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*Capturing transport, diffusion
and reaction: and adaptive
mixed finite element approach*

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Auditorio 'Profesor Hermann Alder Weller'



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Abstract: Convection–diffusion–reaction equations are widely used to model transport phenomena in science and engineering, such as the movement of pollutants, heat, or chemical species. Accurately solving these problems can be challenging, especially when convection dominates, as standard numerical methods may produce unstable or non-physical results. In this talk, I will introduce an adaptive numerical method for solving these equations using a mixed formulation, which allows us to approximate both the solution and its flux. I will explain the main ideas of the method from an intuitive perspective and discuss how it can effectively capture boundary layers.

A central ingredient is a residual-based a posteriori error estimator, which allows us to automatically refine the computational mesh where needed. This leads to an efficient adaptive algorithm.

Finally, I will show numerical examples that illustrate how the method performs in practice, highlighting its stability and accuracy in challenging situation.

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