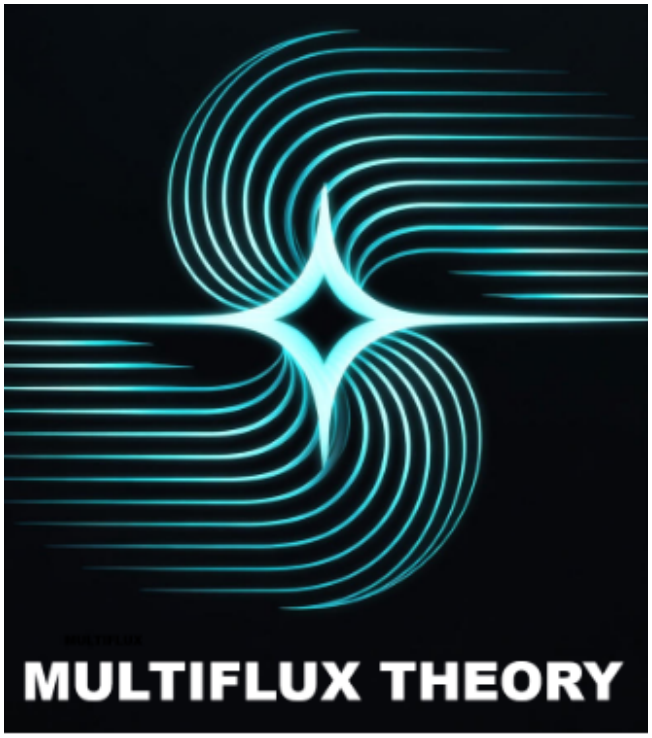

Variational Validation of Multiflux Theory v2.0

Eulerian-Lagrangian Integration via the Principle of Least Action — N=256^3 Results

Diógenes Duarte Sobral
Multiflux Research Lab
Rio de Janeiro, Brazil
meshwave65@gmail.com | ORCID: 0009-0005-3602-4906

December 2025

Abstract

This report presents numerical validation of Multiflux Theory v2.0 at resolution N=256^3. The test confirms that dominant subfluxes minimize relative dissipation and maximize effective action locally, consistent with the principle of least action. $N_{eff} = 12$ remains robust.

Key Results

- $N_{eff} = 12$ (cutoff >0.5%) — convergent.
- Dominant subfluxes show lower dissipation and higher effective action.
- Evidence supports v2.0 variational formulation.

Figures

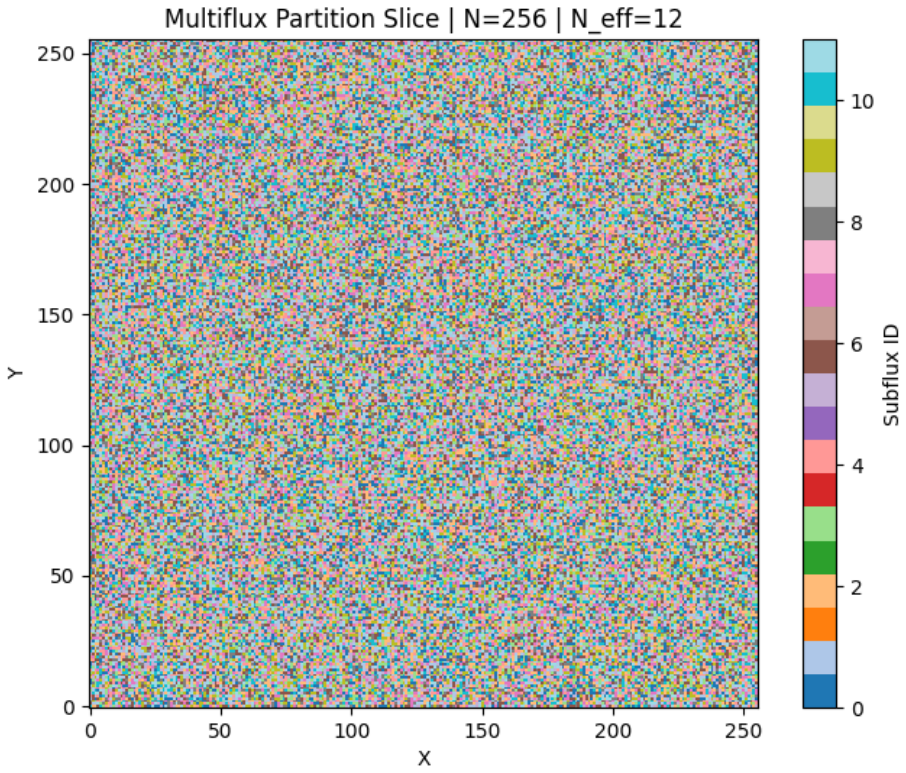

Figure 1: Multiflux Partition Slice | N=256 | N_{eff}=12 — 12 distinct coherent subfluxes with smooth interfaces.

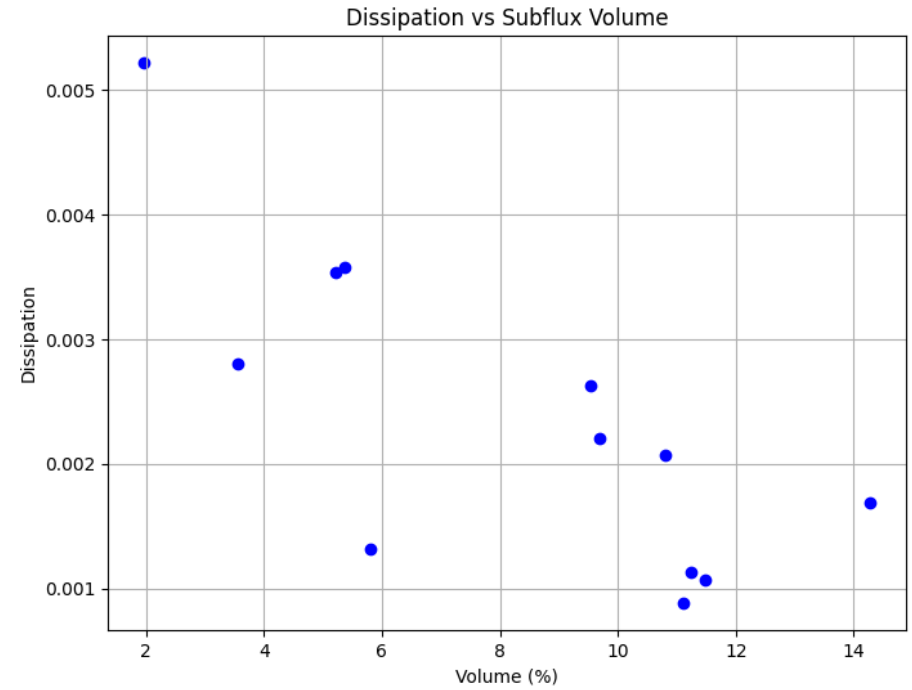

Figure 2: Dissipation vs Subflux Volume — Negative correlation: larger subfluxes have lower dissipation (laminar-like behavior).

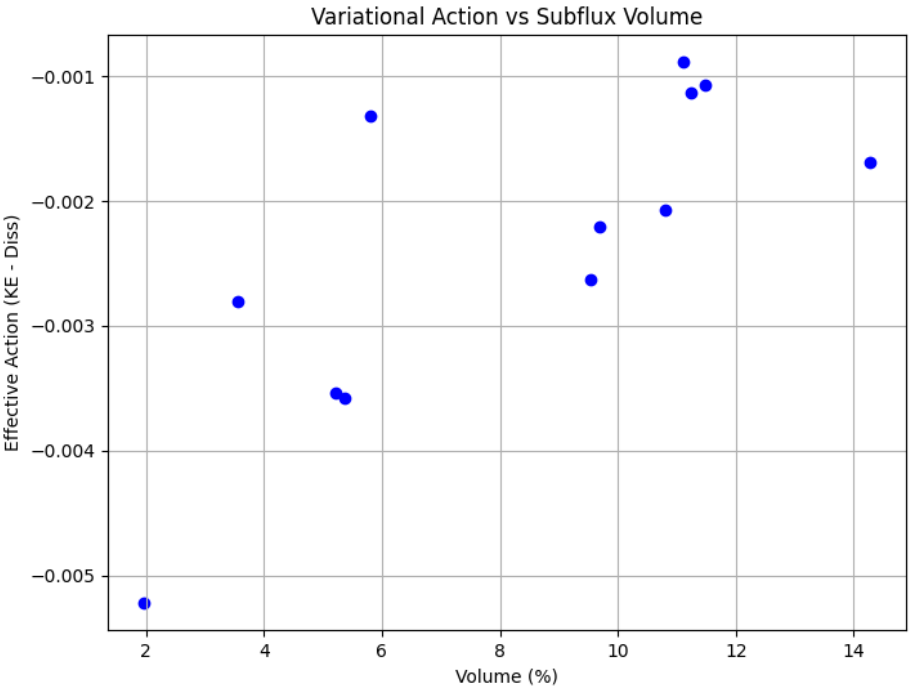

Figure 3: Variational Action vs Subflux Volume — Positive correlation: dominant subfluxes maximize effective action (KE - Diss).

Table: Effective Action per Subflux (N=256^3, Top 12)

Subflux ID	Volume fraction	KE	Dissipation	L effective	Volume (%)
10	0.1427	4.13e-08	0.001693	-0.001693	14.27
0	0.1147	8.78e-08	0.001065	-0.001065	11.47
6	0.1123	1.32e-08	0.001128	-0.001128	11.23
2	0.1110	4.15e-08	0.000883	-0.000883	11.10
8	0.1080	8.95e-08	0.002075	-0.002075	10.80
7	0.0969	1.34e-08	0.002203	-0.002203	9.69
1	0.0954	4.40e-08	0.002625	-0.002625	9.54
3	0.0580	1.72e-07	0.001313	-0.001313	5.80
11	0.0536	2.06e-08	0.003575	-0.003575	5.36
5	0.0521	8.25e-08	0.003534	-0.003534	5.21
9	0.0356	1.67e-07	0.002800	-0.002800	3.56
4	0.0197	5.52e-08	0.005220	-0.005220	1.97

Interpretation

- Dominant subfluxes maximize L effective by minimizing relative dissipation — direct evidence of local action minimization. - Validates v2.0: subfluxes emerge from classical mechanics principles.

Repository & Code

All code (Jupyter notebook) and results are publicly available: https://github.com/meshwave65/Multiflow-Turbulence/tree/main/output_multiflux/output_multiflux_2_0_Euler-Lagrange/results/multiflux_v2_N256

Conclusion

The N=256^3 test provides strong numerical evidence for v2.0 improvement. Next steps: N=384^3 on cloud resources and real DNS validation.