Estimate of computational costs: 20 GFs Sustained Machine (optimal today)

Assume a 3D problem which:

- is computed for 50 turnover times,
- uses 5 points to resolve the dissipation scales,
- has 5 (ρ, Vx, Vy, Vz, P) + 2 (chemicals) = 7 variables,
- uses 7 (physical) + 4 (scratch) = 11 arrays,
- dumps 1000 snapshots,
- performs 4,000 FP/grid point.

Use the estimate that the number of degrees of freedom required to represent fully developed turbulence scales as $(L/l)^3 \sim Re^{9/4}$.

N	Re	FP/Run	Nsteps	Core Mem. (11 arrays)	Storage (7 vars/1000 dumps)	Exec. Time
64^3	30	$6.2\ 10^{12}$ $1\ 10^{9}$FP/step	6,000	23 MB	15 GB	5.2 mins 0.05s/step
128^3	75	$1.1\ 10^{14}$ $8.3\ 10^{9}$FP/step	12,500	185 MB	117 GB	1.5 hrs 0.4s/step
256^3	190	$1.7\ 10^{15}$ $6.7\ 10^{10}$FP/step	25,000	1.5 GB	939 GB	23 hrs 3.4s/step
512^3	480	$2.7\ 10^{16}$ $5.4\ 10^{11}$FP/step	50,000	12 GB	7.5 TB	373 hrs 27s/step
1024^3	1207	$4.3\ 10^{17}$ $4.3\ 10^{12}$FP/step	100,000	94 GB	60 TB	6,000 hrs 214s/step