What is under the hood of current seismic simulation software aiming at 3-D wave propagation solutions?

The goal of this lecture is to teach elements of numerical methods that constitute current elastic wave simulation software. The methods we will discuss include the finite-difference method, aspects of pseudospectral methods and the spectral element method, as well as the Discontinuous Galerkin Method. We will address questions like

1) What is numerical dispersion, how can I recognise it and how can I avoid it? 2) What operators should I use for accurate simulations?
3) How do the methods compare and what are their domains of application?
4) What are the main mathematical differences of the methods and what is the impact on the applications? The differences of the various methods will be illustrated with simple 1D (or 2D) codes written in Python (via Jupyter notebooks). The goal is NOT to make you familiar with specific community simulation software but to make you aware of some of the traps in forward modelling by highlighting the key mathematical features of the methods (finite differencing, numerical interpolation and integration, convergence behavior, etc.). Many sample codes are accessible on www.seismo-live.org -> computational seismology.

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