading to Not A Number (NAN) values. These results were instrumental in our decision to use a time step of 50 seconds and a grid-spacing of 150×45 in our base simulations.

Table C.1: Grid-spacing and Time-steps (Table 1.a).

Grid-size	$\boldsymbol{N_{mins} = \frac{1}{4}}$	$\boldsymbol{N_{mins} = \frac{1}{2}}$	$\boldsymbol{N_{mins} = \frac{3}{4}}$	$\boldsymbol{N_{mins} = 1}$
50 × 15	NAN	NAN	NAN	NAN
100 × 30	NAN	NAN	Numerically unstable	Numerically unstable
150 × 45	NAN	Numerically unstable	Hexagon	Hexagon, unstable
200 × 60	Unstable	Polygon, unstable	Unstable	Hexagon, unstable
300 × 90	Unstable	Polygon, unstable	Unstable	Hexagon, unstable
400 × 120	Unstable	Pentagon, unstable	Hexagon	Hexagon, most stable
500 × 150	Unstable	Pentagon, unstable	Hexagon, unstable	NAN
600 × 180	Unstable	Unstable	NAN	NAN
700 × 210	Unstable	NAN	NAN	NAN
800 × 240	Polygon, unstable	NAN	NAN	NAN

Table C.2: Grid-spacing and Time-steps (Table 1.b).

Grid-size	$\boldsymbol{N_{mins} = \frac{5}{4}}$	$\boldsymbol{N_{mins} = \frac{3}{2}}$	$\boldsymbol{N_{mins} = \frac{7}{4}}$	$\boldsymbol{N_{mins} = 2}$
50 × 15	NAN	NAN	NAN	NAN
100 × 30	Circular jet, numerically unstable	Circular jet, numerically unstable	Circular jet	Circular jet
150 × 45	Circular jet	Circular jet	Circular jet	Circular jet
200 × 60	Circular jet	Circular jet	Circular jet	Circular jet
300 × 90	Circular jet	NAN	NAN	NAN
400 × 120	NAN	NAN	NAN	NAN
500 × 150	NAN	NAN	NAN	NAN
600 × 180	NAN	NAN	NAN	NAN
700 × 210	NAN	NAN	NAN	NAN
800 × 240	NAN	NAN	NAN	NAN

Table C.3: Grid-spacing and Time-steps (Table 2).

Grid-size	$\boldsymbol{N_{mins} = \frac{4}{5}}$	$\boldsymbol{N_{mins} = \frac{9}{10}}$	$\boldsymbol{N_{mins} = 1}$	$\boldsymbol{N_{mins} = \frac{11}{10}}$
150 × 45	Hexagon, stable	Hexagon, stable	Hexagon, unstable - circular	Circular jet
200 × 60	Hexagon, stable	Septagon, stable	Septagon, circular	Circular jet
300 × 90	Polygon, unstable	Hexagon, unstable	Hexagon, unstable - circular	Circular jet
400 × 120	Hexagon, stable	Hexagon, stable	Hexagon, stable	NAN
500 × 150	Hexagon, unstable	NAN	NAN	NAN