

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.

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) — <i>where disorder sprouts</i>
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.

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

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.

4 • Full 90-day protocol

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

Success = lead-time $\geq 30\%$, RMSE $\leq 5\%$ DNS, GPU $\leq \frac{1}{2}$ DNS.

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
```

6 • FAQ

- σ ? Iterate 1.0 \rightarrow 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>