This study considers fatigue damage evolution in a uni-directional (UD) glass fibre composite used for wind turbine blades which is manufactured from a non-crimp fabric. It is the initial part of a time-lapse study where the damage progression is followed in a sample during a fatigue test. In the current study 3D X-ray Computed Tomography (XCT) is used to characterise the fatigue damage in the material at three different stages of the fatigue life of a tension-tension fatigue test. 3D XCT is performed on rectangular samples (4x4x110mm) cut out from pre-fatigued full-size fatigue test specimens. The geometry of the cut-out is similar to that which will be used in the time-lapse study.

As the micro-mechanical damage mechanisms are small features, it is necessary to obtain a high scan resolution which sets a limit to how large the field of view can be. Therefore, it is necessary to perform several scans on each sample to locate damaged regions even for the cut out sample geometry. For the chosen down-scaled sample geometry it was possible to visualize individual broken UD fibres, matrix cracks, and delaminations in the scans. Broken UD fibres are observed locally close to intertwining regions of the supporting backing bundles where they are in direct contact with the UD bundles. Additionally matrix cracks are observed in the off-axis backing layer at locations where the UD fibres are broken.