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Icequakes as precursors of ice avalanche

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A hanging glacier at the east face of Weisshorn broke off in 2005. We were able to monitor and measure surface motion and icequake activity for 25 days up to three days prior to the break-off. Results are presented from the analysis of seismic waves generated by the glacier during the rupture maturation process.
Four types of precursory signals of the imminent catastrophic rupture were identified: (i) an increasing seismic activity within the glacier, (ii) an acceleration of the inverse of waiting time between two icequakes, (iii) a change in the size-frequency distribution of icequake energy, (iv) a change in the waiting time distributions between two successive icequakes.
The analysis of the seismic activity gave indications of the rupture process and led to the identification of two regimes: a stable one which is characteristic of diffuse damage, and an unstable and dangerous one characteristic of a hierarchical cascade of rupture instabilities where large icequakes are triggered.