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TRANSIENT VERIFICATION STUDY OF RESIDUAL FORMULATION OF COBRA-TF

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ABSTRACT

Abstract ...

Key Words: List no more than five key words

1 INTRODUCTION

[1]

2 SINE WAVE ADVECTION PROBLEM SETUP

The problem is to transiently vary the inlet enthalpy h and inlet mass flow rate $\dot{m}$ using a smooth trigonometric function so as to keep velocity constant throughout the solution. Using a cosine, the analytical solution for a variable Y at time index j and space index i, where Y_1 is the initial value, Y_2 is the minimum value of the wave, and P is the period of the wave. The time step size dt, axial mesh size dx, and velocity V_o are assumed constant. If $V_o * j * dt > i * x$, then this equation doesn't apply and the value should just equal the initial value Y_1.

$$Y(i,j) = \frac{1}{2}\left((Y_1 + Y_2) + (Y_1 - Y_2)cos\left(\frac{2\pi}{P}\left(j * dt + \frac{i * dx}{V_o}\right)\right)\right) \tag{1}$$

This analytical solution can be applied to mass flow rate $\dot{m}$, density ρ, liquid enthalpy h, and liquid temperature T. Since velocity and pressure are cosntant, mass flow rate will be proportional to density, and enthlapy will be proportional to temperature.

For the inlet condition, a transient data table was generated for enthalpy and mass flow rate and applied at the inlet node. The comparison between the data table and the output in CTF are shown for enthalpy and mass flow rate in figures 1 and 2 respectively. The CTF output was read from hdf5 data files at each point in time, wich omitted the actual ghost cell where these values were applied. The CTF values are located at the nearest node to the inlet, and therefore will be slightly out of phase to the exact values in the figure. This difference is more notable for smaller mesh sizes.

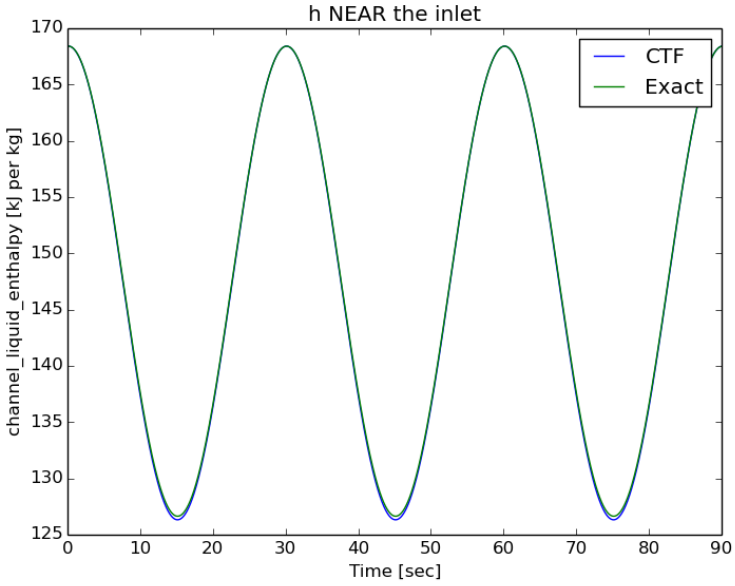

Figure 1. Enthalpy near the inlet and the analytical solution

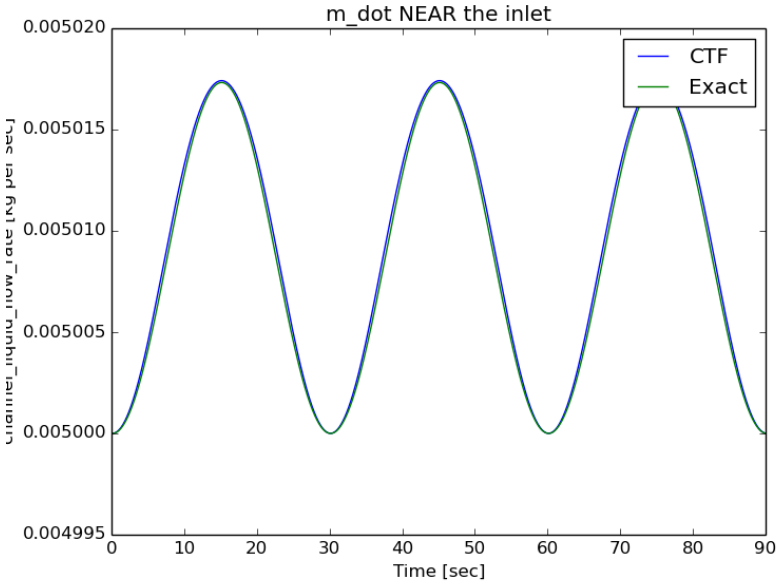

Figure 2. Mass Flow rate near the inlet and the analytical solution

3 CONCLUSIONS

Present your summary and conclusions here.

4 ACKNOWLEDGMENTS

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5 REFERENCES

[1] C. J. Roy, "Review of Code and Solution Verification Procedures for Computational Simulation," *J. Comput. Phys.*, **205**, *1*, pp. 131–156 (2005).