Physics > Data Analysis, Statistics and Probability

Prediction of Catastrophes: an experimental model

Randall D. Peters, Martine Le Berre, Yves Pomeau

(Submitted on 6 Apr 2012)

Catastrophes of all kinds can be roughly defined as short duration-large amplitude events following and followed by long periods of "ripening". Major earthquakes surely belong to the class of 'catastrophic' events. Because of the space-time scales involved, an experimental approach is often difficult, not to say impossible, however desirable it could be. Described in this article is a "laboratory" setup that yields data of a type that is amenable to theoretical methods of prediction. Observations are made of a critical slowing down in the noisy signal of a solder wire creeping under constant stress. This effect is shown to be a fair signal of the forthcoming catastrophe in both of two dynamical models. The first is an "abstract" model in which a time dependent quantity drifts slowly but makes quick jumps from time to time. The second is a realistic physical model for the collective motion of dislocations (the Ananthakrishna set of equations for creep). Hope thus exists that similar changes in the response to noise could forewarn catastrophes in other situations, where such precursor effects should manifest early enough.

Subjects:	**Data Analysis, Statistics and Probability (physics.data-an)**; Geophysics (physics.geo-ph)
Journal reference:	Phys. Rev. E 86, 026207 (2012)
Cite as:	**arXiv:1204.1551 [physics.data-an]**
	(or **arXiv:1204.1551v1 [physics.data-an]** for this version)

Submission history

From: Martine Le Berre [view email]
[v1] Fri, 6 Apr 2012 09:09:47 GMT (3406kb)

Which authors of this paper are endorsers?