As part of the application called migration or reflection seismic imaging, we model wave propagation through the earth, governed by the acoustic wave equation. Downward continuation is a technique to describe or to estimate the seismic wave field at a point beneath a surface where the seismic field is known due to measurements or knowledge of the source. For several reasons this downward continuation is often governed by the so-called one-way wave equation.

The difficulty of deriving and understanding this equation is due to the fact that the velocity is spatially varying. We assume the velocity to be a smooth function and derive the one-way wave equation, using the theory of pseudo-differential operators.

One of the challenges is to derive the one-way wave equation such that it describes wave amplitudes correctly. It relies on an asymptotic approximation of rational powers of the partial differential operator $\frac{-1}{c(x,z)^2}\partial_t^2+\partial_x^2$, for example its square root.

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MicroCHP is a home device, which turns gas into heat and electricity. This means that people can heat their home, and meanwhile generate electricity.

If heat is stored temporarily in the home, production and consumption of both heat and electricity can be decoupled.

If microCHP is applied on a large scale (say, in all houses in The Netherlands), a large part of the electricity production is distributed over the country.

To prevent high peak loads in the electricity grid, we need to control this distributed production.

In this colloquium I present this control problem as an ILP formulation.