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On soil water pressure dynamics at the short timescale

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Several rainfall events causes rapid variation of pressure head in soils which propagates downstream. These "waves" can affect slope stabity and subsurface hydrogical response. They are controlled by the nonlinear aspects in Richards' Equation. With the goal to simplify the computation and in order to capture the main feature of these behaviours, a semi-analytical resolution based on the Kardar-Parisi-Zhang equation is developed. The Kardar-Parisi-Zhang equation is mainly used in literature to describe surface growth patterns and has a nonlinear quadratic term which can have a blow-up effect on the solution. The resolution procedure has a quite short computational time. A study case is shown based on storm data which provokes in a small watershed near Genoa, Italy. Results has been compared with the numerical solution of Richards' Equation. As expected, strong rainfall intensity provokes big pressure spikes and these spikes are more relevant when the nonlinear term increases.