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Earthquakes: From basic science and prediction to preventive disaster management

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Extreme seismic events are a manifestation of complex behavior of the lithosphere structured as a hierarchical system of blocks of different sizes. Driven by mantle convection these lithospheric blocks are involved into relative movement, resulting in stress localization and earthquakes. Despite the lithosphere behaves as a large nonlinear system, featuring instability and deterministic chaos, some integral empirical regularities emerge, indicating a wide range of similarity, collective behavior, and the possibility for earthquake prediction. Recent success in predictions of large earthquakes is able to convince us that earthquakes can be predicted in a probabilistic sense. The forecasts with their accuracy can prevent an essential part of the damage, although far from the whole damage. Large earthquakes are surprising, and society, as a matter of fact, is poorly prepared to deal with them. Protecting human life and property against earthquake disasters requires an uninterrupted chain of research and civil protection tasks: from (i) understanding of physics of earthquakes, their analysis and monitoring, through (ii) interpretation, modeling, seismic hazard assessment, and earthquake prediction, to (iii) delivery the scientific forecasts to local authorities, public awareness, preparedness, and preventive disaster management.