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MS9: Statistical Aspects of Fracture

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Stress concentration in the vicinity of crack tip enhances the role of microscale heterogeneities and defects on the macroscale failure behavior of solids. This translates into strong fluctuations during crack and damage evolution, puzzling scale free fracture patterns and large specimen-to-specimen variations of strength, which are difficult to capture through conventional continuum approaches.

The past twenty years have seen the emergence of novel approaches, some of them inspired from statistical and non-linear physics, which may permit to overcome the above difficulties. The objective of this minisymposium is to discuss the recent advances in the modeling of the statistical aspects of fracture and their experimental investigation. Applications of this research to material characterization, failure analysis and structural health monitoring are also most welcome. Key topics will include:

1. **Predictability in brittle fracture:** Statistics of failure strength, material defect characterization, crack initiation, size effects
2. **Statistical characterization of patterns and shapes in fracture**: crack trajectory, morphology of fracture surfaces, fragmentation, crack networks
3. **Intermittency, crackling and universal features:** acoustic emission, stick-slip dynamics of cracks, crack pinning, earthquake statistics
4. **Statistical approaches in damage mechanics**: quasi-brittle materials, compressive and shear failure, localization
5. **Scale coupling and emergence of effective failure properties**: Theoretical and numerical methods to address multiscale processes, homogenization techniques, stochastics approaches
6. **Statistical tools for engineering applications:** Structural health monitoring, acoustic emission techniques, risk assessment, quantitative fractography, failure analysis

Numerical, theoretical and experimental studies are welcome and encouraged.