Aerodynamic force coefficients of plain bridge cables in wet conditions

In this paper, the aerodynamic forces and force coefficients from preliminary static wind tunnel tests on a plain cable in wet conditions are presented. The presented results are for several different relative cable wind-angles. A comparison is made with tests in dry conditions. In dry conditions, tests were performed for wind velocities between 2 and 31 m/s, whilst in wet conditions tests were performed for the range of wind velocities where rain rivulet formation was found possible, i.e. between 8-18 m/s. For all of the tested relative cable-wind angles in wet conditions, a reduction in the drag coefficient with increasing Reynolds number, accompanied by a near-zero lift coefficient, was observed. A theoretical evaluation of the aerodynamic damping assuming quasi-steady conditions reveals that changes in drag and lift coefficient are nonetheless not sufficient to generate negative aerodynamic damping. Analysis of the fluctuating lift component shows the presence of "enhanced" vortex shedding at specific wind velocities – similar to what might be observed in the presence of a tripping wire.