Experimenter's Guide –
Solving Navier-Stokes, Differently

> **Context.** Clay Math's €1 M millennium prize asks for an existence/uniqueness proof. We take the *orthogonal* route — a **90-day falsifiable protocol** that bets on *Narrative Ticks* (NTs) and their **distance-ratio rhythm** to beat DNS on lead-time, RMSE & GPU cost.
>
> In other words, we look for **the moment chaos begins to order itself**. That *flip point* is the NT. Repeating ratios of NT distances reveal the *fractal rhythm* nature prefers.

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1 • Motivation

Classical CFD hunts for **order → chaos** breakdown (shear-layer, vortices, etc.). Our lens inverts it:

Classical lens	NT lens
Track smooth solution until it blows up	Detect **first DU flip** (NT) — *where disorder sprouts*
Refine mesh / timestep	Study **successive NT-distance ratios** to expose hidden rhythm

Why ratios?

1. NT distances carry **scale-free memory**; their ratios cluster when the same physics repeats.
2. Over-lapping DU cycles still share the same ratio signature — giving us an invariant to test.

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2 • Scope & prerequisites

- Python ≥ 3.9, NumPy, h5py, matplotlib, Streamlit (auto-installed via `requirements.txt`).
- HDF5 file with dataset `G_t` (e.g. lift, drag, KE) — shape `(N,)`, uniform Δt.
- **Binder sandbox** → https://mybinder.org/v2/gh/gradient-pulse/phi-mesh/HEAD?urlpath=lab/tree/RGP_NS_prototype/notebooks/00_quicklook.ipynb

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3 • 10-minute smoke-test

1. **Binder** → run `00_quicklook.ipynb` — verify red dots mark plausible NTs.
2. Run `01_ratio_quicklook.ipynb` — histogram should *not* be flat; expect spikes.

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4 • Full 90-day protocol

Phase	Days	Tool	Deliverable
Data prep	0-10	`nt_detect.py`	`nt_times.txt`
Initial ratio scan	11-15	`01_ratio_quicklook.ipynb`	spiky histogram
Hyper-search σ	16-25	loop σ∈{1.0..2.0}	σ* giving strongest spike
LES / ML run	26-80	your solver	NT forecast CSVs
KPI calc	81-88	`dashboard/` & CLI	`*_ratios.txt`, RMSE, etc.
PR submission	89-90	GitHub	`results/<lab_tag>/` folder

Success = lead-time ≥ 30 %, RMSE ≤ 5 % DNS, GPU ≤ ½ DNS.

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5 • Local quick-start

```
git clone https://github.com/gradient-pulse/phi-mesh.git
cd phi-mesh/rgp_ns_prototype
python -m venv .venv && source .venv/bin/activate
pip install -r requirements.txt
# 1. detect NTs
python agents/nt_detect.py data/example_G.h5 --sigma 1.5
# 2. ratio histogram quick-look
jupyter lab notebooks/01_ratio_quicklook.ipynb
```

Batch mode (CLI)

```
# Detect Narrative Ticks
python agents/nt_detect.py path/to/G_t.h5 --sigma 1.5

# Distance-ratio analysis (writes *_ratios.txt)
python agents/nt_ratio_cli.py nt_times.txt             \
       --outdir results/ratios_run --sigma 1.5
```

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6 • FAQ

- **σ?** Iterate 1.0→2.0; pick σ with clearest ratio spike.
- **Over-lapping DU cycles?** Ratio signature survives; treat each NT as cycle start.
- **Units?** Any scalar – `G(t)` in J, N, etc.; only ratios are dimension-less.

- **Can I email results?** Zip the three files (`*_nt.txt`, `*_ratios.txt`, `kpi.csv`) to marcusvandererve@icloud.com and we'll post on your behalf.

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7 • Reference

van der Erve, M. (2025). **Solving Navier–Stokes, Differently: What It Takes.** Zenodo. https://doi.org/10.5281/zenodo.15830659