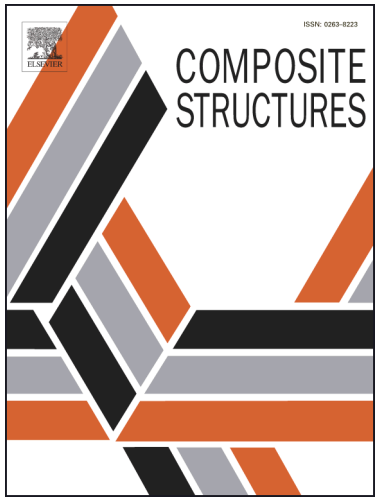

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Nondestructive identification of composite beams damage based on the curvature mode difference

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Abstract: The nondestructive identification method for composite beams damage was explored based on the curvature mode difference (CMD). By combining hammer experiment tests with finite element simulation, modal analysis were performed on intact and damaged composite beams with single, multiple or different degree of damage, respectively. The first three-order modal parameters were obtained by using dynamic signal test system and finite element software ANSYS. From the obtained mode shapes, the CMD were calculated by the central difference operation to identify the damage in composite beams. Experimental and simulation results revealed that damage in the composite beams would cause mutation of CMD. The presence, location and size of damage, as well as the multiple damage can be accurately detected by the mutation position. In addition, when the number of delamination at the same damage location was increased from 1 to 3, the CMD of damage unit obtained from the finite element simulation results were increased from 5.45 to 54.63, with the corresponding experimental results increased from 3.79 to 40.54, which were significantly higher than those from the undamaged units. It can be concluded that the CMD can be used to quantitatively determine the damage degree at the same damage location.