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input3d.dat

```
================================================================================
================================================================================
            MAIN INPUT DATA FILE :

           SUCCESSIVE COMPRESSION CYCLES OF A 2D QUASI-ADIABATIC CAVITY
           LMN APPORACH

                        Wall Qh=0
        ------------------------------------------------------------|
               |                                                    |
               |                                                    |
           <-- | -->                                                |
Wall Qh= 0
        T= T0  |                                                    |
               |                                                    |
        ------------------------------------------------------------|
                  Symmetric plan

            DIMENSIONAL SETUP

               fluid : air  at P= 101325 Pa and T= 294.146 K (initial
condition at t=0)
               cavity size= 0.10m * 0.015m
               volume variation : A.sin(2pi.f.t- w0)    w0= pi/2
                                  A= 0.01 m
                                  f= 50 Hz

================================================================================
================================================================================
&Version File_Version="VERSION2.0"/
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++
                     GENERAL LAYOUT
                     (DIMENSIONLESS)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++
&Fluid_Properties  Variable_Density           = .true. ,
Constant_Mass_Flow          = .false. ,
                   Variable_Fluid_Volume= .true. ,
                   Molecular_Mass=  0.02896421357024561   ,
                   Heat_Transfer_Flow         = .true.  ,
                   Reference_Dynamic_Viscosity = 1.795D-05,
                   Reference_Density          = 1.2 ,
```

```
                    Reference_Temperature       = 294.146  ,
                    Prandtl                     = 0.726 ,
                    Reference_Heat_Capacity     = 1004.7093960142244 ,
                    Heat_Capacity_Ratio         = 1.4  /

&Velocity_Initialization  I_Velocity_Reference_Value  = 0.0 ,
J_Velocity_Reference_Value = 0.0 , K_Velocity_Reference_Value = 0.0 /
&Temperature_Initialization Temperature_Reference_Value= 294.146 ,
Initial_Field_Option_For_Temperature= 0 /
================================================================================
                     DOMAIN FEATURES
                      (DIMENSIONLESS)
================================================================================
&Domain_Features Start_Coordinate_I_Direction=-0.020 ,
End_Coordinate_I_Direction= 0.10,
                  Start_Coordinate_J_Direction= 0.00 ,
End_Coordinate_J_Direction= 0.015,
                  Start_Coordinate_K_Direction= 0.00 ,
End_Coordinate_K_Direction= 0.00,
                  Cells_Number_I_Direction= 512
,Cells_Number_J_Direction= 64 ,Cells_Number_K_Direction= 1,
                  Regular_Mesh= .false. /
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
               DEFINITION OF BOUNDARY CONDITIONS
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
================================================================================
                   WALL BOUNDARY CONDITION SETUP
                       (DIMENSIONLESS)
================================================================================


================================================================================
                 INLET AND OUTLET  BOUNDARY CONDITIONS
                       (DIMENSIONLESS)
================================================================================

&Inlet_Boundary_Conditions  Type_of_BC= "INLET", Direction_Normal_Plan=
1 ,
                            Plan_Location_Coordinate= -0.0200  ,
                            Start_Coordinate_of_First_Span =  0.00  ,
End_Coordinate_of_First_Span = 0.015 ,
                            Start_Coordinate_of_Second_Span= 0.0    ,
End_Coordinate_of_Second_Span= 0.0  ,
```

```
                              Flow_Direction= 1 ,
                              Define_Velocity_Profile= 0,
                              Normal_Velocity_Reference_Value= 0.0  ,
                              Temperature_Reference_Value= 294.146 ,
                              Density_Reference_Value= 1.2 ,
                              Temperature_BC_Type="Neumann",
                              Density_BC_Type="Neumann",
                              Variable_Flowrate= 0/
                             !Time_Fct_Name= "Sinus_zero_average" ,
Time_Fct_Threshold= 0.0 ,
                            !Time_Fct_Time_Scale= 2.0E-02 ,
Time_Fct_Magnitude= 4.712 /

================================================================================
              IMMERSED BOUNDARY METHODS : PENALIZATION METHOD
================================================================================
&Immersed_Boundary_Methods  Immersed_Boundary_Method_Type= 1 ,
                              Name_of_Solid="RECTANGLE",
                              Linked_IBM_Inlet_Number = 1 ,
                              Gravity_IBM_Enabled = .false. ,
                              StrongPenaltyForVelocity_Enabled=.true.,
                              Coordinate_Gravity_Center_At_Rest_I=-0.04 ,
Coordinate_Gravity_Center_At_Rest_J= 0.0075 ,
Coordinate_Gravity_Center_At_Rest_K= 0.0 ,
                              Coordinate_Gravity_Center_Init_I= -0.05   ,
Coordinate_Gravity_Center_Init_J= 0.0075    ,
Coordinate_Gravity_Center_Init_K= 0.0    ,
                              Coordinate_Restricted_Motion_I=-0.04      ,
Coordinate_Restricted_Motion_J= 0.0 , Coordinate_Restricted_Motion_K=
0.0 ,
                              Size_Object_I= 0.08                     ,
Size_Object_J= 0.015                        , Size_Object_K= 0.0
,
                              Reference_Velocity_I= 0.0               ,
Reference_Velocity_J= 0.0                , Reference_Velocity_K= 0.0
,
                              Motion_Magnitude_I= 0.010
, Motion_Magnitude_J= 0.00           , Motion_Magnitude_K= 0.0
,
                              Mass= 1.2 ,
                              Spring_Stiffness_Constant_I= 0.0        ,
Spring_Stiffness_Constant_J= 0.0         , Spring_Stiffness_Constant_K=
0.0         ,
                              Transitional_Time= 0.00, Forced_Frequency=
5.0D+01 , OffSet= 0.5,
                              Heat_Transfer_Type= 0,
                              Reference_Temperature= 294.146 ,
Reference_Heat_Flux= 0.0 ,
                              Material_Thermal_Conductivity= 2.4841D-02 ,
```

```
Material_Mass_Heat_Capacity= 1004.7094, Material_Density= 1.2 /

================================================================================
               ENDS BOUNDARY CONDITIONS
================================================================================
&Border_Domain_Boundary_Conditions West_BC_Name  = "None" ,
East_BC_Name  = "None" ,
                                  Back_BC_Name  = "Symmetric" ,
Front_BC_Name = "None" ,
                                  North_BC_Name = "None" ,
South_BC_Name = "None" /
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                    NUMERICAL METHODS
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
&Numerical_Methods
                     !!!NS_NumericalMethod= "BDF2-SchemeO2",
                     NS_NumericalMethod= "CN-SchemeO2",
                     !!!NS_NumericalMethod= "CN-SchemeO2-
SpecialLowMachFlow",
                     !!MomentumConvection_Scheme="Centered-O2-
Conservative" ,
                     MomentumConvection_Scheme="Centered-O2-
Convective_2" ,
                     !!!MomentumConvection_Scheme="Upwind-O1-
Convective" ,
                     TemperatureAdvection_Scheme="Centered-O2-
Convective_2" ,
                     !!!TemperatureAdvection_Scheme="Upwind-O1-
Convective" ,
                     !!!TemperatureAdvection_Scheme="Centered-O2-
Convective" ,
                    !Poisson_NumericalMethod="Home-
PartialDiagonalization"  ,
                    !Poisson_NumericalMethod="Home-SORMultigrid-
ConstantMatrixCoef"  ,
                     Poisson_NumericalMethod="Home-SORMultigrid-
VariableMatrixCoef"  ,
                     Off_Set_Poisson_Source_term= .true./

!HomeData_PoissonSolver
      Direction_1= 2,
      Direction_2= 1,
      Direction_3= 3/

&HomeData_PoissonSolver SolverName="SOR"           ,!Successive Over-
Relaxation (SOR) method based on the red-black algorithm
```

```
                        MultiGrid_Type="V_Cycle",
                        Relaxation_Coefficient= 1.45     ,!Relaxation
coefficient of the SOR method ( 1 <= Relaxation_Coefficient < 2)
                        Number_max_Grid= 7          ,!Number of grid
levels
                        Number_max_Cycle= 9
                        Number_Iteration_FineToCoarseGrid=3   ,!number
of SOR iterations applied on any grid level during the restriction step
(before the coarsest grid computation)
                       Number_Iteration_CoarseToFineGrid= 15   ,!number
of SOR iterations applied on any grid level during the prolongation
step (after the Coarsest grid computation)
                        Number_Iteration_CoarsestGrid= 30   ,!number of
SOR iterations applied on the coarsest grid
                        ResidualNormalisation_Enabled= .true.,
                        ConvergenceStrengthening_Enabled= .true. ,
                        Convergence_Criterion= 1.D-04
/!convergence tolerance on the residu of the Poisson's equation

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++
                   SIMULATION MANAGEMENT
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++
The numerical time step is dynamic and is estimated by the constant CFL
coefficient

&Simulation_Management    Restart_Parameter= 0 ,
                          Steady_Flow_Stopping_Criterion_Enabled =
.true. , Steady_Flow_Stopping_Criterion = 1.D-16,
                          Temporal_Iterations_Number = 4000000
, Final_Time = 4.00D-00  ,
                          TimeStep_Type     = 0 ,
                          TimeStep_Max      =  1.0D-05,
                          CFL_Max      = 0.3 ,
                          Simulation_Backup_Rate                 = 1000
, Simulation_Checking_Rate = 101 /
================================================================================
======
                   PROBES MANAGEMENT
================================================================================
=======

&Simulation_Management    Probe_Recording_Rate = 100     /

&Probe_Quantities_Enabled  Temporal_Series_For_Quantity_Enabled(:)=
.true. , .true., .false., .false., .false., .false. /

&Probe_Location  Xi=-0.011 , Xj= 0.007 , Xk= 0.0 /

================================================================================
```

```
======
           FIELDS RECORDING DECLARATION
================================================================================
======

!------------------------------
!--- Instantaneous fields
!------------------------------

&Field_Recording_Setup    Precision_On_Instantaneous_Fields= 1 /
&Simulation_Management    InstantaneousFields_TimeRecordingRate =
1.0D-03 InstantaneousFields_RecordingStartTime=0.0  /

&Instantaneous_Fields_Listing  Name_of_Field = "U     "  /      First
velocity component
&Instantaneous_Fields_Listing  Name_of_Field = "V     "  /      Second
velocity component
&Instantaneous_Fields_Listing  Name_of_Field = "P     "  /
&Instantaneous_Fields_Listing  Name_of_Field = "T     "  /
&Instantaneous_Fields_Listing  Name_of_Field = "TRACE "  /
&Instantaneous_Fields_Listing  Name_of_Field = "RHO   "  /
!Instantaneous_Fields_Listing  Name_of_Field = "divU  "  /
!Instantaneous_Fields_Listing  Name_of_Field = "divRU "  /
!Instantaneous_Fields_Listing  Name_of_Field = "PHI   "  /
!Instantaneous_Fields_Listing  Name_of_Field = "drho  "  /
!Instantaneous_Fields_Listing  Name_of_Field = "SRC_P "  /

!------------------------------
!--- Statistic fields
!------------------------------

&Simulation_Management    Start_Time_For_Statistics= 2.D-01
, Time_Range_Statistic_Calculation = 3.8D-01  /

&Statistical_Fields_Listing  Name_of_Field = "<U>   "  /
&Statistical_Fields_Listing  Name_of_Field = "<V>   "  /
&Statistical_Fields_Listing  Name_of_Field = "<T>   "  /
&Statistical_Fields_Listing  Name_of_Field = "<P>   "  /
&Statistical_Fields_Listing  Name_of_Field = "<Rho> "  /

!------------------------------
!--- Time series
!------------------------------
&Time_Series_Data Title= "MassFlowBalance" , Filename= "check_mass.dat"
, iter_rec= 10 ,
                  Time_Start_Mean_Calculation= 40.
,Range_Mean_Calculation= 80.
                  Restart_Enabled= .false. /

&Time_Series_Data Title= "VolumeFlowBalance" , Filename=
```

```
"check_vol.dat" , iter_rec= 10 ,
                  Time_Start_Mean_Calculation= 40.
,Range_Mean_Calculation= 80.
                  Restart_Enabled= .false. /

&Time_Series_Data Title= "LMN_Data" , Filename= "check_lmndata.dat" ,
iter_rec= 10 ,
                  Time_Start_Mean_Calculation= 40.
,Range_Mean_Calculation= 80.
                  Restart_Enabled= .false. /

&Time_Series_Data Title= "KE_Average" , Filename=
"check_kin_energy.dat" , iter_rec= 10 ,
                  Time_Start_Mean_Calculation= 40.
,Range_Mean_Calculation= 80.
                  Restart_Enabled= .false. /
```

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