Karlsruher Institut für Technologie

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Institut für Hydromechanik (IfH)
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Mechanik-Seminar

Referent:	**Prof. S. Balachandar** Department of Mechanical & Aerospace Engineering University of Florida, Gainesville, FL
Datum:	Donnerstag, 08.05.2014
Uhrzeit:	15:45 Uhr
Ort:	Geb. 10.81, HS 62 (R 153)
Titel:	**On the Propagation, Instability and Turbulence of Advancing Material Fronts**

Abstract

Penetration of one material into another is a fundamental fluid mechanical process that can be observed all around us in many industrial and environmental applications. Filling/emptying pipelines, coating flows, falling films and sedimentation fronts are some industrial applications. Tsunamis, volcanic plumes, lava and pyroclastic flows, dust storms, powder snow avalanches, submarine turbidity currents and supernovae offer fascinating examples of advancing material fronts. This talk will introduce the concept of gravity currents, where the density difference between the propagating and the ambient materials drives the flow. The examples mentioned above include both scalar and particulate gravity currents, where in the former the density difference is due to temperature or salinity, while in the later suspended particles contribute to density difference. Particular attention will be paid to the front velocity and simple theoretical models that attempts to predict it. The propagating fronts undergo Rayleigh-Taylor, Lobe-and-cleft and Kelvin-Helmholtz instabilities, giving rise to fascinating pathways to turbulence.

One particular example we will consider in greater detail is the sustained propagation of submarine turbidity currents, whose propagation depends on an interesting interplay between suspended particles and turbulence. The suspended particles drive the flow and are the source of turbulence in a turbidity current, while the flow turbulence enables resuspension of particles from the bed. If resuspension dominates over deposition the intensity of the current can increase, thereby further increasing resuspension and resulting in a runaway current. On the other hand, stable stratification due to suspended sediment concentration can damp and even kill turbulence. Then deposition dominates over resuspension and the current could laminarize resulting in massive deposits.

In this talk we present results that indicate the existence of conditions for the total damping of the near-bed turbulence. Under these conditions, sediment in suspension rains out passively on the bed, even though the upper layer may remain turbulent. The above scenario provides a reasonable (but not unique) explanation for the formation of massive turbidities that have recently been reported from field observations.

Alle Interessenten sind herzlich eingeladen.
Prof. Dr.-Ing. Markus Uhlmann