**Supplement**

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

**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 | $H_1$ | $w_r = \begin{cases}0.04559\exp(2.746\text{AR}) + 0.002081,\text{AR}<0.5\\ -0.3718\exp(\text{-5.31AR}) + 0.1556,\text{AR}\geq 0.5\end{cases}$ |
| | $H_2$ | $w_r = -0.307\exp(-5.844\text{AR}) + 0.1185$ |
| | $H_3$ | $w_r = -0.426\exp(-3.011\text{AR}) + 1.318$ |
| windward at entrance/exit | $H_1$ | $w_r = \begin{cases}w_r(\text{AR}=0.5),\text{AR}<0.5\\ -3.712\exp(\text{-5.28AR}) + 0.9836,\text{AR}\geq 0.5\end{cases}$ |
| | $H_2$ | $w_r = \begin{cases}w_r(\text{AR}=0.5),\text{AR}<0.5\\ -0.7792\exp(\text{-2.273AR}) + 0.2835,\text{AR}\geq 0.5\end{cases}$ |
| leeward at middle | $H_1$ | $w_r = \begin{cases}0.5417\text{AR} + 0.0377,\text{AR}<0.5\\ 9.341\exp(\text{-8.185AR}) + 0.1524,\text{AR}\geq 0.5\end{cases}$ |
| | $H_2$ | $w_r = \begin{cases}0.225\text{AR}+0.05438,\text{AR} < 0.5\\ 0.904\exp(-5.519\text{AR}) + 0.1201,\text{AR} \geq 0.5\end{cases}$ |
| | $H_3$ | $w_r = -0.4408\exp(-2.875\text{AR}) + 0.5083$ |

| | | |
|---|---|---|
| windward at middle | $H_1$ | $w_r = \begin{cases} 0.2472\mathrm{AR} + 2.858, \mathrm{AR} < 0.5 \\ 4.77\exp(-5.175\mathrm{AR}) + 0.05055, \mathrm{AR} \geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = 0.4383\exp(-4.059\mathrm{AR}) - 0.1127$ |
| | $H_3$ | $w_r = -1.275\exp(-0.6783\mathrm{AR}) + 0.9835$ |

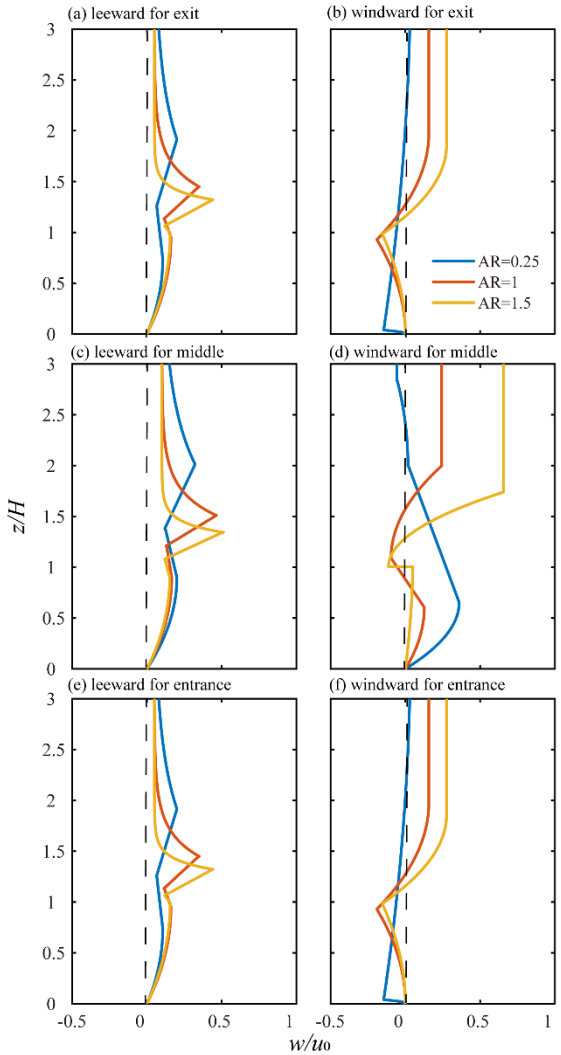


**Figure S1 Wind profile of *w* component obtained from IWSUS for perpendicular scenarios at different positions with AR= 0.25, 1 and 1.5. The point $H_i$ are the segmentation points referred in Table S1 and Table S2.**

**Table S3 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 S4 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 | $H_1$ | $u_r = 0.04175\exp(-9.374\mathrm{AR}) - 0.02567$ |

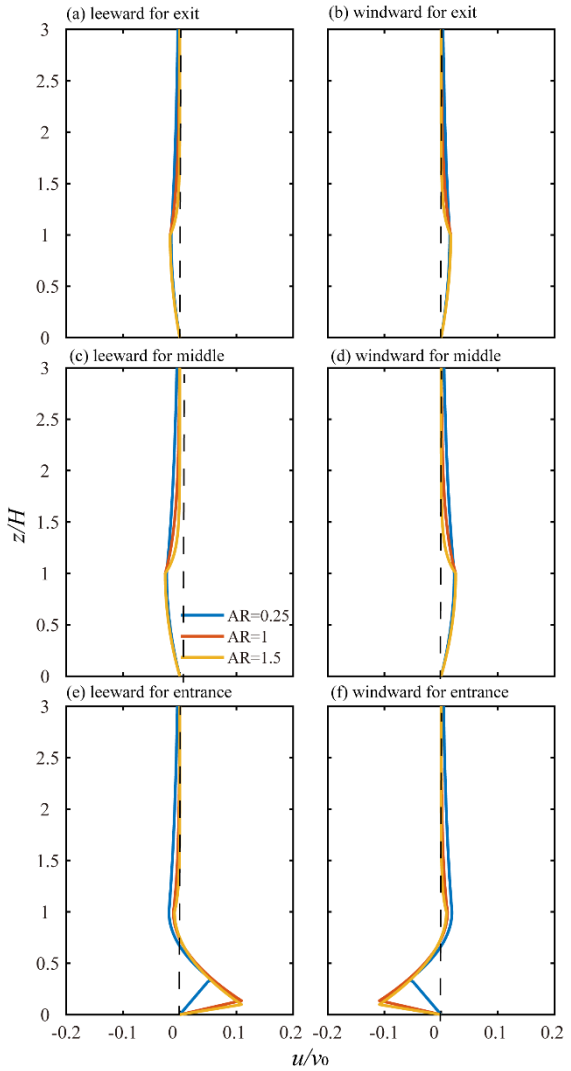


**Figure S2 Wind profile of *u* component obtained from IWSUS at different positions for parallel scenarios with AR= 0.25, 1 and 1.5. The point $H_i$ are the segmentation points referred in Table S3 and Table S4.**

**Table S5 The fitting functions of the segmentation points for the wind components *v* in the parallel scenarios**

| Positions | Segmentation Points | Fitting Functions |
|---|---|---|
| Leeward/windward | $H_1$ | $h_r = 0.5948\exp(-1.288\mathrm{AR}) + 0.1745$ |
| at entrance | $H_2$ | $h_r = 1$ |
| Leeward/windward | $H_1$ | $h_r = 0.5948\exp(-1.288\mathrm{AR}) + 0.1745$ |
| at middle | $H_2$ | $h_r = 2.206\exp(-3.593\mathrm{AR}) + 1.173$ |
| 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 S6 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 | $H_2$ | $v_r = 2.206\exp(-3.593\mathrm{AR}) + 1.173$ |

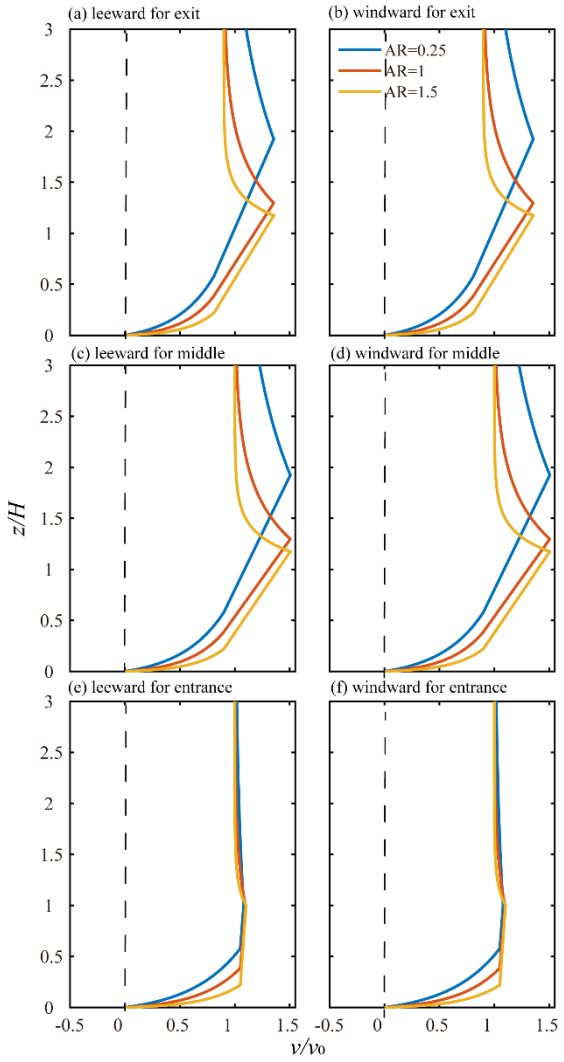


**Figure S3 Wind profile of *v* component obtained from IWSUS at different positions for parallel scenarios with AR= 0.25, 1 and 1.5. The point $H_i$ are the segmentation points referred in Table S5 and**

**Table S6.**

**Table S7 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 | $H_1$ | $h_r = 1.222\exp(-3.644\mathrm{AR}) + 0.02068$ |
| | $H_2$ | $h_r = 1$ |
| Leeward/windward at exit | $H_1$ | $h_r = 1.222\exp(-3.644\mathrm{AR}) + 0.02068$ |
| | $H_2$ | $h_r = 1$ |

**Table S8 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 | $H_1$ | $w_r = -0.1621\exp(-1.648\mathrm{AR}) + 0.156$ |
| Leeward/windward at middle | $H_1$ | $w_r = \begin{cases} -0.05433\mathrm{AR} + 0.003, \mathrm{AR}<0.5 \\ -0.0484\exp(-0.8592\mathrm{AR}) + 0.00731, \mathrm{AR}\geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = \begin{cases} w_r(\mathrm{AR}=0.5), \mathrm{AR}<0.5 \\ -1.034\exp(-0.0328\mathrm{AR}) + 1.025, \mathrm{AR}\geq 0.5 \end{cases}$ |
| Leeward/windward at exit | $H_1$ | $w_r = \begin{cases} -0.05433\mathrm{AR} + 0.003, \mathrm{AR}<0.5 \\ -0.0484\exp(-0.8592\mathrm{AR}) + 0.00731, \mathrm{AR}\geq 0.5 \end{cases}$ |
| | $H_2$ | $w_r = \begin{cases} w_r(\mathrm{AR}=0.5), \mathrm{AR}<0.5 \\ -1.034\exp(-0.0328\mathrm{AR}) + 1.025, \mathrm{AR}\geq 0.5 \end{cases}$ |

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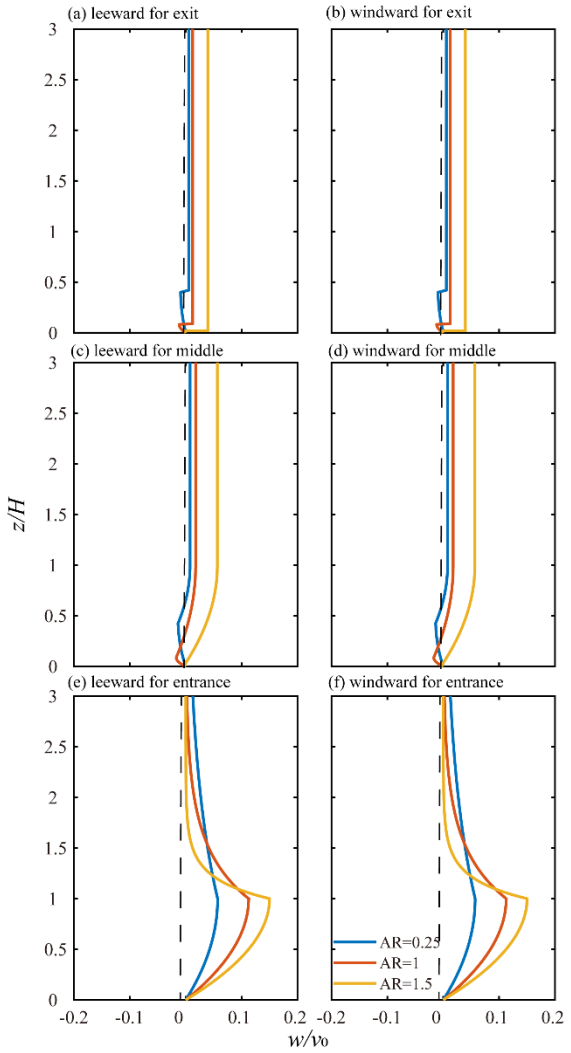


**Figure S4 Wind profile of *w* component obtained from IWSUS at different positions for parallel scenarios with AR= 0.25, 1 and 1.5. The point $H_i$ are the segmentation points referred in Table S7 and Table S8.**