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On the scaling and dynamics of periodically generated vortex rings[1] HOSSEIN ASADI, HAFEZ ASGHARZADEH, IMAN BORAZJANI, State Univ of NY - Buffalo, SCIENTIFIC COMPUTING AND BIOFLUIDS TEAM — Periodically generated vortex rings are observed in nature, e.g., left ventricle or jellyfish, but their scaling and dynamics is not completely well understood. We are interested in identifying the main parameters governing the propagation and dynamics of periodically generated vortex rings. Therefore, vortex rings, generated periodically through a circular cylinder into a tank, is numerically investigated for a range of Reynolds numbers (Re), non-dimensional periods (T), and stroke ratios (stroke time to period) for a simple square wave. Based on the results, by using the averaged inflow velocity in definition of Reynolds number and non-dimensional period, vortex ring velocity becomes approximately independent of the stroke ratio. The results also show that reducing Reynolds number or increasing non-dimensional period increases the translational velocity of vortex ring. Based on our test cases, an empirical relation is proposed to predict the location of vortex cores propagating into domain which shows good agreement with other experimental data. The vortex instabilities and interactions are also visualized and discussed.

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