Modelling transport across the running sandpile by means of fractional transport equations

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In this contribution, fractional transport equations are used to build an effective model for transport across the running diffusive sandpile [T. Hwa and M. Kardar, Phys. Rev. A 45, 7002 (1992).]. It is shown that both temporal and spatial fractional derivatives must be considered in order to properly reproduce the sandpile transport features, that are non-Markovian and non-local, at least over sufficiently long/large scales. In contrast to other applications of fractional derivatives to the modelling of transport, the specifics of sand motion require, in this case, that the spatial fractional derivatives used for the running sandpile must be of the completely asymmetrical Riesz-Feller type. Values of the fractional exponents that define these derivatives are obtained numerically.