|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TEST: Advection Diffusion for Uniform Flow, Gaussian, Neumann BC** | | | | | | | | | | | | | | | |
| Conceptualization of Test  Advection uniform flow test.png | | | | | | | | | Test Description: (Do we need this?)  Uniform flow field, Gaussian initial distribution of mass, constant area and velocity flux trivial concentration boundary condition, moves forward and compares with the analytical solution. | | | | | | |
| Test Setup | | | | | | | | | | | | | | | |
| Process Tested | | | | Dispersion Coeff.  (m2/s) | Decay Rate  (1/sec) | | | Flux Limiter | | Domain Length | # Grid Cells | | | Time Step (S) | # Time Steps |
| Advection (Flow) | Diffusion (Mixing) | Reaction (Decay) | |
| ✓ | ✓ | - | | 1.00 | NA | | | Off | | 25.6 km | 64 | | | 150 | 64 |
| 128 | | | 300 | 128 |
| 256 | | | 600 | 256 |
|  | | | | | | | | | | | | | | | |
| Dimensionless Parameters | | | | | | | | | | | | | | | |
| Courant #: Courant Number.png | | | Mesh Peclet #: Mesh Peclet Number.png | | | | Diffusion #: Diffusion Number.png | | | | | DamKohler #  Damkohler Number.png | | | |
| ≤1: required for stability | | | ≤1: dispersion dominant | | | | ≤0: required for stability | | | | | ≤1: Advection dominates | | | |
| 0.90 | | | 3.75-7.5-15 | | | | 0.24-0.12-0.06 | | | | | NA | | | |
| Stable | | | Advection dominates | | | | stable | | | | |  | | | |
|  | | | | | | | | | | | | | | | |
| Test Results | | | | | | | | | | | | | | | |
| Plot of Results | | | | | | | | | Comments :  The initial distribution of mass is shifted forward while diffuses and the result is compared with analytical solution. area, dispersion coefficient and velocity are constant. | | | | | | |
| Numerical Order of Accuracy and Convergence | | | | | | | | | | | | | | | |
| Grid Cell Refinement (Increase # Grid Cells) | | Order of Accuracy Measure (L-1norm) Target: ≤ 1% | | | | Convergence Measure  (L-1 norm) Target: value ≥2 | | | | | | | Comments | | |
| 64 - 128 | | 5.30E-4 | | | | 1.96 | | | | | | | Test passes the defined criteria, and it is acceptable | | |
| 1.36E-4 | | | | 2nd Order Accurate | | | | | | |
| 128 - 256 | | 3.59E-5 | | | | 1.92 | | | | | | |
| OK | | | | 2nd Order Accurate | | | | | | |
| Bottom Line: (What should I mention here?) | | | | | | | | | | | | | | | |