Next, by definition,

$$\left|\frac{\mathrm{d}}{\mathrm{d}\eta}\left(\frac{v}{kp}\right)\right|_{|\eta=1} = \left|\frac{\mathrm{d}}{\mathrm{d}\eta}\left[f_1(\eta)+\mathrm{i}f_2(\eta)\right]\right|_{|\eta=1} = \sqrt{\left(\frac{\mathrm{d}f_1(\eta)}{\mathrm{d}\eta}\right)^2+\left(\frac{\mathrm{d}f_2(\eta)}{\mathrm{d}\eta}\right)^2_{|\eta=1}} = \sqrt{0^2+\left(\frac{\mathrm{d}f_2(\eta)}{\mathrm{d}\eta}\right)^2_{|\eta=1}}$$
$$= \left|\frac{\mathrm{d}f_2(\eta)}{\mathrm{d}\eta}\right|_{|\eta=1}.$$

From this result and equation (9), it follows that

$$\left|\frac{\mathrm{d}}{\mathrm{d}\eta}\left(\frac{v}{kp}\right)\right|_{|\eta=1} = \left|\frac{\mathrm{d}}{\mathrm{d}\eta}\left|\left(\frac{v}{kp}\right)\right|\right|_{|\eta=1}.$$

Thus, from the latter result and equation (5), it follows that the absolute value of the slope of the radial velocity profiles that are shown in Figures 2 and 4 of reference [1] must be equal to

$$\left|\frac{\mathrm{d}}{\mathrm{d}\eta}\left(\frac{v}{kp}\right)\right| = \left|\frac{\mathrm{d}}{\mathrm{d}\eta}\left|\left(\frac{v}{kp}\right)\right|\right| = |-\mathrm{i}| = 1 \quad \text{at } \eta = 1. \tag{10}$$

As can be seen in the Figures 2 and 4 of reference [1], the deviation of the absolute value of the slope of the radial velocity profiles (including the exact solution [2]) from unity is about 30% at $\eta = 1$.

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AUTHOR'S REPLY

J.-G. Ih

Center for Noise and Vibration Control, Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, Science Town, Taejon 305-701, *Korea*

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I have checked all formulae and programs that were used in my article [1] as well as the paper by Denisov and Khitrik [2]. The result is as follows

(1) Reference [2] has no fault except for the reference citation of Zwikker and Kosten [3]. I suppose that they referred to Tijdeman's paper [4] because there appears no explicit equation on this matter. If Denisov and Khitrik had referred to equation (B.20) in reference [4], then they have used the wrong one. The right-hand side of equation (B.20) should be multiplied by $1/\gamma$ and, in the third term of the right-hand side, η in the denominator should be replaced by n. However, equation (B.14) is correct. Their argument about the difference in slope by a factor γ might stem from this fact.

(2) It is found that the equations in my paper [1] have no fault.

(3) Figures 2(b) and (4) were calculated correctly. The following tables show the calculation results near the boundary. In all calculations, the number of points for

numerical calculations is 200 which means that the spatial resolution or $\Delta\eta$ is 0·005. The slope can be obtained by the following method:

$$\frac{\mathrm{d}}{\mathrm{d}\eta}\left|\frac{v}{kp}\right| \approx \frac{|v/(kp)|(\eta+\Delta\eta) - |v/kp|(\eta)}{\Delta\eta}. \tag{1}$$

for $\bar{M} = 0$, Table 1 shows the data in Figure 2(b) [1]. Calculated data in the vicinity of the wall for $\bar{M} = 0{\cdot}03$, corresponding to Figures 4(a) and (b) in reference [1] are shown in Tables 2 and 3, respectively. The slopes of these tables reveal that the slope of the radial velocity fluctuation is nearly equal to 1 and, if one recalls that the spatial resolution of the calculation was 0·005, one can infer that

$$\frac{\mathrm{d}}{\mathrm{d}\eta}\left|\frac{v}{kp}\right| \to 1 \text{ for } \eta \to 1.$$

I guess that the estimation of the slope of my data by Denisov and Khitrik was based on the line drawing for the curves in Figures 2(b) and 4 [1]. I also tried to find the slope of these

TABLE 1

Calculated data in the vicinity of the wall for $\bar{M} = 0$, corresponding to Figure 2(b) in reference [1]

η	$s = 0{\cdot}2$ |v/kp|	$s = 2$ |v/kp|	$s = 4$ |v/kp|	$s = 6$ |v/kp|	$s = 8$ |v/kp|
0·96	0·03762	0·03757	0·03708	0·03625	0·03537
1·00	0·00001	0·00001	0·00001	0·00001	0·00001
Equation (1)	0·94	0·94	0·93	0·91	0·88

TABLE 2

Calculated data in the vicinity of the wall for $\bar{M} = 0{\cdot}03$, corresponding to Figure 4(a) in reference [1]

η	$s = 0{\cdot}2$ |v/kp|	$s = 1$ |v/kp|	$s = 2$ |v/kp|	$s = 4$ |v/kp|	$s = 6$ |v/kp|	$s = 8$ |v/kp|
0·96	0·03763	0·03765	0·03769	0·03745	0·03696	0·03638
1·00	0	0	0	0	0	0
Equation (1)	0·94	0·94	0·94	0·94	0·92	0·91

TABLE 3

Calculated data in the vicinity of the wall for $\bar{M} = 0{\cdot}03$, corresponding to Figure 4(b) in reference [1]

η	$s = 0{\cdot}2$ |v/kp|	$s = 1$ |v/kp|	$s = 2$ |v/kp|	$s = 4$ |v/kp|	$s = 6$ |v/kp|	$s = 8$ |v/kp|
0·96	0·03724	0·03680	0·03649	0·03518	0·03370	0·03228
1·00	0	0	0	0	0	0
Equation (1)	0·93	0·92	0·91	0·88	0·84	0·81

figures and discovered that the slope will appear quite different when one draws a line from a point far from the boundary. Their conclusion is perhaps based on this false line drawing and might be also based on the incorrect equation in reference [4].

In all three articles [1, 2, 4], I could conclude that

$$\left|\frac{\partial}{\partial\eta}\left(\frac{v}{kp}\right)\right| = \frac{\partial}{\partial\eta}\left(\left|\frac{v}{kp}\right|\right) = 1$$

Consequently, the last sentence of reference [2], i.e., "… the deviation of the absolute value of the slope of the radial velocity profiles (including the exact solution [2]) from unity is about 30% at $\eta = 1$" is not valid at all.

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