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Limit and Shakedown Analysis with Decohesive Effects

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Local failure of composite materials under variable loading can be considered as being caused by repeated, dissipative events occurring on the micro-structural level. The interaction between the composite components determines the local response of the material, in particular the mechanisms leading to local damage and overall failure. Therefore, the study of these mechanisms on the micro-level under complex loads can be helpful to better understand the causes of failure. It is shown in this work, how direct methods can help to assess and how can be used in a constructive manner for the design of such materials. It is based on a two-scale approach: On the macroscopic scale, the global response of the composite is analysed. On the microscopic scale, the influence of each component on the global behaviour is investigated. The two principal used ingredients are averaging techniques combined with direct methods applied to a representative volume element on the micro-level.

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