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With increasing interests in the development of offshore floating vertical axis wind turbines (FVAWTs), a large amount of studies on the FVAWTs have been conducted. This paper focuses on evaluating the effect of second-order difference-frequency force on the dynamics of a 5 MW FVAWT in misaligned wave-wind condition. The studied FVAWT is composed of a 5 MW Darrieus rotor, a semi-submersible floater and a catenary mooring system. Fully coupled nonlinear time domain simulations were conducted using the state-of-art code Simo- Riflex-DMS. Several misaligned wave-wind conditions were selected to investigate the global dynamic responses of the FVAWT, such as the platform motions, structural responses and mooring line tensions. It has been found that the wave-wind misalignment does not significantly affect the mean values of the global responses since the global responses are primarily wind-induced. And the second order differencefrequency force can contribute to a slightly larger mean value. The standard deviations and maximum values of the global responses are slightly more sensitive to the wave-wind misalignment and the second order difference-frequency force, especially at high significant wave height conditions.

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