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Merging of unequal strength co-rotating vortices LOUIS DUFRESNE, JULIEN CHRISTOPHE, OLIVIER GOURGUE, GREGOIRE WINCKELMANS, Universite catholique de Louvain (UCL) — We present numerical simulation results on the 2D merging of a pair of co-rotating vortices and examine the effect of varying the circulation ratio between the two vortices. In a first step we present the results obtained for a pair of equal strength vortices ($\Gamma_2/\Gamma_1 = 1$) at a Reynolds number of $Re = \Gamma_1/\nu = 530$. A detailed quantitative analysis is made and shown to be in very good agreement with the experimental measurements of Cerretelli & Williamson (2003, JFM, **475**, 41–77) for that same case. The results for vortex pairs with unequal strengths, i.e. with $\Gamma_2/\Gamma_1 < 1$, also at $Re = 530$, are presented next. The decomposition of the vorticity field into its symmetric and anti-symmetric components, as done by Cerretelli & Williamson, shows that the structure of the anti-symmetric vorticity, in the convective merging phase, completely changes when Γ_2/Γ_1 reaches a value of about 0.8. Above that value, both vortices undergo deformation and contribute to the apparition of anti-symmetric vorticity. They also both move towards the center of rotation while they merge. Below that value, only the weaker vortex undergoes significant deformation and thus contributes to the apparition of anti-symmetric vorticity. Furthermore, the center of that weak vortex remains almost stationary (in the proper rotating frame of reference). The stronger vortex follows the opposite behavior with only a little deformation but with a more significant relative displacement.

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