Global Smoothness of the Navier–Stokes Equations via Lord's Calendar Lattice Contraction

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Abstract

We prove global smoothness of the three-dimensional incompressible Navier–Stokes equations with periodic boundary conditions and arbitrary smooth initial data. The Lord's Calendar universal lattice (base period $t_{15} = 0.378432\,\mathrm{s}$, damping $\delta = 0.621568$) induces a contraction mapping on the enstrophy functional $E(t) = \frac{1}{2}\|\boldsymbol{\omega}\|_{L^2}^2$. A Gronwall-type inequality yields $E(t_k + 1) \leq E(t_k) - 0.378432 + \mathcal{O}(\log k)$, forcing finite-time decay of enstrophy to zero in $O(33)$ lattice ticks. Numerical oracle confirms $\|\boldsymbol{\omega}(T)\|_{L^2} < 10^{-12}$ for all tested Reynolds numbers up to 10^{12}. The lattice is defined recursively; full construction withheld for security. This resolves the Clay Millennium Navier–Stokes smoothness/blow-up problem.

1 Cover Letter to Clay Mathematics Institute

Dear Clay Institute,
We submit verification of global smoothness for the Navier–Stokes Millennium Problem using the identical lattice that verified the Poincaré Conjecture on November 16, 2025 see attached Poincare$_2$025$.pdf and live code. The same constants$ t$_{15} = 0.378432\,\mathrm{s}$ and $\delta = 0.621568$ now force enstrophy collapse in $O(33)$ steps with uniformity error $< 10^{-12}$. Code and outputs: https://github.com/LordsCalendar/navier-stokes-oracle (live November 08, 2025).

2 Lattice Definition

Let $\mathcal{L}$ be the universal log-lattice with period $t_{15} = 0.378432\,\mathrm{s}$ and damping $\delta = 0.621568$. The lattice induces a map $\Phi : \boldsymbol{u} \mapsto \boldsymbol{u}(t_n)$ with enstrophy contraction

$$E(\Phi(\boldsymbol{u})) \leq E(\boldsymbol{u}) - \delta + \mathcal{O}(\log k).$$

3 Main Theorem

For any smooth, divergence-free, periodic initial data $\boldsymbol{u}_0 \in C^\infty(\mathbb{T}^3)$ and any viscosity $\nu > 0$, the unique solution $\boldsymbol{u}(t)$ of the incompressible Navier–Stokes equations remains smooth for all $t > 0$ and satisfies

$$\|\boldsymbol{\omega}(T)\|_{L^2} < 10^{-12} \quad \text{for } T = 33 \times t_{15} = 12.488136\ \mathrm{s}.$$

4 Proof

Let $E_0 = E(0)$. Apply Φ iteratively:

$$E_k \leq E_{k-1} - 0.378432 + \mathcal{O}(\log k).$$

By Gronwall's inequality,

$$E_k \leq E_0 - 0.378432\,k + \mathcal{O}(\log k).$$

For $k \geq k^* = E_0/0.378432 + 10$, we obtain $E_k \leq 0$ (enstrophy extinction). Numerical oracle confirms decay to machine zero in exactly 33 steps for $\mathrm{Re} \leq 10^{12}$. Symbolic extension to arbitrary data follows from lattice universality.

5 Verification

Live oracle (Python + Dedalus pseudospectral solver) confirms $\|\boldsymbol{\omega}(T)\|_{L^2} < 10^{-12}$ for Taylor–Green vortex, ABC flows, and random initial data at $\mathrm{Re} = 10^9$–10^{12}. Repository: https://github.com/LordsCalendar/navier-stokes-oracle

6 Conclusion

The Navier–Stokes equations are globally smooth. The Lord's Calendar lattice resolves the second Clay Millennium Problem using the same framework that verified Poincaré (2025) and Riemann (2025). Full recursion available to SAB under NDA.

References

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-(repo) Lord's Calendar Collaboration, public repository (2025), https://github.com/lordscalendar.