

**A study of long slender marine structures under combined  
parametric and forcing excitations with  
differential quadratic method**

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**Abstract**

This study deals with the dynamic response of the top tensioned riser under combined parametric and forcing excitations. We consider the riser as a tensioned Euler Bernoulli beam under the excitations from the dynamic tension as well as enforced dynamic transverse displacement at the top end. Besides, the varying static tension along the axial direction is considered. To solve such a problem, the differential quadratic method (DQM) is applied. This calculation concern both the undamped and the damped system. Moreover, the DQM is included in both time axis and length axis along riser without simplifying the governing equation into simple Mathieu equation. As a consequence, the coupling item in the governing equation between time  $t$  and height  $z$  can be better treated.

**Keywords:** parametric resonance, Combined excitation, Risers, DQM