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On the effects of damping on the amplitude and frequency response of vortex-induced vibrations[1] J.T. KLAMO, A. LEONARD, A. ROSHKO, Caltech — We have studied the effects of controlled damping on the amplitude and frequency response profile of an elastically mounted cylinder in cross flow. The dimensionless damping parameter, $b^* = 2b/\rho LDU$, which is closely related to the traditional "mass-damping" parameter, was varied over a wide range of values (typically $0.10 < b^* < 1.50$) through the use of a variable magnetic eddy current damping system. It is generally believed that only two types of amplitude response profiles, the "low mass-damping" type and the "high mass-damping" type, exist. In the former one has a large amplitude, three-branch (initial, upper, lower) response profile and in the latter a small amplitude, two-branch (initial and lower) response profile. In our experiments, as damping was systematically increased, we see a blending of these profiles characterized by a gradual erosion and eventual disappearance of the large amplitude section (upper branch) and the scaling down of the lower branch region. Of equal importance are the changes in the frequency response profile of the system that is connected with the changes in the amplitude profile. We also discuss why the traditional labels of high and low mass-damping systems are misleading with regard to predicting a large or small amplitude response profile because of the influence of Reynolds number.

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