# Supplement

## 1. Piecewise fitting of perpendicular scenarios

The fitting horizontal components have been mentioned in the essay. Here, the endpoints and expressions of vertical component w is shown from Table S1 to Table S3. Figure S1 shows the vertical profile of w components from IWSUS.

**Table S1 The fitting functions of the segmentation points for the wind components *w* in the perpendicular scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| leeward at entrance/exit | $H_1$ | $h_r=\begin{cases}-5.284\exp(-6.065\mathrm{AR})+0.9939, \mathrm{AR}\geq 0.5\\ h_r(\mathrm{AR}=0.5), \mathrm{AR}<0.5\end{cases}$ |
| | $H_2$ | $h_r=0.3585\exp(-1.898\mathrm{AR})+1.057$ |
| | $H_3$ | $h_r=1.475\exp(-3.011\mathrm{AR})+1.318$ |
| windward at entrance/exit | $H_1$ | $h_r=\begin{cases}-3.712\exp(-5.28\mathrm{AR})+0.9836, \mathrm{AR}\geq 0.5\\ h_r(\mathrm{AR}=0.5), \mathrm{AR}<0.5\end{cases}$ |
| | $H_2$ | $h_r=8.236\exp(-5.263\mathrm{AR})+1.857$ |
| leeward at middle | $H_1$ | $h_r=0.9$ |
| | $H_2$ | $h_r=0.5214\exp(-1.5\mathrm{AR})+1.055$ |
| | $H_3$ | $h_r=1.534\exp(-2.733\mathrm{AR})+1.337$ |
| windward at middle | $H_1$ | $h_r=\begin{cases}-0.4067\mathrm{AR}+0.7757, \mathrm{AR}\geq 0.5\\ 0.0219\exp(-1.688\mathrm{AR})+0.5214, \mathrm{AR}<0.5\end{cases}$ |
| | $H_2$ | $h_r=4.424\exp(-4.943\mathrm{AR})+1.005$ |
| | $H_3$ | $h_r=2.654\exp(-2.872\mathrm{AR})+1.73$ |

**Table S2 The fitting functions of the wind components *w* at the segmentation points ($H_i$) in the perpendicular scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| leeward at entrance/exit | $H_1$ | $w_r=\begin{cases}0.04559\exp(2.746\mathrm{AR})+0.002081, \mathrm{AR}<0.5\\ -0.3718\exp(-5.31\mathrm{AR})+0.1556, \mathrm{AR}\geq 0.5\end{cases}$ |
| | $H_2$ | $w_r=-0.307\exp(-5.844\mathrm{AR})+0.1185$ |
| | $H_3$ | $w_r=-0.426\exp(-3.011\mathrm{AR})+1.318$ |
| | $H_1$ | $w_r=\begin{cases}w_r(\mathrm{AR}=0.5), \mathrm{AR}<0.5\\ -3.712\exp(-5.28\mathrm{AR})+0.9836, \mathrm{AR}\geq 0.5\end{cases}$ |

| | | |
|---|---|---|
| windward at entrance/exit | $H_2$ | $w_r = \begin{cases} w_r(AR=0.5), AR<0.5 \\ -0.7792\exp(-2.273AR) + 0.2835, AR\geq 0.5 \end{cases}$ |
| leeward at middle | $H_1$ | $w_r = \begin{cases} 0.5417AR + 0.0377, AR<0.5 \\ 9.341\exp(-8.185AR) + 0.1524, AR\geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = \begin{cases} 0.225AR+0.05438, AR < 0.5 \\ 0.904\exp(-5.519AR) + 0.1201, AR \geq 0.5 \end{cases}$ |
| | $H_3$ | $w_r = -0.4408\exp(-2.875AR) + 0.5083$ |
| windward at middle | $H_1$ | $w_r = \begin{cases} 0.2472AR + 2.858, AR<0.5 \\ 4.77\exp(-5.175AR) + 0.05055, AR\geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = 0.4383\exp(-4.059AR) - 0.1127$ |
| | $H_3$ | $w_r = -1.275\exp(-0.6783AR) + 0.9835$ |

**Table S3 Expressions of *w* component vertical profile for perpendicular scenarios, where the functional relations between $w_r$ and $h_r$ and determine functions of coefficients in these expressions are listed. The $H_i$ and $w_r(H_i)$ represents the relative height and relative wind components speed at the endpoints determined by Table S1 and Table S2 respectively.**

| Positions | Wind profile Functions | Formula for Coefficients in Wind profile Functions |
|---|---|---|
| leeward at entrance/exit | $w_r(h_r) = \begin{cases} a_{1,1}(h_r + b_{1,1})^2 + c_{1,1}, 0 \leq h_r \leq H_1 \\ a_{1,2}h_r + b_{1,2}, H_1 \leq h_r \leq H_2 \\ a_{1,3}h_r + b_{1,3}, H_2 \leq h_r \leq H_3 \\ \frac{a_{1,4}\exp(b_{1,4}h_r)}{u_0}, h_r \geq H_3 \end{cases}$ | $\begin{cases} a_{1,1} = -\frac{c_{1,1}}{b_{1,1}^2}, b_{1,1} = -h_r(H_1), c_{1,1} = w_r(H_1) \\ a_{1,2} = \frac{w_r(H_2) - w_r(H_1)}{h_r(H_2) - h_r(H_1)}, b_{1,2} = w_r(H_2) - a_{2,2}h_r(H_2) \\ a_{1,3} = \frac{w_r(H_3) - w_r(H_2)}{h_r(H_3) - h_r(H_2)}, b_{1,3} = w_r(H_2) - a_{1,3}h_r(H_2) \\ a_{1,4} = \frac{w_r(H_3)}{exp(b_{1,4}h_r(H_3))}, b_{1,4} = -0.1 \end{cases}$ |
| windward at entrance/exit | $w_r(h_r) = \begin{cases} a_{2,1}(h_r + b_{2,1})^2 + c_{2,1}, 0 \leq h_r \leq H_1 \\ a_{2,2}(h_r + b_{2,2})^2 + c_{2,2}, H_1 \leq h_r \leq H_2 \\ w_r(H_2), h_r \geq H_2 \end{cases}$ | $\begin{cases} a_{2,1} = -\frac{c_{2,1}}{b_{2,1}^2}, b_{2,1} = -h_r(H_1), c_{2,1} = w_r(H_1) \\ a_{2,2} = \frac{w_r(H_1) - c_{2,2}}{(h_r(H_1) + b_{2,2})^2}, b_{2,2} = -h_r(H_2), c_{2,2} = w_r(H_2) \end{cases}$ |
| leeward at middle | $w_r(h_r) = \begin{cases} a_{3,1}(h_r + b_{3,1})^2 + c_{3,1}, 0 \leq h_r \leq H_1 \\ a_{3,2}h_r + b_{3,2}, H_1 \leq h_r \leq H_2 \\ a_{3,3}h_r + b_{3,3}, H_2 \leq h_r \leq H_3 \\ \frac{a_{3,4}\exp(b_{3,4}h_r) + 0.1u_0}{u_0}, h_r \geq H_3 \end{cases}$ | $\begin{cases} a_{3,1} = -\frac{c_{3,1}}{b_{3,1}^2}, b_{3,1} = -h_r(H_1), c_{3,1} = w_r(H_1) \\ a_{3,2} = \frac{w_r(H_2) - w_r(H_1)}{h_r(H_2) - h_r(H_1)}, b_{3,2} = w_r(H_2) - a_{3,2}h_r(H_2) \\ a_{3,3} = \frac{w_r(H_3) - w_r(H_2)}{h_r(H_3) - h_r(H_2)}, b_{3,3} = w_r(H_2) - a_{3,3}h_r(H_2) \\ a_{3,4} = \frac{w_r(H_3)}{exp(b_{3,4}h_r(H_3))}, b_{3,4} = -0.1 \end{cases}$ |

| | | |
|---|---|---|
| windward at middle | $w_r(h_r) = \begin{cases} a_{4,1}(h_r + b_{4,1})^2 + c_{4,1}, 0 \le h_r \le H_1 \\ a_{4,2}h_r + b_{4,2}, H_1 \le h_r \le H_2 \\ a_{4,3}(h_r + b_{4,3})^2 + c_{4,3}, H_2 \le h_r \le H_3 \\ w_r(H_3), h_r \ge H_3 \end{cases}$ | $\begin{cases} a_{4,1} = -\frac{c_{4,1}}{b_{4,1}^2}, b_{4,1} = -h_r(H_1), c_{4,1} = w_r(H_1) \\ a_{4,2} = \frac{w_r(H_2) - w_r(H_1)}{h_r(H_2) - h_r(H_1)}, b_{4,2} = w_r(H_2) - a_{4,2}h_r(H_2) \\ a_{4,3} = \frac{v_r(H_3) - c_{4,3}}{(h_r(H_3) + b_{4,3})^2}, b_{4,3} = -h_r(H_2), c_{4,3} = w_r(H_2) \\ a_{4,4} = w_r(H_3) \end{cases}$ |

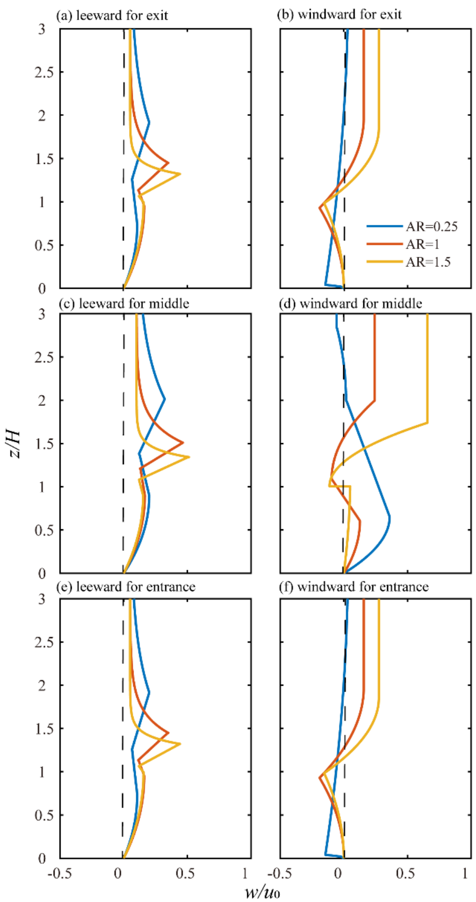


**Figure S1 Wind profile of *w* component obtained from IWSUS for perpendicular scenarios at different positions with AR= 0.25, 1 and 1.5.**

## 2. Piecewise fitting of parallel scenarios

The endpoints and expressions of component *u* vertical profile in parallel scenarios are shown from Table S4 to Table S6. Figure S2 shows the vertical profile of w components from IWSUS. For *v* component, the results are shown from Table S7 to Table S9 and Figure S3. For *w* components, the results are shown from Table S10 to Table S12 and Figure S4.

**Table S4 The fitting functions of the segmentation points for the wind components *u* in the parallel scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| Leeward/windward at entrance | $H_1$ | $h_r = 0.7662\exp(-3.718\mathrm{AR}) + 0.0975$ |
| | $H_2$ | $h_r = 1$ |
| Leeward/windward at middle | $H_1$ | $h_r = 1$ |
| Leeward/windward at exit | $H_1$ | $h_r = 1$ |

**Table S5 The fitting functions of the wind components *u* at the segmentation points ($H_i$) in the parallel scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| windward at entrance | $H_1$ | $u_r = \begin{cases} 0.7662\exp(-3.718\mathrm{AR}) + 0.0975, \mathrm{AR} \le 1 \\ u_r(\mathrm{AR}=1), \mathrm{AR} > 1 \end{cases}$ |
| | $H_2$ | $u_r = 0.02603\exp(-3.252\mathrm{AR}) + 0.009276$ |
| windward at middle | $H_1$ | $u_r = -0.04175\exp(-9.374\mathrm{AR}) + 0.02567$ |
| windward at exit | $H_1$ | $u_r = -0.04175\exp(-9.374\mathrm{AR}) + 0.02567$ |
| leeward at entrance | $H_1$ | $u_r = \begin{cases} -0.7662\exp(-3.718\mathrm{AR}) - 0.0975, \mathrm{AR} \le 1 \\ u_r(\mathrm{AR}=1), \mathrm{AR} > 1 \end{cases}$ |
| | $H_2$ | $u_r = -0.02603\exp(-3.252\mathrm{AR}) - 0.009276$ |
| leeward at middle | $H_1$ | $u_r = 0.04175\exp(-9.374\mathrm{AR}) - 0.02567$ |
| leeward at exit | $H_1$ | $u_r = 0.04175\exp(-9.374\mathrm{AR}) - 0.02567$ |

**Table S6 Expressions of *u* component vertical profile for parallel scenarios, where the functional relations between $u_r$ and $h_r$ and determine functions of coefficients in these expressions are listed. The $H_i$ and $u_r(H_i)$ represents the relative height and relative wind components speed at the endpoints determined by Table S4 and Table S5 respectively.**

| Positions | Wind profile Functions | Formula for Coefficients in Wind profile Functions |
|---|---|---|
| windward at entrance | $u_r(h_r) = \begin{cases} a_{1,1}h_r, 0 \le z \le H_1 \\ a_{1,2}(h_r + b_{1,2})^2 + c_{1,2}, H_1 \le h_r \le H_2 \\ \frac{a_{1,3}\exp(b_{1,3}h_r)}{u_0}, h_r \ge H_2 \end{cases}$ | $\begin{cases} a_{1,1} = \frac{u_r(H_1)}{h_r(H_1)} \\ a_{1,2} = \frac{u_r(H_1) - c_{1,2}}{(h_r(H_1) + b_{1,2})^2}, b_{1,2} = -h_r(H_2), c_{1,2} = u_r(H_2) \\ a_{1,3} = \frac{u_r(H_2)}{exp(b_{1,3}h_r(H_2))}, b_{1,3} = -0.05 \end{cases}$ |
| windward at middle | $u_r(h_r) = \begin{cases} a_{2,1}(h_r + b_{2,1})^2 + c_{2,1}, 0 \le h_r \le H_1 \\ \frac{a_{2,2}\exp(b_{2,2}h_r)}{v_0}, h_r \ge H_1 \end{cases}$ | $\begin{cases} a_{2,1} = -\frac{c_{2,1}}{b_{2,1}^2}, b_{4,1} = -h_r(H_1), c_{2,1} = u_r(H_1) \\ a_{2,2} = \frac{u_r(H_1)}{exp(b_{2,2}h_r(H_2))}, b_{2,2} = -0.05 \end{cases}$ |
| windward at exit | $u_r(h_r) = \begin{cases} 0.66(a_{3,1}(h_r + b_{3,1})^2 + c_{3,1}), 0 \le h_r \le H_1 \\ \frac{0.66a_{3,2}\exp(b_{3,2}h_r)}{v_0}, h_r \ge H_1 \end{cases}$ | $\begin{cases} a_{3,1} = -\frac{c_{3,1}}{b_{3,1}^2}, b_{3,1} = -h_r(H_1), c_{3,1} = u_r(H_1) \\ a_{3,2} = \frac{u_r(H_1)}{exp(b_{3,2}h_r(H_1))}, b_{3,2} = -0.05 \end{cases}$ |
| leeward at entrance | $u_r(h_r) = \begin{cases} -a_{4,1}h_r, 0 \le z \le H_1 \\ -a_{4,2}(h_r + b_{4,2})^2 - c_{4,2}, H_1 \le h_r \le H_2 \\ -\frac{a_{4,3}\exp(b_{4,3}h_r)}{u_0}, h_r \ge H_2 \end{cases}$ | $\begin{cases} a_{4,1} = \frac{u_r(H_1)}{h_r(H_1)} \\ a_{4,2} = \frac{u_r(H_1) - c_{4,2}}{(h_r(H_1) + b_{4,2})^2}, b_{4,2} = -h_r(H_2), c_{4,2} = u_r(H_2) \\ a_{4,3} = \frac{u_r(H_2)}{exp(b_{4,3}h_r(H_2))}, b_{4,3} = -0.05 \end{cases}$ |
| leeward at middle | $u_r(h_r) = \begin{cases} -a_{5,1}(h_r + b_{5,1})^2 - c_{5,1}, 0 \le h_r \le H_1 \\ -\frac{a_{5,2}\exp(b_{5,2}h_r)}{v_0}, h_r \ge H_1 \end{cases}$ | $\begin{cases} a_{5,1} = -\frac{c_{5,1}}{b_{5,1}^2}, b_{5,1} = -h_r(H_1), c_{5,1} = u_r(H_1) \\ a_{5,2} = \frac{u_r(H_1)}{exp(b_{5,2}h_r(H_2))}, b_{5,2} = -0.05 \end{cases}$ |
| leeward at exit | $u_r(h_r) = \begin{cases} -0.66(a_{6,1}(h_r + b_{6,1})^2 + c_{6,1}), 0 \le h_r \le H_1 \\ -\frac{0.66a_{6,2}\exp(b_{6,2}h_r)}{v_0}, h_r \ge H_1 \end{cases}$ | $\begin{cases} a_{6,1} = -\frac{c_{6,1}}{b_{6,1}^2}, b_{6,1} = -h_r(H_1), c_{6,1} = u_r(H_1) \\ a_{6,2} = \frac{u_r(H_1)}{exp(b_{6,2}h_r(H_1))}, b_{6,2} = -0.05 \end{cases}$ |

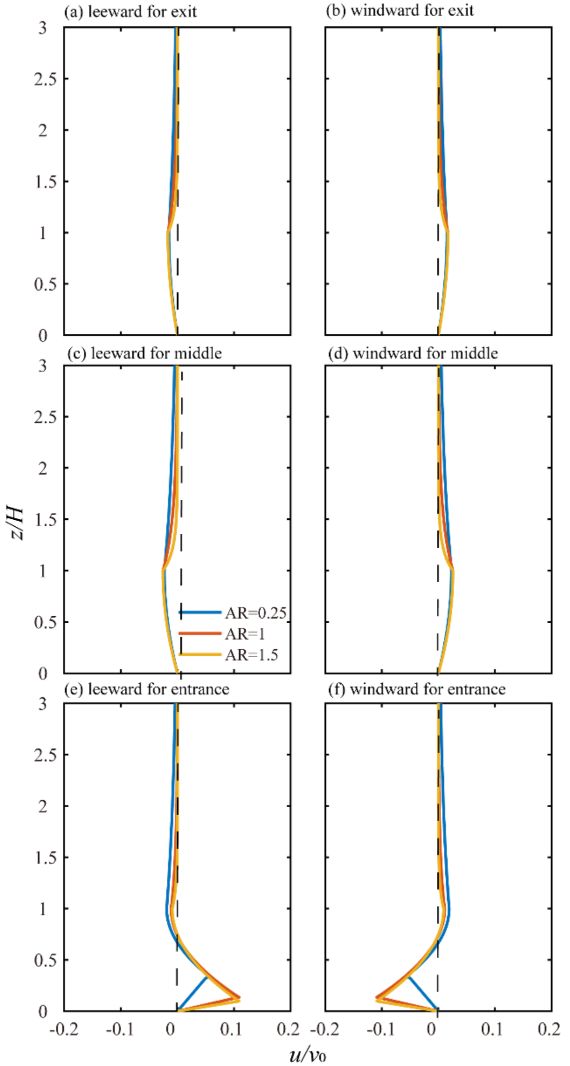


**Figure S2 Wind profile of *u* component obtained from IWSUS at different positions for parallel scenarios with AR= 0.25, 1 and 1.5.**

**Table S7 The fitting functions of the segmentation points for the wind components *v* in the parallel scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| Leeward/windward at entrance | $H_1$ | $h_r = 0.5948\exp(-1.288\text{AR}) + 0.1745$ |
| | $H_2$ | $h_r = 1$ |
| Leeward/windward at middle | $H_1$ | $h_r = 0.5948\exp(-1.288\text{AR}) + 0.1745$ |
| | $H_2$ | $h_r = 2.206\exp(-3.593\text{AR}) + 1.173$ |

| | | |
|---|---|---|
| Leeward/windward | $H_1$ | $h_r = 0.5948\exp(-1.288\mathrm{AR}) + 0.1745$ |
| at exit | $H_2$ | $h_r = 2.206\exp(-3.593\mathrm{AR}) + 1.173$ |

**Table S8 The fitting functions of the wind components *v* at the segmentation points ($H_i$) in the parallel scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| Leeward/windward | $H_1$ | $v_r = 1.05$ |
| at entrance | $H_2$ | $v_r = -0.0534\exp(-3.028\mathrm{AR}) + 1.102$ |
| Leeward/windward | $H_1$ | $v_r = 0.9$ |
| at middle | $H_2$ | $v_r = 2.206\exp(-3.593\mathrm{AR}) + 1.173$ |
| Leeward/windward | $H_1$ | $v_r = 0.9$ |
| at exit | $H_2$ | $v_r = 2.206\exp(-3.593\mathrm{AR}) + 1.173$ |

**Table S9 Expressions of v component vertical profile for parallel scenarios, where the functional relations between $v_r$ and $h_r$ and determine functions of coefficients in these expressions are listed. The $H_i$ and $v_r(H_i)$ represents the relative height and relative .wind components speed at the endpoints determined by Table S7 and Table S8 respectively.**

| Positions | Wind profile Functions | Formula for Coefficients in Wind profile Functions |
|---|---|---|
| Leeward/windward at entrance | $v_r(h_r) = \begin{cases} \frac{a_{1,1}}{\ln(h_r+1)}, 0 \le h_r \le H_1 \\ a_{1,2}h_r + b_{1,2}, H_1 \le h_r \le H_2 \\ \frac{a_{1,3}\exp(b_{1,3}h_r) + v_0}{v_0}, h_r \ge H_2 \end{cases}$ | $\begin{cases} a_{1,1} = \frac{v_r(H_1)}{ln(h_r(H_1)+1)} \\ a_{1,2} = \frac{v_r(H_2) - v_r(H_1)}{h_r(H_2) - h_r(H_1)}, b_{1,2} = v_r(H_2) - a_{1,2}h_r(H_2) \\ a_{1,3} = \frac{v_r(H_3) - v_0}{exp(b_{1,3}h_r(H_3))}, b_{1,3} = -0.05 \end{cases}$ |
| Leeward/windward at middle | $v_r(h_r) = \begin{cases} \frac{a_{2,1}}{\ln(h_r+1)}, 0 \le h_r \le H_1 \\ a_{2,2}h_r + b_{2,2}, H_1 \le h_r \le H_2 \\ \frac{a_{2,3}\exp(b_{2,3}h_r) + v_0}{v_0}, h_r \ge H_2 \end{cases}$ | $\begin{cases} a_{2,1} = \frac{v_r(H_1)}{ln(h_r(H_1)+1)} \\ a_{2,2} = \frac{v_r(H_2) - v_r(H_1)}{h_r(H_2) - h_r(H_1)}, b_{2,2} = v_r(H_2) - a_{2,2}h_r(H_2) \\ a_{2,3} = \frac{v_r(H_3) - v_0}{exp(b_{2,3}h_r(H_3))}, b_{2,3} = -0.05 \end{cases}$ |
| Leeward/windward at exit | $v_r(h_r) = \begin{cases} \frac{0.9a_{3,1}}{\ln(h_r+1)}, 0 \le h_r \le H_1 \\ 0.9(a_{3,2}h_r + b_{3,2}), H_1 \le h_r \le H_2 \\ 0.9\left(\frac{a_{3,3}\exp(b_{3,3}h_r) + v_0}{v_0}\right), h_r \ge H_2 \end{cases}$ | $\begin{cases} a_{3,1} = \frac{v_r(H_1)}{ln(h_r(H_1)+1)} \\ a_{3,2} = \frac{v_r(H_2) - v_r(H_1)}{h_r(H_2) - h_r(H_1)}, b_{3,2} = v_r(H_2) - a_{3,2}h_r(H_2) \\ a_{3,3} = \frac{v_r(H_3) - v_0}{exp(b_{3,3}h_r(H_3))}, b_{3,3} = -0.05 \end{cases}$ |

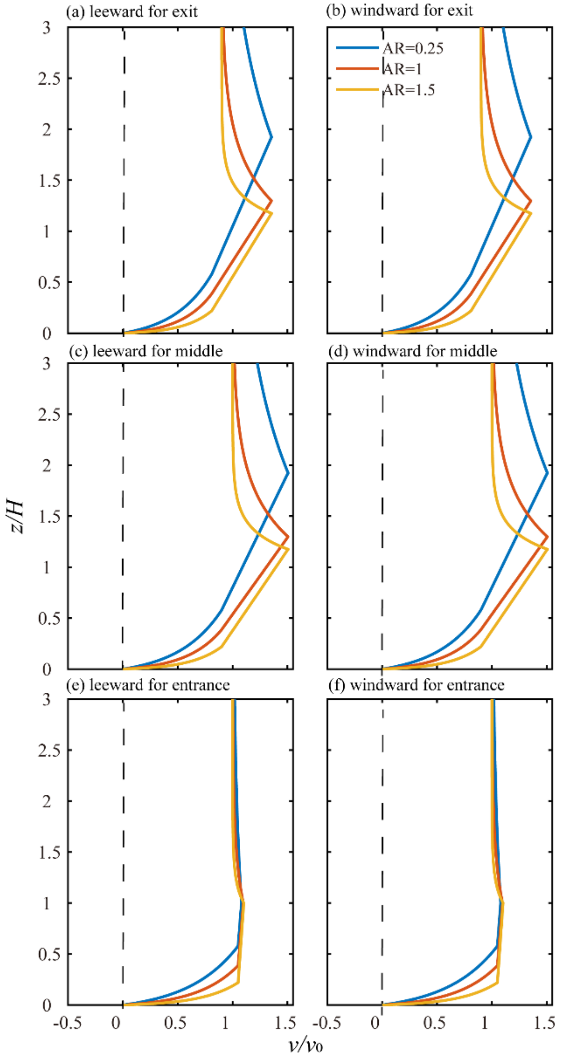


**Figure S3 Wind profile of *v* component obtained from IWSUS at different positions for parallel scenarios with AR= 0.25, 1 and 1.5.**

**Table S10 The fitting functions of the segmentation points for the wind components *w* in the parallel scenarios**

| Positions | Endpoints | fitting function |
|---|---|---|
| Leeward/windward at entrance | $H_1$ | $h_r = 1$ |
| Leeward/windward at middle | $H_1$ | $h_r = 1.222\exp(-3.644\mathrm{AR}) + 0.02068$ |
| | $H_2$ | $h_r = 1$ |
| | $H_1$ | $h_r = 1.222\exp(-3.644\mathrm{AR}) + 0.02068$ |

| | | |
|---|---|---|
| Leeward/windward at exit | $H_2$ | $h_r = 1$ |

**Table S11 The fitting functions of the wind components *w* at the $H_i$ positions in the parallel scenarios**

| Positions | Endpoints | fitting function |
|---|---|---|
| Leeward/windward at entrance | $H_1$ | $w_r = -0.1621\exp(-1.648\text{AR}) + 0.156$ |
| Leeward/windward at middle | $H_1$ | $w_r = \begin{cases} -0.05433\text{AR} + 0.003, \text{AR}<0.5 \\ -0.0484\exp(\text{-}0.8592\text{AR}) + 0.00731, \text{AR}\geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = \begin{cases} w_r(\text{AR} = 0.5), \text{AR}<0.5 \\ -1.034\exp(\text{-}0.0328\text{AR}) + 1.025, \text{AR}\geq 0.5 \end{cases}$ |
| Leeward/windward at exit | $H_1$ | $w_r = \begin{cases} -0.05433\text{AR} + 0.003, \text{AR}<0.5 \\ -0.0484\exp(\text{-}0.8592\text{AR}) + 0.00731, \text{AR}\geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = \begin{cases} w_r(\text{AR} = 0.5), \text{AR}<0.5 \\ -1.034\exp(\text{-}0.0328\text{AR}) + 1.025, \text{AR}\geq 0.5 \end{cases}$ |

**Table S12 Expressions of *w*component vertical profile for perpendicular scenarios, where the functional relations between $w_r$ and $h_r$ and determine functions of coefficients in these expressions are listed. The $H_i$ and $w_r(H_i)$ represents the relative height and relative wind components speed at the endpoints determined by Table S10 and Table S11 respectively.**

| Positions | Wind profile Functions | Formula for Coefficients in Wind profile Functions |
|---|---|---|
| Leeward/windward at entrance | $w_r(h_r) = \begin{cases} a_{1,1}(h_r + b_{1,1})^2 + c_{1,1}, 0 \leq h_r \leq H_1 \\ a_{1,2}h_r + b_{1,2}, H_1 \leq h_r \leq H_2 \\ a_{1,3}h_r + b_{1,3}, H_2 \leq h_r \leq H_3 \\ \frac{a_{1,4}\exp(b_{1,4}h_r)}{u_0}, h_r \geq H_3 \end{cases}$ | $\begin{cases} a_{1,1} = -\frac{c_{1,1}}{b_{1,1}^2}, b_{1,1} = -h_r(H_1), c_{1,1} = w_r(H_1) \\ a_{1,2} = \frac{w_r(H_1)}{exp(b_{1,2}h_r(H_1))}, b_{1,2} = -0.05 \end{cases}$ |
| Leeward/windward at middle | $w_r(h_r) = \begin{cases} a_{2,1}(h_r + b_{2,1})^2 + c_{2,1}, 0 \leq h_r \leq H_1 \\ a_{2,2}(h_r + b_{2,2})^2 + c_{2,2}, H_1 \leq h_r \leq H_2 \\ w_r(H_2), h_r \geq H_2 \end{cases}$ | $\begin{cases} a_{2,1} = -\frac{c_{2,1}}{b_{2,1}^2}, b_{2,1} = -h_r(H_1), c_{2,1} = w_r(H_1) \\ a_{2,2} = \frac{w_r(H_1) - c_{2,2}}{(h_r(H_1) + b_{2,2})^2}, b_{2,2} = -h_r(H_2), c_{2,2} = w_r(H_2) \end{cases}$ |
| Leeward/windward at exit | $w_r(h_r) = \begin{cases} 0.7a_{3,1}(h_r + b_{3,1})^2 + c_{3,1}, 0 \leq h_r \leq H_1 \\ 0.7a_{3,2}(h_r + b_{3,2})^2 + c_{3,2}, H_1 \leq h_r \leq H_2 \\ 0.7w_r(H_2), h_r \geq H_2 \end{cases}$ | $\begin{cases} a_{3,1} = -\frac{c_{3,1}}{b_{3,1}^2}, b_{3,1} = -h_r(H_1), c_{3,1} = w_r(H_1) \\ a_{3,2} = \frac{w_r(H_1) - c_{3,2}}{(h_r(H_1) + b_{3,2})^2}, b_{3,2} = -h_r(H_2), c_{3,2} = w_r(H_2) \end{cases}$ |

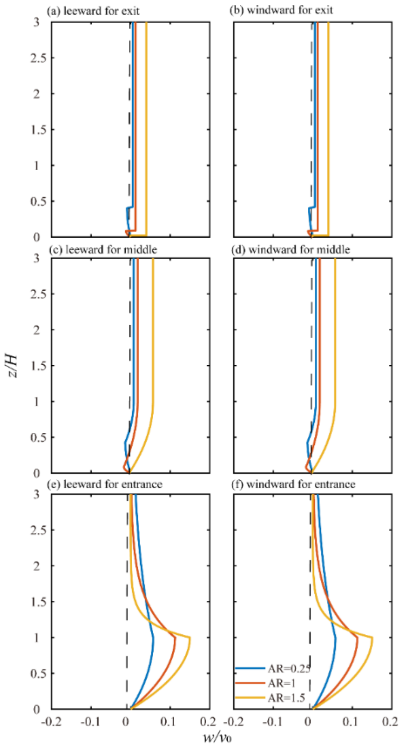


**Figure S4 Wind profile of *w* component obtained from IWSUS at different positions for parallel scenarios with AR= 0.25, 1 and 1.5.**