Microscopic Dynamics

N	Number of particles in the system
D_C	Cartesian dimension of the system – usually 3
D_{KY}	Kaplan-Yorke dimension
D	accessible phase space domain
$\mathbf{q}$	ND_C dimensional vector, representing the particle positions
$\mathbf{p}$	ND_C dimensional vector, representing the particle momenta
$\mathbf{\Gamma}$	$2ND_C$ dimensional phase space vector, representing all $\mathbf{q}$'s and $\mathbf{p}$'s
$\delta V_\Gamma(S^t\mathbf{\Gamma})$	very small volume element of phase space centred on $S^t\mathbf{\Gamma} \equiv \exp[iL(\mathbf{\Gamma})t]\mathbf{\Gamma}$
$p(\delta V_\Gamma(\mathbf{\Gamma});t)$	probability of observing sets of trajectories inside $\delta V_\Gamma(\mathbf{\Gamma})$ at time t
$p_{+/-}(t)$	probability that the dissipation function is plus/minus over the time interval (0,*t*)
M^T	time reversal map

$$M^K\mathbf{\Gamma} = M^K(x,y,z,p_x,p_y,p_z) = (x,-y,z,-p_x,p_y,-p_z) \equiv \mathbf{\Gamma}^{(K)}$$

Kawaski or K-map of phase space vector for planar Couette flow,

where, $\dot{\boldsymbol{\gamma}} = \partial \mathbf{u} / \partial \mathbf{r} = \begin{pmatrix} 0 & \partial u_x/\partial y & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

L	*f*-Liouvillian
$\exp[-iL(\mathbf{\Gamma})t]...$	*f*-propagator

L	p-Liouvillean
$\exp[iL(\mathbf{\Gamma})t]$	p-propagator
$S^t \ldots$	p-propagator
$K(\mathbf{p})$	peculiar kinetic energy
$\Phi(\mathbf{q})$	interparticle potential energy
$\phi_{i,j}(r_{ij})$	pair potential of atom i with atom j
$\mathbf{r}_{ij} \equiv \mathbf{r}_j - \mathbf{r}_i$	position vector from atom i to atom j
$r_{ij} \equiv \lvert \mathbf{r}_j - \mathbf{r}_i \rvert$	distance between atoms i & j
$\mathbf{F}_{ij}$	force on particle i due to particle j
$\nabla_{\mathbf{q}} \equiv (\partial/\partial\mathbf{q}_1, \ldots, \partial/\partial\mathbf{q}_N)$	
$H_0(\mathbf{\Gamma})$	internal energy, $H_0 = K + \Phi$, where K is the peculiar kinetic energy
$H(\mathbf{\Gamma})$	Hamiltonian at phase vector $\mathbf{\Gamma}$
$g(\mathbf{\Gamma})$	deviation function – even in the momenta
H_E	extended Hamiltonian for Nosé-Hoover dynamics
K_{th}	peculiar kinetic energy of thermostat
N_{th}	number of thermostatted particles
α	Gaussian thermostat multiplier
ζ	Nosé-Hoover thermostat multiplier
τ	time constant
τ_M	Maxwell time
$\dot{Q}$	rate of increase in heat in thermostat
Λ	phase space expansion factor

S_i	switch function
$\mathbf{J}(\mathbf{\Gamma})$	dissipative flux
$\mathbf{F}_e$	external field
m	particle mass
$\mathbf{T} \equiv \partial\dot{\mathbf{\Gamma}}(\mathbf{\Gamma})/\partial\mathbf{\Gamma}$	stability matrix
$\exp_L$	latest times to left, time ordered exponential operator
	tangent vector propagator
λ_i	i^{th} Lyapunov exponent
$\lambda_{\max/\min}$	largest/smallest Lyapunov exponent for steady or equilibrium state

Statistical mechanics

$\overline{A}_t$	time average of some phase variable, A
$\langle A(t)\rangle$	ensemble average of A over time evolved paths
$f(\mathbf{\Gamma};t)$	time dependent phases space distribution function
$\langle.\rangle_{\mu c}$	equilibrium microcanonical ensemble average
$\langle.\rangle_{c}$	equilibrium canonical enamble average
$f_c(\mathbf{\Gamma})$	equilibrium canonical distribution
$f_{\mu c}(\mathbf{\Gamma})$	equilibrium microcanical distribution
Λ	phase space expansion factor
$\Omega(S^t\mathbf{\Gamma})$	the instantaneous dissipation function, at time t on a phase space trajectory that started at phase $\mathbf{\Gamma}$
$\mathbf{r}$	3 dimensional position vector

$\mathbf{u}(\mathbf{r},t)$	3 dimensional local fluid streaming velocity
S_G	fine-grained Gibbs entropy - $= k_B \int_D d\mathbf{\Gamma}\ f(\mathbf{\Gamma})\ln(f(\mathbf{\Gamma})) = k_B \ln(Z_{\mu c})$
Z	partition function – normalization for the equilibrium phase space distribution
Z_c	canonical partition function

Mechanical variables

Q	heat
V	system volume
U	internal energy, $U = \langle H_0 \rangle$
W	work performed on system of interest
Y	purely dissipative generalized dimensionless work
X	generalized dimensionless work

Thermodynamic variables

T	temperature
β	Boltzmann factor (reciprocal temperature)
S	entropy
A	Helmholtz free energy, $= -k_B T \ln(Z_c)$
$\langle \Sigma(t) \rangle$	entropy production
G_0	zero frequency elastic shear modulus
G_∞	infinite frequency shear modulus

Transport

γ	strain (note: γ is sometimes used to fix the systems total momentum)
$\delta\gamma$	small strain
$\dot{\gamma}$	strain rate
P_{xy}	*xy*-element of the pressure tensor
$-\langle P_{xy} \rangle$	xy-element of the ensemble averaged stress tensor
η_{0^+}	limiting zero frequency shear viscosity of a solid
η	shear viscosity of a fluid
τ_M	Maxwell relaxation time
$J(\mathbf{\Gamma})$	Dissipative flux
$J_\perp(k_y,t)$	wavector dependent transverse momentum density
$\eta_M(t)$	Maxwell model memory function for shear viscosity
η_M	zero frequency Maxwell shear viscosity

Mathematics

Θ	Heaviside step function
λ	arbitrary parameter
$\tilde{F}(s)$	Laplace transform of $F(t)$
$\hat{F}(s)$	anti-Laplace transform of $F(t)$
$\oint_P$	cyclic integral of a periodic function
${}_{qs}\int_a^b$	quasi static integral from *a* to *b*

Note: Upper case sub/supers for people. Lower case for most else. Subscripts preferred to supers so as to not confuse powers with superscripts. Italics for algebraic initials. Nonitalics for word initials. (e.g. T-mixing not *T*-mixing because T stands for Transient, *N*-particle not N-particle.*)*