7 Definition of Variables

α	P or compressional wave velocity
A	Cavity radius
$A(t)$	Instantaneous amplitude
A_n	RF event amplitude factor
a_0, a_s	Radius of source, radii of scatterers
β	S or shear wave velocity
b	Unitless constant
χ and χ_s	Radiation reactance of medium and scatterer
C	A normalization constant
C_{scat}	Amplitude decay factor due to scattering
c	Speed of sound in a fluid or gas
c_S and c_{eq}	Concentrations of disolved gas
d	Diameter of flow dimension Cylinder diameter (vortex shedding) Conduit diameter (slug flow)
D	Duct diameter
d_{scat}	Mean distance between scatterers
ΔE_H	Helmholtz energy of bubble formation
E_{nT}	Total energy of a rapid fire event
ε_s	Scatterer efficiency
$f(t)$	Instantaneous frequency
F_0	Point force in the j direction
f_0	A fixed or test frequency
f_1	Fundamental frequency of harmonic tremor
f_K	Vortex shedding frequency
F_l	Force per unit length (vortex shedding)
f_n	Frequency of nth overtone ($f_n = nf_1$, n = 1, 2, 3)
f_i	Frequencies of transverse duct resonance (i = 1, 2, 3)
g	Gravitational acceleration
$g(t)$	Green's function
γ_i and γ_j	Directional cosines

η	Dynamic or shear viscosity
h	Depth
$H(t)$	Heaviside function
i_0	True incidence angle for P waves
$\bar{i}_0$	Apparent incidence angle
j_0	True incidence angle for SV waves
κ	Kinematic viscosity
k', k	Proportionality constant between pressure difference and flow velocity, Boltzmann constant, Wavenumber
K	Proportionality factor in Henry's Law
$k\Delta t$	A sequence of times spaced Δt, k = 1, 2, 3, ...
λ	Poisson parameter
L	Separation between cylinders (vortex shedding) Length of conduit (slug flow)
m	Mass of gas
$\dot{m}$	Mass flux
$\dot{m}_b$	Mass flux due to bubbles
$\dot{m}_e$	Mass flux due to escaping gas
μ	Shear modulus
M_{gas}	Molecular mass of gas
N	Number of moles of gas
n_b, $\dot{n}_b$	Number of bubbles, Bubble nucleation rate
P	Pressure
$\dot{P}$	Time derivative of pressure
Δp	Change in momentum between laminar and turbulent flow
P_A	Atmospheric pressure
q	Cross-sectional area of soda bottle vent
Q	Cross-sectional area of bubble filled fluid
θ and θ_s	Radiation resistance of medium and scatterer
$\Theta(t)$	Instantaneous phase
Θ_R	Reduced instantaneous phase
ρ	Density

$\bar{\rho}_b$	Mean density of bubbles
ρ_{gas}	Density of gas in bubble
ρ_{scat}	Density of scatterers in medium
R	Universal gas constant
R'	Normalized universal gas constant
Re	Reynolds number (dimensionless)
r	Distance from source
r_0	Source receiver distance
r_b	Bubble radius
r_s	Source scatterer distance
r_{s0}	Scatterer receiver distance
σ	Poisson ratio
$s_0(t)$	Characteristic source function for RF events
$s_n(t)$	Source-time function of RF event n
σ_S	Surface tension
σ_{scat}	Scatterer cross-sectional area
St	Strouhal number (dimensionless)
t	Time
T	Temperature
τ	Pulse duration
T_c	Interval for sound pulse to travel distance L
T_D	Vortex drift interval
T_I	Intermittency factor (slug flow)
T_S	Interval of slug cycle
T_T	Interval of turbulence
$\dot{u}(t)$	Characteristic time function for RF events
$\bar{u}_H$	Recorded ground motion of SH waves
$u_i(x,t)$	The *i*th component of the displacement wavefield
$\dot{u}_i(x,t)$	The *i*th component of the velocity wavefield
$\dot{u}_{n\max}$	Maximum ground velocity
$\dot{u}_n(t)$	Ground velocity of RF event *n*
U_0	Velocity amplitude at the source

U_H	Ground motion due to incident SH waves
U_V	Ground motion due to incident SV waves
v	Velocity of flow for fluids
V	Gas volume
$\dot{V}$	Time derivative of volume
V_0	Constant volume of gas
v_A	Average flow velocity of slug
$\bar{v}_b$	Mean ascent velocity of bubbles
v_D	Vortex drift velocity
v_F	Flow velocity of front of slug
v_R	Flow velocity of rear of slug
$X(f_0,n)$	Fourier transform of n points of $x(t)$
$x(t)$	Some function of time
$y(t)=H(x(t))$	Hilbert transform of $x(t)$
$z(t)$	Analytic function of $x(t)$