# Multi-dimensional shear shallow water flows and compressible turbulence : light at the end of the tunnel?

S. Gavrilyuk*

September 27, 2017

**Abstract**

The multi-dimensional equations of shear shallow water flows represent a $2D$ hyperbolic non-conservative system of equations which is reminiscent of generic Reynolds averaged equations for barotropic turbulent fluids. The model has three families of characteristics corresponding to the propagation of surface waves, shear waves and average flow.

I present a new splitting technique to define the weak solutions to this non-conservative system of equations. The full system is split into several subsystems for which the notion of the weak solution is almost classical. Each split subsystem contains only one family of waves (either surface or shear waves) and contact characteristics. The accuracy of such an approach is tested on the exact $2D$ solutions describing the flow where the velocity is linear with respect to the space variables (generalisation of L. I. Sedov's and L. V. Ovsyannikov's solutions to the Euler equations of compressible fluids), and on the solutions describing $1D$ roll waves. The capacity of the model to describe multi-$D$ experimentally observed phenomena was shown : 'fingering' of plane one-dimensional wave fronts, and the formation of singularities in radially convergent flows.

I will also discuss the perspectives of such a 'splitting approach' for the description of $3D$ compressible turbulent flows.

This is joint work with K. Ivanova and N. Favrie.

## References

[1] 2017 S. Gavrilyuk, K. Ivanova, N. Favrie, Multi-dimensional shear shallow water flows : problems and solutions (submitted).

*Aix–Marseille Université, CNRS, IUSTI, UMR 7343, 5 rue E. Fermi, 13453 Marseille Cedex 13, France, sergey.gavrilyuk@univ-amu.fr