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Earthquake-related electromagnetics: from phenomena to physics

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Numerous electromagnetic changes possibly related with earthquakes have been reported independently and even been attempted to apply to short-term prediction of earthquakes. But even till now, the above earthquake-related electromagnetic reports are on great debates. The main concerns include the physical generation mechanism of the reported electromagnetic phenomena. Thus, it is important for the current empirical study on earthquake-related electromagnetic changes to move to a physics-based study, which would be helpful for understanding earthquake-related electromagnetic phenomena and strengthening their potential applications.
As a potential physics-based approach, we present an integrated research scheme, taking into account the interaction among observation, methodology and physical model. The main approach includes the following key problems: (1) because observation provides the basic data for earthquake-related electromagnetics, an important issue is how to perform a reliable and appropriate observation with some clear physical quantities; (2) how to develop a robust methodology to reveal weak earthquake-related electromagnetic signals from noisy background is another key point, taking into account the facts of the observing reports and the increasing environmental electromagnetic noise; (3) the final stage of the physics-based approach is how to develop physical models based on theoretical analyses and/or laboratory experiments for earthquake-related electromagnetic signals.
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