Computational seismology – *Pseudospectral methods*

1. Numerical methods are often compared in terms of memory required and floating point operations needed per time step. How do you think does a standard finite difference method compare to a pseudospectral method?

2. The first derivative of a function in the spectral domain is *ik*

$$\partial_x f(x) = \partial_x \left(\int_{-\infty}^{\infty} F(k) e^{-ikx} dk \right)$$
$$= -\int_{-\infty}^{\infty} ikF(k) e^{-ikx} dk$$

   What are the operators for the 2nd (3rd etc) derivatives. How would one in principle calculate the corresponding (convolutional) operators in the space domain?

3. Why does the numerical solution for Green's functions lead to unusable results (without postprocessing). Why – however – is it very useful to calculate impulse responses in many cases. Any applications?

4. Do pseudospectral methods suffer from numerical anisotropy?