List of used symbols:

A_i:	cross-sectional area in front of a contraction
A_o:	cross-sectional area behind a contraction
C_C:	Cunningham slip correction factor
d:	inner diameter (ID)
D:	particle diffusion coefficient
d_a:	aerodynamic particle diameter
d_{phys}:	physical particle diameter
f_{calm}:	parameter in Grinshpun et al. (1993, 1994)
	(interpolation weighting factor for calm air)
f_{moving}:	parameter in Grinshpun et al. (1993, 1994)
	(interpolation weighting factor for moving air)
g:	acceleration of gravity
I_v:	parameter in Hangal, Willeke (1990a, b)
	(describes inertial losses in the vena contracta for isoxaxial sampling)
$I_w \Downarrow$:	parameter in Hangal, Willeke (1990a, b)
	(direct impaction loss parameter for non-isoaxial downward sampling)
$I_w \Uparrow$:	parameter in Hangal, Willeke (1990a, b)
	(direct impaction loss parameter for non-isoaxial upward sampling)
k:	parameter in Belyaev, Levin (1972, 1974)
	(isoaxial sampling)
k':	parameter in Heyder, Gebhart (1972)
	(gravitational settling)
Kn:	Knudsen Number
L:	tube length
Q:	volumetric flow rate
R:	velocity ratio
R_0:	curvature ratio
Re:	Reynolds Flow Number
Re_p:	Particle Reynolds Number
Sc:	Schmidt Number
Sh:	Sherwood Number
Stk:	Stokes Number

Stk': modified Stokes Number in Durhem, Lundgren (1980)

U: flow velocity in the sampling probe/tube

U_0: surrounding wind speed

V_0: initial velocity of the particles

V_t: turbulent inertial deposition velocity

V_{ts}: terminal settling velocity of the particles

Z: parameter in Fuchs (1964), Thomas (1958)
(gravitational deposition parameter)

α: parameter in Hangal, Willeke (1990a, b)
(non-isoaxial sampling)

δ: parameter in Grinshpun et al. (1993, 1994)
(sampling from low-velocity gas flow)

ϵ: parameter in Fuchs (1964), Thomas (1958)
(gravitational settling)

η_{asp}: aspiration efficiency

$\eta_{asp,calm\ air}$: aspiration efficiency in calm air

$\eta_{asp,overall}$: overall aspiration efficiency

$\eta_{bend,inert}$: transport efficiency associated with inertial deposition in a bend

$\eta_{cont,inert}$: transport efficiency associated with inertial deposition in a contraction

η_{diff}: transport efficiency associated with diffusion

η_{grav}: transport efficiency associated with sedimentation

$\eta_{sampling}$: sampling efficiency

η_{inlet}: overall efficiency/inlet efficiency

η_{trans}: transmission efficiency

$\eta_{trans,grav}$: transmission efficiency associated with gravitational sedimentation

$\eta_{trans,inert}$: transmission efficiency associated with inertial deposition

$\eta_{transport}$: transport efficiency

$\eta_{tube\ section,mechanism}$: transport efficiency for each mechanism in each tube section

$\eta_{turb\ inert}$: transport efficiency associated with turbulent inertial deposition

θ_{cont}: contraction half-angle

θ_{enl}: enlargement half-angle

θ_i: angle of inclination corresponding to the horizontal

θ_{Kr}:	angle of curvature of a bend
θ_S:	aspiration angle corresponding to the wind direction
λ:	gas molecular mean free path
μ:	dynamic viscosity of the flow medium (air)
ξ:	parameter in Willeke, Baron (2005)
	(diffusional losses)
ρ_0:	standard particle density, 1 $g\ cm^{-3}$
ρ_f:	density of the flow medium (air)
ρ_p:	particle density
φ:	angle corresponding to the vertical
χ:	dynamic shape factor

Description of used angles:

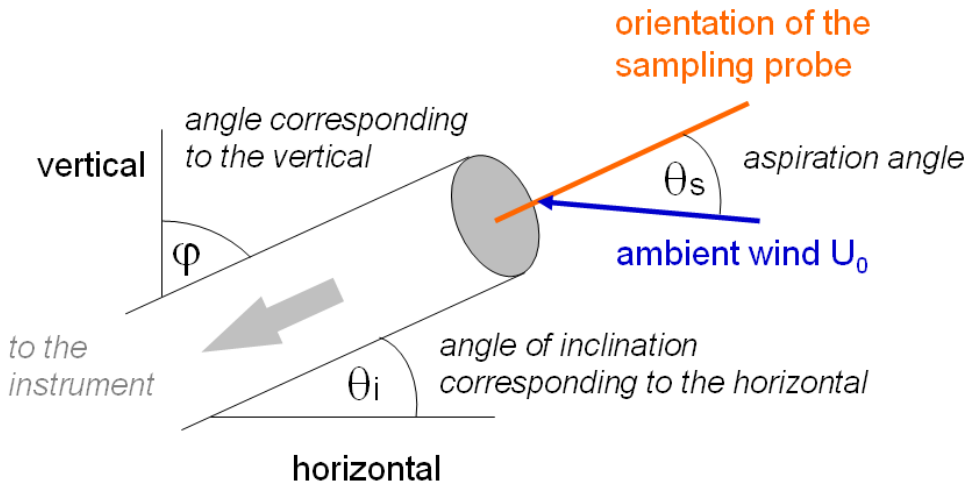

Figure 1: Used angles to describe the orientation of sampling probe and inlet tubes.

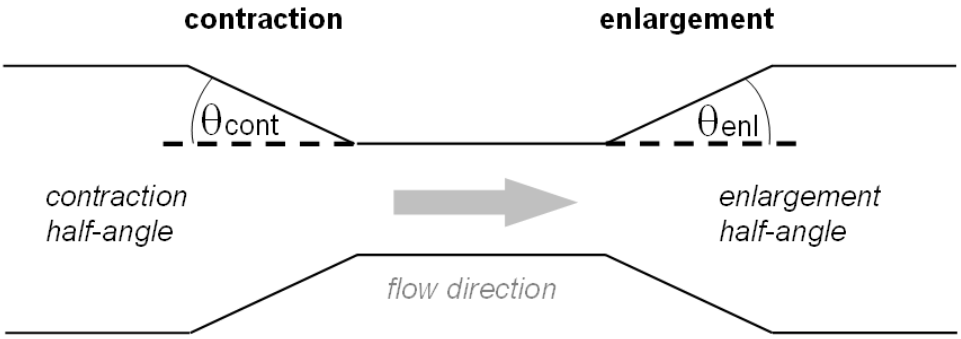

Figure 2: Contraction and enlargement half-angles

Range of validity for implemented aerosol sampling and transport effect parameterizations:

Sampling Effect	Condition	Stokes Number	Velocity Ratio	Miscellaneous
Aspiration efficiency	moving air isoaxial	$0.05 \leq Stk \leq 2.03$	$0.17 \leq R \leq 5.6$	
	moving air non-isoxial: $> 0° - 60°$	$0.02 \leq Stk \leq 4$	$0.5 \leq R \leq 2$	
	moving air non-isoaxial: $61° - 90°$	$0.02 \leq Stk \leq 0.2$	$0.5 \leq R \leq 2$	
	calm air	$0.001 \leq Stk \leq 100$		$0° \leq \varphi \leq 90°$ $0.001 \leq V_{ts}/U \leq 1$
	slow motion air	see above	see above	$-90° \leq \varphi \leq 90°$ $-90° \leq \theta_S \leq 90°$
Transmission efficiency	isoaxial $R > 1$	$0.01 \leq Stk \leq 100$	$1 \leq R \leq 10$	
	isoaxial $R < 1$	$0.02 \leq Stk \leq 4$	$0.25 \leq R \leq 1$	
	non-isoaxial	$0.02 \leq Stk \leq 4$	$0.25 \leq R \leq 1$	$0° \leq \theta_S \leq 90°$

Transport Effect	Condition	Limiting parameter
Diffusion		no limits
Sedimentation	inclined tube	$V_{ts} sin(\theta_i)/U \ll 1$
Turbulent inertial deposition		$Re < 15600$
Inertial deposition: bend		$5 \leq R_0 \leq 30$
Inertial deposition: contraction		$0.001 \leq Stk(1 - A_0/A_i) \leq 100$ $12° \leq \theta_{cont} \leq 90°$