Mean load effects on the fatigue life of offshore wind turbine monopile foundations

This paper discusses the importance of mean load effects on the estimation of the fatigue damage in offshore wind turbine monopile foundations. The mud line bending moment time series are generated using a fully coupled aero-hydro-elastic model accounting for non-linear water waves and sea current. The fatigue damage is analysed in terms of the lifetime fatigue damage equivalent bending moment. Three different mean value correction techniques are considered, namely, Goodman, Walker, and mean sensitivity factor. An increase in the lifetime fatigue damage equivalent bending moment between 6% (mean sensitivity factor) and 33% (Goodman) is observed when mean load corrections are considered. The lifetime damage equivalent bending moment is further increased by approximately 7% when considering sea current forces. The results indicate that mean load correction techniques should be employed in the analysis of the fatigue life of offshore wind turbine monopile foundations. Moreover, it is shown that a nonlinear hydrodynamic model is required in order to correctly account for the effect of the current.