turbine2d.example - Turbine Cascade, steady, MARVS model
Corresponds to the turbine cascade example in paper AIAA-2010-4314, "An RSM/EVM Flow/Heat Transfer Model Applied to Pre-Transitional and Turbulent Boundary Layers" by Joan G. Moore and John Moore. The calculations for the AIAA paper used the MARV Reynolds stress model, implemented in code MEFP. Here, the MARVS variation of the Reynolds stress model is set up for the new code, M4D. The EVM model for heat transfer is the same.
Geometry: Langston turbine cascade 2d.
Conditions correspond to the data of Butler et al. (2001): Re=66,000, turbulence: Tu=10%, L=0.23 chord, (at l.e. no blade row)

Unix instructions to run the turbine cascade example
Bring up a terminal window and cd to turbine2d.example, then
mkdir out
../../a.m4d < in.Re66kTu10 > out/print (1) calculate flow with MARVS model
../../a.m4d < in.heat > out/printheat (2) solve energy Eq.
../../a.m4d < in.plots > out/printplots (3) plot results

Input/Output
(1) The primary input file, in.Re66kTu10, uses several other input files for specific tasks.
inn.grid164x86 - set up calculation grid, grid.vpic.015.164.86.2, block pressure solution, and other grid related initializations.
inn.init.ButlerTu - initialize variables for Butler conditions. Set outflow boundary condition.
inn.iter.uvwpmarvs *, one iteration of the steady flow procedure to solve momentum, continuity and the MARVS model. Uses:
inn.newcv * - to reset the control volumes and related arrays.
inn.iter.marvs * - 1 iteration to update Reynolds stress variables.
inn.cont * - additional velocity updates from continuity.
inn.analysis10.50 * - to analyze changes over 10 and 50 iterations.
inn.iter.output - to dump results to out/u#ITER and plot using:
inn.plotconv * - convergence plots, out/conv.gif and out/convm.gif and lineplot file convline.
Input files inn.iter.uvwpmarvs, inn.cont, inn.analysis10.50, inn.iter.output all contribute to the convergence file out/converge started in in.Re66kTu10.

* Identical to the files in backstep.example. For standard 2d or 3d steady MARVS calculations with fixed inlet conditions.

(2) The primary input file, in.heat, uses inn.grid164x86 and inn.init.ButlerTu as above and:
inn.heatsetup - to set up the turbulent energy equation. Gives file out/walldist.
inn.heatsolve - to solve the energy equation for the temperature distribution. Adds to the convergence file out/convheat.
inn.heatsetuplam - to set up a laminar energy equation (but using the turbulent flow).
inn.nusselt - plot laminar and turbulent surface Nusselt numbers. Gives out/linenusselt, out/nusselt.gif and out/nusseltle.gif.

(3) The primary input file, in.plots, uses inn.grid164x86 and inn.init.ButlerTu as above and:
inn.plotgrid - to plot the grid. Gives out/grid.gif, out/gridle.gif, out/gridte.gif.
inn.plotq - to plot qturb. Gives out/qturbbar.gif, out/qturb.gif, out/qturble.gif, out/qturbte.gif.
inn.plotptloss - to plot the total pressure loss. Gives out/ptlossbar.gif, out/ptloss.gif, out/ptlossle.gif, out/ptlosste.gif.
inn.plotvectors - replots the total pressure loss with velocity vectors added. Gives out/ptlossbar.gif, out/ptlossv.gif, out/ptlosslev.gif, out/ptlosstev.gif, and a trailing edge plot which adds the grid as well, out/ptlosstegv.gif.

Compare results with those obtained by jgm.
Post-processing of output by jgm
Delete out/u100 thru out/u400. mv out out.jgm