X The nominally East-West coordinate of the QUIC domain which has its origin at the lower-left corner of the domain.

Y The nominally North-South coordinate of the QUIC domain which has its origin at the lower-left corner of the domain.

Z The vertical coordinate of the QUIC domain which has its origin at ground level.

X' The along-wind coordinate used by the new wake algorithm which has its origin at the center of the building.

Y' The cross-wind coordinate used by the new wake algorithm which has its origin at the center of the building.

Z' The vertical coordinate used by the new wake algorithm which has its origin at the base of the building

L The dimension of the building which in the unrotated case is in the X direction.

W The dimension of the building which in the unrotated case is in the Y direction.

H The height of the building.

γ The building rotation angle.

ϕ The wind direction at H relative to the domain.

ψ The wind direction at H relative to the building's orientation.

L_r The maximum extent of the cavity behind the surface of the building in the X' direction.

L_{eff} The effective dimension of the building in the X' direction used to compute L_r.

W_{eff} The effective dimension of the building in the Y' direction used to compute L_r.

P The point of interest located at (x', y').

X_s The distance of the leeward surface of the building at y'.

dN The local extent of the cavity behind the surface of the building for a particular y' and z'.

β The angle based on the W/L aspect ratio of the building which is used to determine which building dimension (L or W) will be used to compute L_{eff} and W_{eff} for rectangular buildings.

$$\psi = \phi - \gamma$$

$$L_r = \frac{AW_{eff}}{\left(\frac{L_{eff}}{H}\right)^{0.3}\left(1 + 0.24\frac{W_{eff}}{H}\right)}$$

In the standard Röckle wake algorithm the coefficient A has a value of 1.8. This has been found to produce too large of wakes for cylindrical buildings so the new algorithm uses a value 0.9 instead. The ratio of the effective length to building height $\frac{L_{eff}}{H}$ is also bounded having a maximum value of 3 and a minimum of 0.3.

$$dN = L_r\sqrt{\left(1 - \left(\frac{y'}{y'_{max}}\right)^2\right)\left(1 - \left(\frac{z'}{H}\right)^2\right)}$$

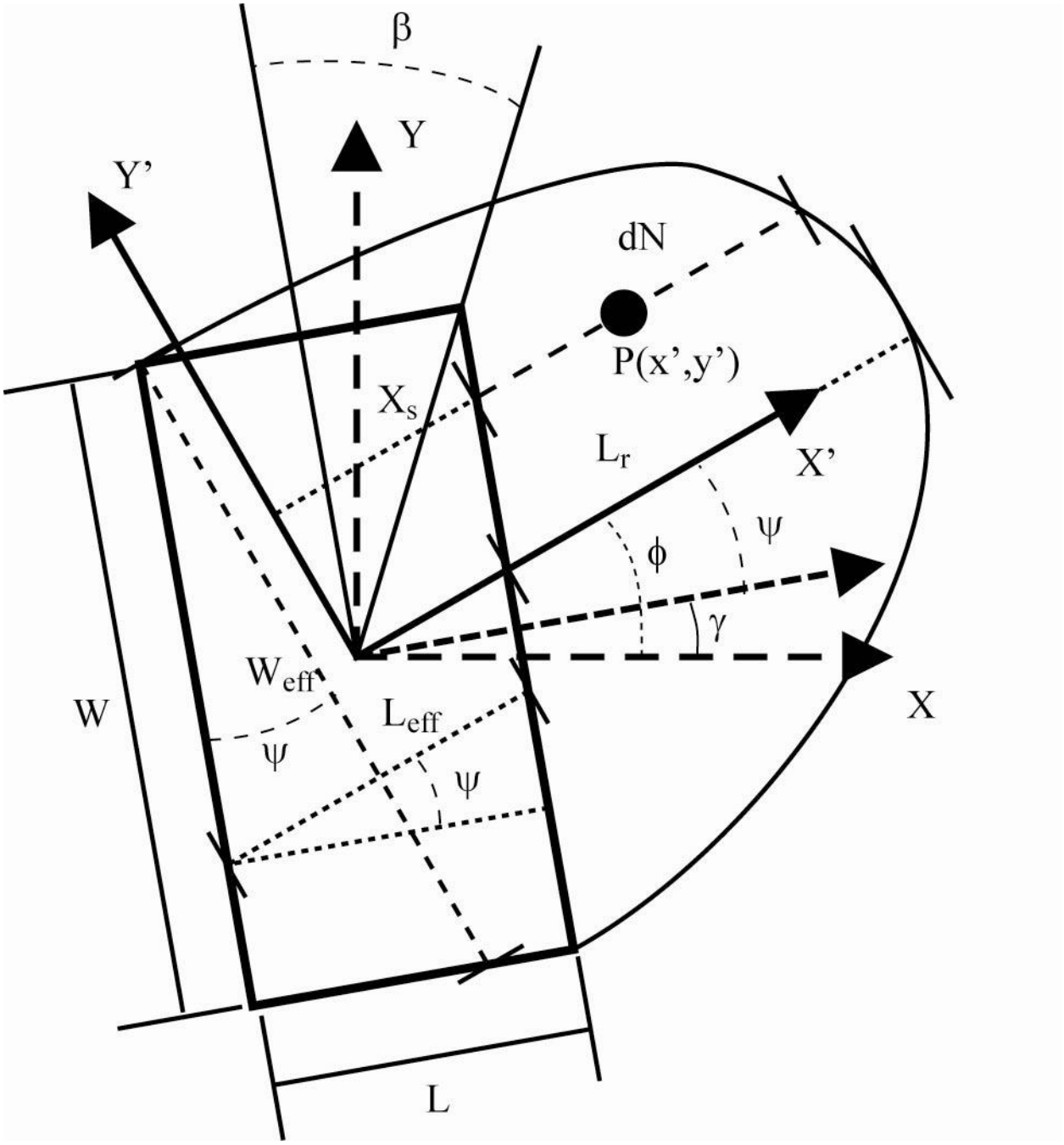

Figure 1. Diagram of the parameters used to produce the wake behind a rotated rectangular building.

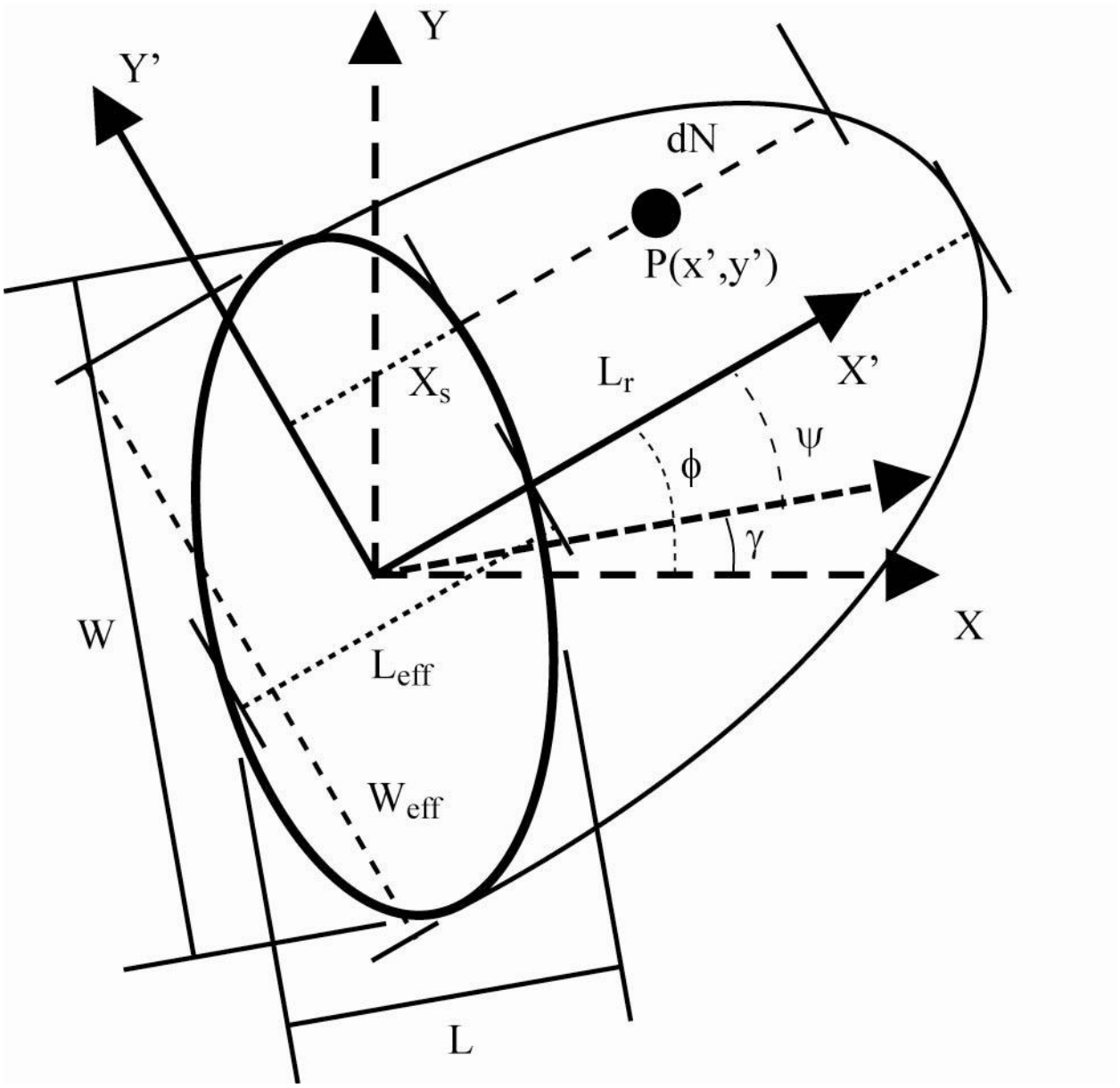

Figure 2. Diagram of parameters used to produce the wake behind a rotated elliptical building.