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VIV Diagnostics for Fatigue Damage Estimation in the Field YAHYA MODARRES-SADEGHI, MICHAEL TRIANTAFYLLOU, FRANZ HOVER, Department of Mechanical Engineering, MIT — We apply systematic diagnostics obtained form laboratory experiments at MIT to the strain and acceleration signals of model scale experiments on a riser, in order to assess the predictability of the response, and also extract the contribution of the higher-harmonic force components. The displacement signals are cut into small sub-signals and the cross flow displacement in each sub-signal is plotted versus the in-line displacement, showing a figure-eight or crescent-like motion. For linearly sheared flow cases, the trajectories are counterclockwise (moving upstream at the lateral extremes) figure-eights at high flow region and change to crescent-like and clockwise figure-eight ones at low flow region. A large third-harmonic contribution is observed for the majority of uniform flow cases, suggesting the importance of considering the influence of higher harmonic force components, when analyzing the fatigue life of a riser. The region of excitation for various sheared flow cases remains almost constant, independent of the maximum sheared flow, suggesting about half of the riser is excited. The excited part covers the region where counterclockwise figure-eight motions are observed. These results can be directly compared with the results of the experiments on a flexibly mounted rigid cylinder, showing good agreement especially in sheared flow cases.

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