



**Seminar on “Application of the Multiple Timescale Spectral Analysis”**

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ABSTRACT

The random response of civil engineering structures to the buffeting action of wind loads is typically composed of several components, usually referred to as the background component, in the low frequency zone and the resonant component(s) in the neighborhood of natural frequencies. It has become customary to study separately and add the contributions of these components to the total response, at least as far as the second order response (variance of structural responses) is concerned and as long as the structural behavior is linear. Such a decomposition exists but is less usual for the computation of covariances of modal coordinates or of structural displacements, which are in turn necessary for the determination of internal stresses. The question of such a decomposition also holds for higher statistical moments such as the skewness coefficient (in case of  non Gaussian responses). It also holds for systems endowed with fractional derivatives or even nonlinear systems, with assumptions that are very similar to those formulated in averaging. With very wide ranges of applicability, the Multiple Timescale Spectral Analysis summarizes under a unified framework recent works aiming at the development of such decompositions. This paper briefly pictures this particular theory based on perturbation methods, and provides illustrations of its applicability to the problems cited above.