topic that was not addressed in the paper. Any parabolized Navier-Stokes (PNS) algorithm is subject to error purely because of the single-pass philosophy. A second source of error is the modification of the flux vector that occurs to allow the space-marching solution to be obtained. Both the parabolized FDS and FVS algorithms are subject to these errors. However, the simple fact of the matter is that the parabolized FDS algorithm is not conservative in subsonic regions of the flowfield. This is what was demonstrated, among other points, in the paper in question. By construction, the parabolized FVS algorithm exactly conserves the mass flux upon convergence of the iteration at a given marching station. The mass flux was chosen as the quantity to monitor since the other momentum and energy equations effectively have source terms, i.e., the viscous terms. However, the remaining quantities in the modified flux vector are also exactly conserved when the effects of the viscous terms are taken into account. The fact that the mass flux error occurring when parabolized FDS is used is grid dependent, as correctly noted in the Comment, certainly does little to mitigate the consequences of its presence.

In Ref. 1, a numerical integration of the fluxes used in the solution algorithm along an ξ = const line was used to compute the mass flux at each marching station. The error in mass flux was defined as the computed mass flux minus the exact mass flux divided by the exact mass flux. The errors were displayed as a percentage of the total mass flux at each marching station. In results not included in Ref. 1, doubling and halving the grid spacing in each direction produced a maximum local change in the mass flux error of less than a factor of 3. However, according to Ramakrishnan et al.,[2] the mass flux errors computed using a similar computer code[3] were "2 to 3 orders of magnitude less" than the mass flux errors shown in Figs. 2 and 4 of Ref. 1. Therefore, it seems unlikely that grid sensitivity alone is responsible for the discrepancy in reported mass flux errors. Since there are many possible interpretations of a mass flux error and since Ramakrishnan et al.[2] do not describe their method of determining the mass flux error, we can only attribute the discrepancy in reported values to their use of a different error measure.

Although not considered in the paper, several points raised in the Comment concerning the relative accuracy of the two methods merit brief discussion. The statement in the Comment that neglecting the $u - c$ eigenvalue eliminates only a part of the streamwise pressure gradient in the limiting case of $M \to 0$ is misleading. The effect of this term, in conjunction with the associated right eigenvector, is to modify each of the terms in the interface flux, not just the pressure term. It is in no way apparent that the net effect of neglecting the flux increment associated with this eigenvalue coupled with a nonconservative formulation is superior to the Vigneron approach in a conservative formulation as conjectured in the Comment. To our knowledge, this question has never been addressed.

Incidentally, the character of the flowfield associated with the hypersonic inlet, particularly the streamwise separation, is well known and has been previously reported.[4] This case was included because it had been computed by other researchers and, presumably, was familiar to the PNS community.

References

[1]Thompson, D. S., and Matus, R. J., "Conservation Errors and Convergence Characteristics of Iterative Space-Marching Algorithms," *AIAA Journal*, Vol. 29, No. 2, 1991, pp. 227–234.

[2]Ramakrishnan, S. V., Ota, D. K., and Chakravarthy, S. R., "Comment on 'Conservation Errors and Convergence Characteristics of Iterative Space-Marching Algorithms,' " *AIAA Journal*, Vol. 30, No. 4, 1992.

[3]Ota, D. K., Chakravarthy, S. R., and Darling, J. C., "An Equilibrium Air Navier-Stokes Code for Hypersonic Flow," AIAA Paper 88-0419, Jan. 1988.

[4]Newsome, R. W., Walters, R. W., and Thomas, J. L., "An Efficient Iteration Strategy for Upwind/Relaxation Solutions to the Thin-Layer Navier-Stokes Equations," AIAA Paper 87-1113, June 1987.

Errata

Critical Evaluation of Two-Equation Models for Near-Wall Turbulence

Charles G. Speziale
NASA Langley Research Center, Hampton, Virginia 23665
Ridha Abid
Vigyan Research Associates, Hampton, Virginia 23665
and
E. Clay Anderson
NASA Langley Research Center, Hampton, Virginia 23665

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DURING typesetting of this article, several errors were introduced that critically affect its content. Corrected reprints are available from the authors.

Page 325:

The last term in Eq. (9) should be preceded by a minus sign and is missing an overbar:

$$\mathcal{P}_\epsilon = -2\nu \overline{\frac{\partial u_i'}{\partial x_j}\frac{\partial u_k'}{\partial x_j}}\frac{\partial \bar{u}_i}{\partial x_k} - 2\nu \overline{\frac{\partial u_j'}{\partial x_i}\frac{\partial u_j'}{\partial x_k}}\frac{\partial \bar{u}_i}{\partial x_k} - 2\nu \overline{\frac{\partial u_i'}{\partial x_k}\frac{\partial u_i'}{\partial x_j}\frac{\partial u_k'}{\partial x_j}} - 2\nu \overline{u_k' \frac{\partial u_i'}{\partial x_j}}\frac{\partial^2 \bar{u}_i}{\partial x_j \partial x_k} \tag{9}$$

Page 326:

The third minus sign was omitted in Eq. (32):

$$\frac{D\tau}{Dt} = \frac{\tau}{K}\tau_{ij}\frac{\partial \bar{u}_i}{\partial x_j} - 1 - \frac{\tau}{K}\mathfrak{D} - \frac{\tau^2}{K}\mathcal{P}_\epsilon + \frac{\tau^2}{K}\Phi_\epsilon + \frac{\tau^2}{K}\mathfrak{D}_\epsilon + \frac{2\nu}{K}\frac{\partial K}{\partial x_i}\frac{\partial \tau}{\partial x_i} - \frac{2\nu}{\tau}\frac{\partial \tau}{\partial x_i}\frac{\partial \tau}{\partial x_i} + \nu\nabla^2\tau \tag{32}$$

The sentence following Eq. (35) should end with "$(\ldots C_\mu = 0.09)$."

Page 327:

In Eq. (35), the last variable in the partial derivative should be changed from "x" to "x_i."