**06 - 3D TGV**

3D TGV was used to quantify the time evolution invariants as JCP. Although invariants are stable they present high-frequency oscillations and need further analysis.

This TGV is defined with the following initial conditions. rho = U\_0 = 1, P\_0 = 100 and a domain of 2pi^3 with 32^3 mesh.

u = sin(2\*pi/3).\*sin(X).\*cos(Y).\*cos(Z);

v = sin(-2\*pi/3).\*cos(X).\*sin(Y).\*cos(Z);

w = u\*0;

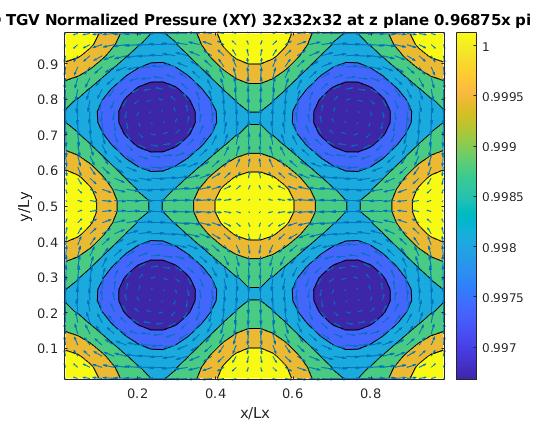
P = P\_0 + (1/16).\*((cos(2\*X) + cos(2\*Y)).\*(cos(2\*Z) + 2) - 2);

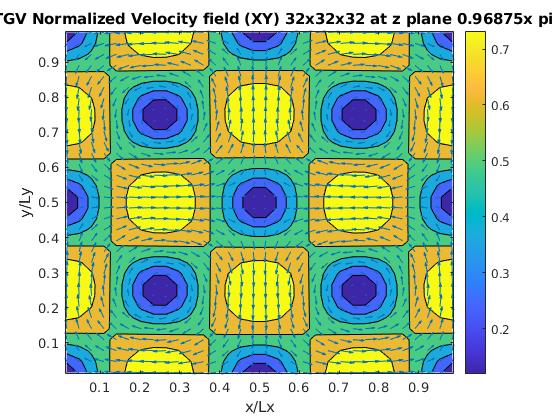
T = P./(rho\_0.\*R\_specific);

It does not have analytical solution, and in fact, smaller and smaller scales are generated by the non-linear Navier-Stokes term. Since there is no viscosity to regularize the flow, after a sufficiently long time there will be just a chaotic flow.

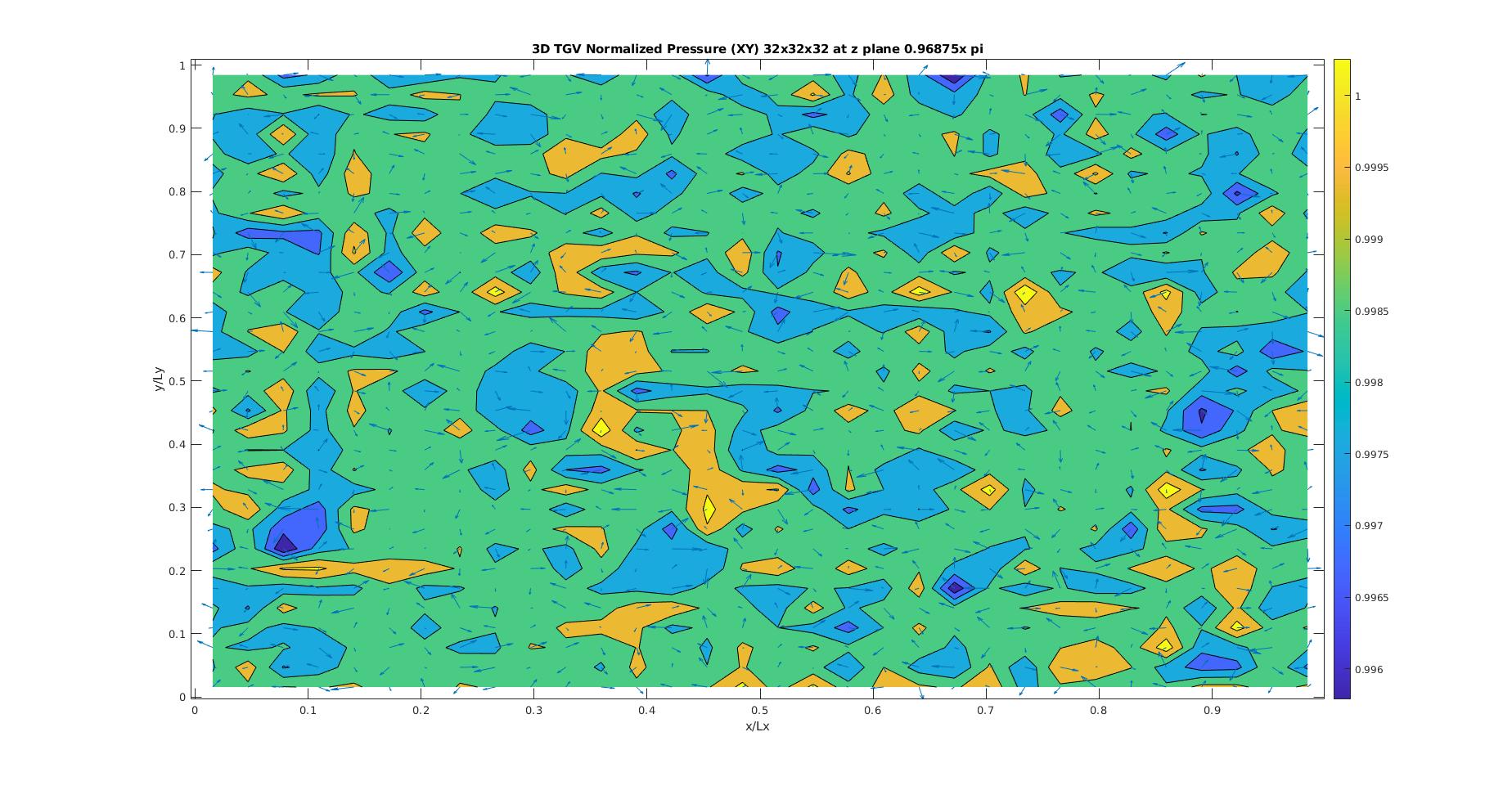
The results presented below are at CFL = 0.1 and define U\_ref for the delta time considering U\_0 (not 3D components) + sos.

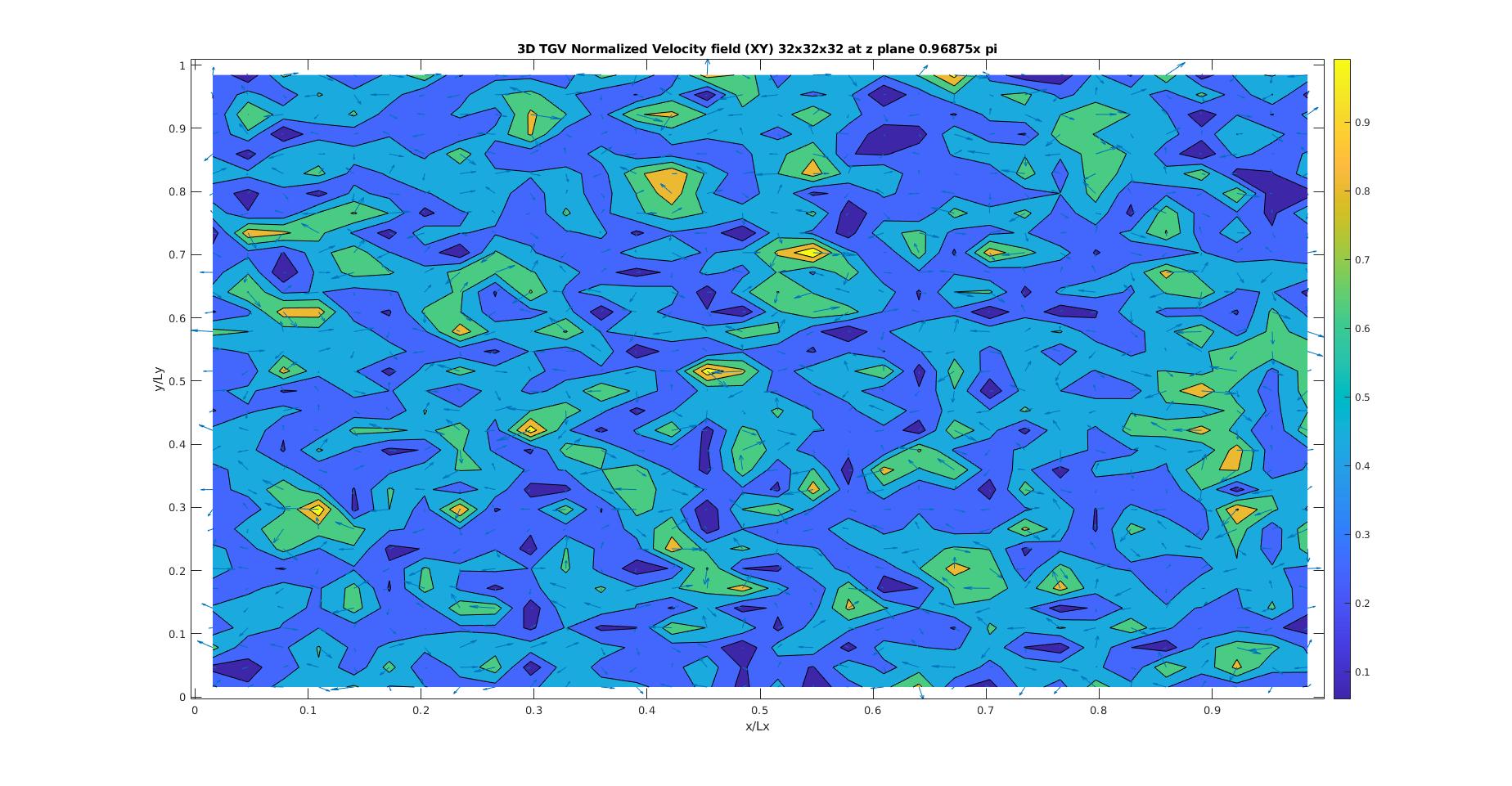
1. **Pressure and velocity field at XY section at mid Z-plane.**
   1. At t = 0.1s



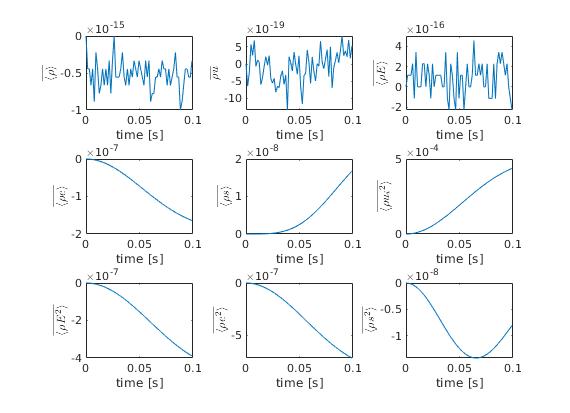


* 1. At t = 100s.

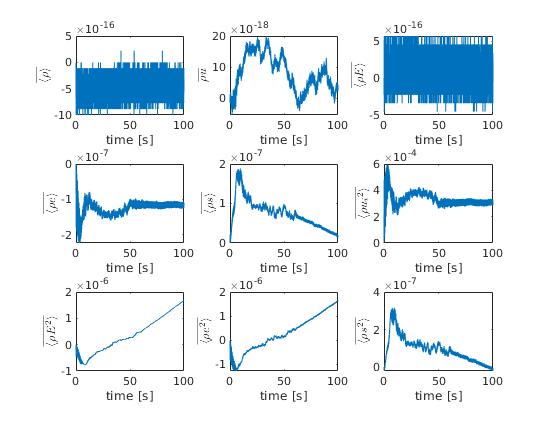




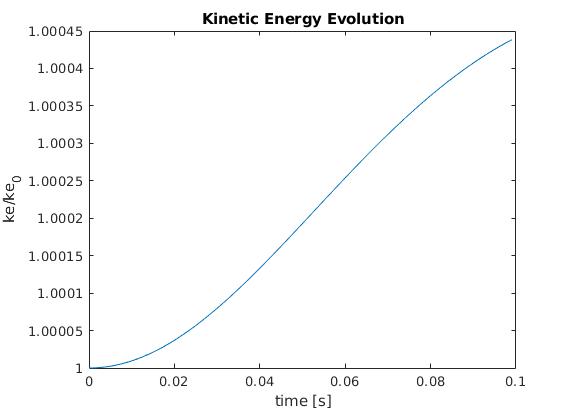
1. **Invariants**
   1. At t = 0.1s



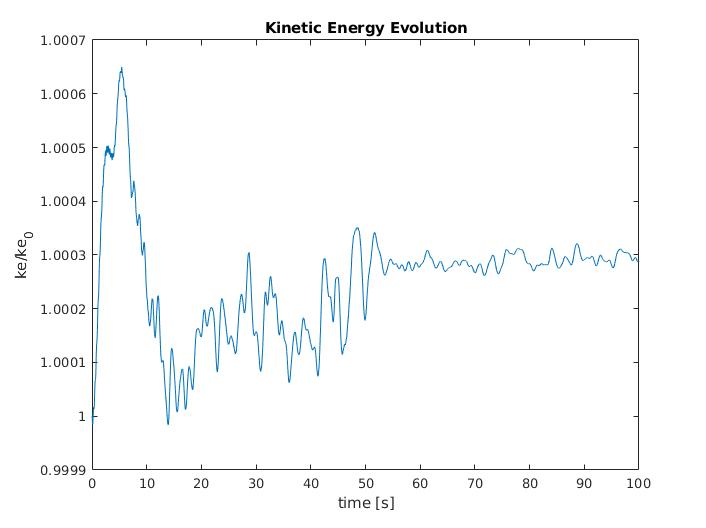
* 1. At t = 100s



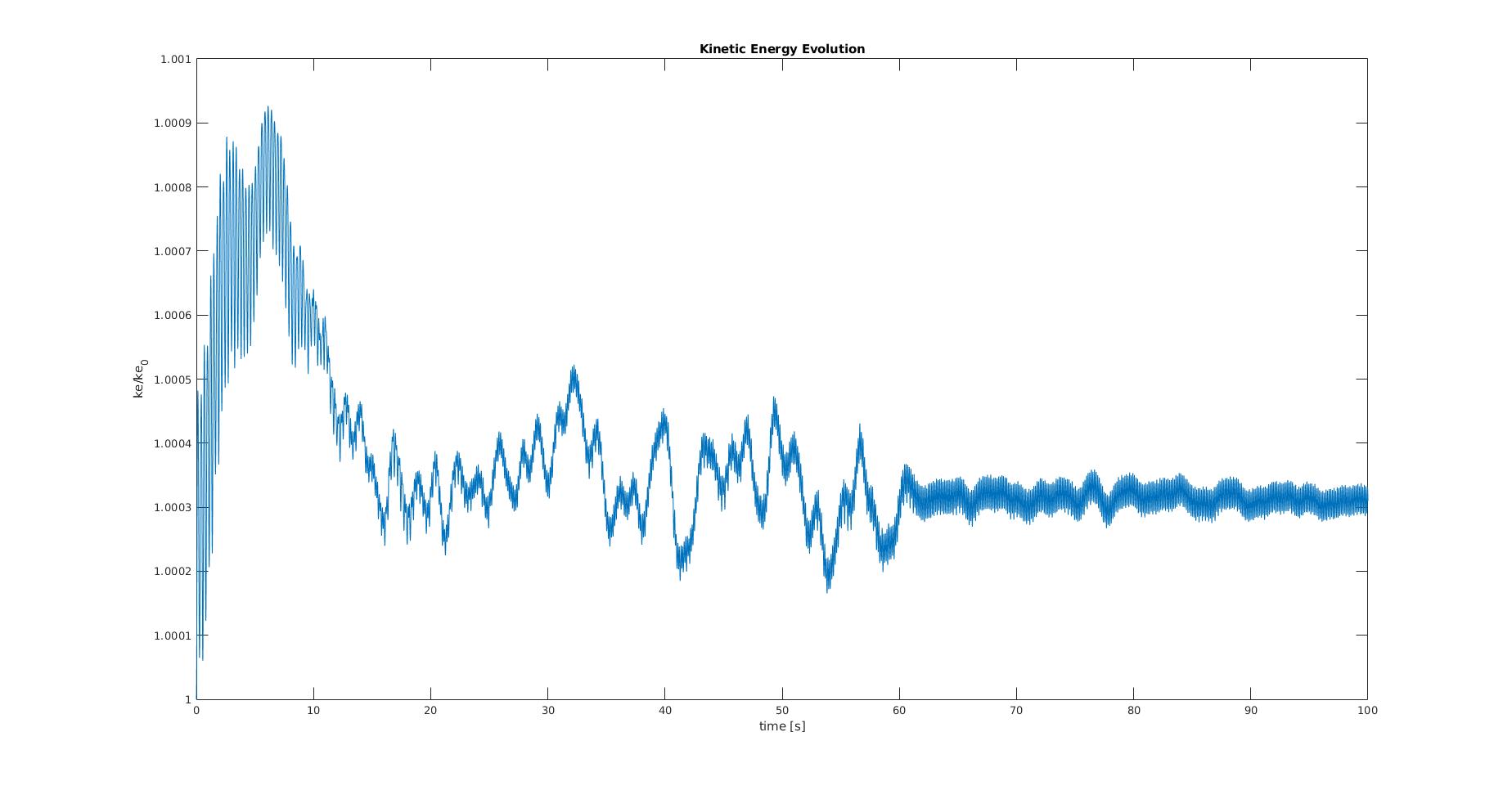
1. **Kinetic energy**
   1. At t = 0.1s



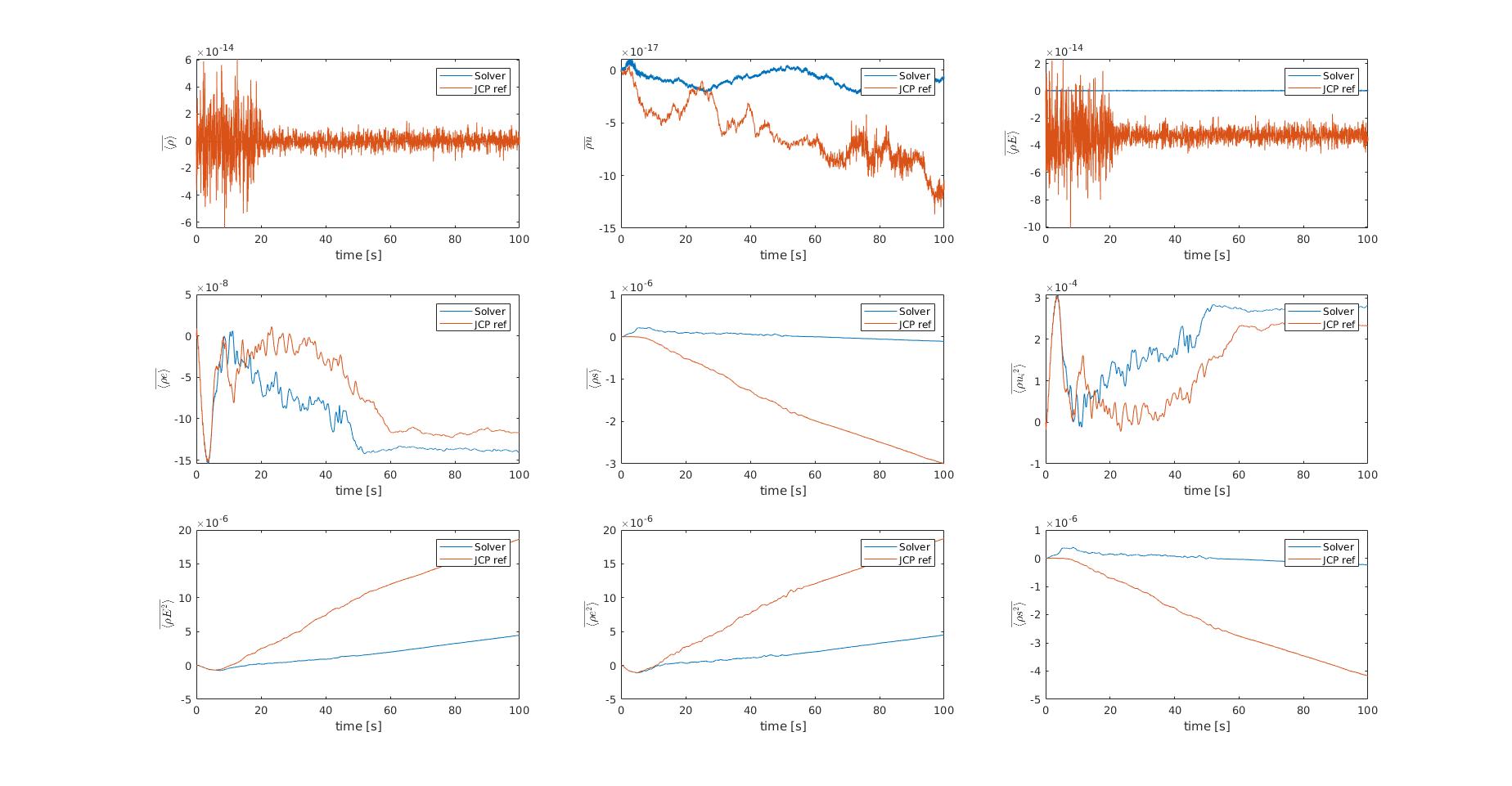
* 1. At t = 100s



* Results with CFL based on high temperature and therefore time step low



1. **Comparison with JCP reference**
   1. Invariants at t = 100s and CFL = 0.1



* 1. Ke comparison 5sec with TGV FFT solver

