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Emergence of oscillations in critical shearing, application to fractures in glaciers.

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The emergence of log periodicity in critical processes is usually associated to discrete scale invariance properties of the system. For time dependent fracture processes, the cracks show successive discrete scale invariant patterns. The transition from one scale to the following induces log periodic oscillations which are observed to decorate the global acceleration of the system. These oscillations are not necessarily sinusoidal, what seems to be in contradiction with observations of surface displacements of unstable ice masses prior to failure. We propose here another approach to explain these oscillations. Using a continuum damage model, we show that sinusoidal oscillations emerge from the anisotropic properties of the cracks in the shearing fracture zone. The oscillations have no longer a logarithmic but a power law periodicity. We apply this model to the description of the displacements of unstable ice masses for which data are available. Results show good agreement with observations.