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Third Super-Harmonic Resonance in Vortex-Induced Vibration of a Pipeline Close to the Seabed

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Abstract : The third super-harmonic resonance of a pipeline close to the seabed is investigated in this paper. To analyse the vortex-induced vibration (VIV) of the pipeline close to the seabed, the classic Van der Pol equation is extended with a nonlinear item. Then, on the base of the multi-scale method, the frequency-response curves of the pipeline with regard to the third super-harmonic resonance are studied with a series of parameters, such as the mass ratio, frequency, damp ratio and gap ratio. On the whole, the numerical results show that the characters of third super-harmonic resonance are quite from that of primary resonance, though with the same trend that the larger is the mass ratio, the smaller impact the gap ratio has on the frequency-response curves of the third super-harmonic resonance.

Keywords : the third super-harmonic resonance, gap ratio, vortex-induced vibration, multi-scale method
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