國立中山大學應用數學系
學術演講

講　者：曾昱豪博士

Department of Mechanical Engineering, Johns Hopkins University, USA

講　題：Stability of a Fluid Interface Near a Zero-Vorticity Point

時　間：2014/02/27（星期四）14：10 ~ 15：00

地　點：理學院 4 樓理 4009-1 室

茶　會：15:00~15:30 於理 4010 室（系辦公室）

摘要

Oil pollution in the Gulf of Mexico has been an important issue after the major accident in 2010. Recent research shows that the ecological impact of the oil has been less severe than originally feared. One possible explanation is that the water-oil interface becomes unstable due to fluid convection and surfactant activation, so that the unstable structures can easily dissolve into small size droplets, and can be cleaned easily or become part of the food chain in the ocean. To understand the fundamental mechanisms behind, we show how a single interfacial instability mechanism leads to a variety of different fragmentation phenomena of liquid masses immersed in an immiscible liquid. The process involves the flow behaviour in the vicinity of zero-vorticity points (or lines) on the interface. The flow compresses surface disturbances causing their amplification in the region. This mechanism is universal and it can be observed in the formation of so-called ”skirts” behind rising drops and bubbles, streaming from the tips of drops in a straining flow and others. Moreover, it is found that the interfacial instability near a zero-vorticity point is strongly intensified by the presence of surfactants. We have worked on the local stability analysis to support this conjecture and developed some theoretical results and numerical simulations as well.

(Joint work with Andrea Prosperetti)

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