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ON THE IMPLICATIONS OF GERMANO'S CONDITION IN THE DESIGN OF FINITE ELEMENT MODELS FOR TURBULENT INCOMPRESSIBLE FLOWS

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In this talk we discuss the implications of Germano's condition in finite element models for incompressible flows, particularly in the context of variational mulstiscale methods. The main idea of this type of approaches is to split the unknown (usually only the velocity) into the finite element component, considered to be the resolvable part, and the subgrid scale, which can be understood as the unresolvable component. Usually, the latter is expressed as proportional to the residual of the former. We explain why this leads in most cases to a method with a modified energy balance which does not fit within the framework of Germano's analysis. This inconvenience can be overcome by taking the orthogonal projection of the residual of the finite element component. In this case, Germano's condition can be checked provided the parameters on which the formulation depends are properly chosen. The main objective of this talk is to prove this fact using classical arguments of statistical fluid mechanics in a relatively general setting. The results to be presented are an extension of the work presented in [1].

REFERENCES

[1] O. Guasch and R. Codina. Statistical behavior of the orthogonal subgrid scale stabilization terms in the finite element large eddy simulation of turbulent flows. *Computer Methods in Applied Mechanics and Engineering*, Vol. **261-262**, 154–166, 2013.