

國立中山大學跨領域及數據科學研究中心  
國立中山大學應用數學系  
學術演講

講者：洪子倫 教授

逢甲大學應用數學系

講題：Direct numerical simulation of two vortex rings' head-on collision

時間：2015/10/08 (星期四) 14:10 ~ 15:00

地點：理學院四樓理 SC 4011 室

茶會：15:00 於理 SC 4010 室 (系辦公室)

### 摘要

3D incompressible Navier-Stokes equations in velocity-vorticity formulation are solved here by method of lines with Fourier pseudospectral discretization in space and integration by RK23 in time to investigate head-on collision of two identical vortex rings with opposite circulations. Under certain set of parameters, this pair of vortex rings would encounter azimuthal instability during the collision. This azimuthal disturbance of each vortex ring would further grow and cause vortex reconnection as the vortex rings approaching each other. Finally, small circumferential vortex rings would develop and then pinch off the two main vortex rings. The result of current simulation agrees well with famous flow visualization experiments by Lim and Nickels (1992). Basically, the development of flow depends on initial separation of two vortex rings, the initial core radius, Reynolds number based on circulation, the perturbed azimuthal wave number, and the phase difference between the initial azimuthal disturbance of two vortex rings.

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