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Time Scale Calculus - a new perspectives for synthetic seismogram calculations

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Synthetic, numerically generated seismograms are one of the key factors of any interpretation of recorded seismic data. At the early stage of development, calculation of full seismic waveforms was impossible due to a limited computational resource so we were forced to used only some selected characteristics of seismic waves relatively easy for numerical calculations like first arrival times, maximum amplitude, approximate source spectra, to name a few. Continues development of computational resources as well as progress in numerical techniques has opened possibilities of generation the full, 3-component seismograms incorporating many physically important elements like wave attenuation, anisotropy or randomness of the media. Although achieved results are impressive we still need new numerical methods to tackle existing problems with the synthetic seismogram generation. In this contribution we present a novel approach to discretization of the wave equation which brings together continues and discrete numerical analysis of the seismic waves. The foundations of this new technique, called Time Scale Calculus, have been formulated by Hilger in late eighties and is very dynamically developing. The Time scale calculus, due to its universality seems to have a great potential when practical applications are considered. Thus we have decided to bring the Time Scale calculus concept closer to geophysical, or more precisely to seismological applications.
This presentation is intend as a basic introduction to the time scales calculus considered from seismological point of view. We shortly present and discuss the possibility of using the Time Scales (TS) technique for solving the simplest acoustic 2D wave equation keeping in mind its particular applications for mining induced seismicity.