Tellus (2002), 54A, 439
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TELLUS
ISSN 0280–6495

FOREWORD

Kabatic flows over ice sheets and glaciers

During the Climate Conference 2001, which was held in August 2001 at Utrecht University, the Netherlands, a workshop was devoted to *katabatic flows over glaciers and ice sheets*. In this issue of Tellus a number of papers presented at this workshop have been brought together. In recent years the mass balance of glaciers and ice sheets and its sensitivity to climate change has received considerable attention. The exchange of mass, momentum and sensible heat between the glacier surface and atmosphere is determined by turbulence in the lower atmospheric layers. Extensive field experiments have shown that persistent katabatic flow dominates the dynamics of the lower atmosphere over ice sheets and glaciers. Even over such exposed glaciers like Vatnajökull, Iceland, katabatic flow prevails most of the time.

Katabatic flows owe their existence to the generation of negative buoyancy associated with cooling of air over a sloping surface. When the spatial scale is small, as is the case for many mountain glaciers, the momentum budget is dominated by a balance between buoyancy force and friction. When the spatial scale is large, like on the Greenland and Antarctic ice sheets, the first-order balance is among buoyancy force, friction and Coriolis force. Katabatic flows are characterized by a wind maximum close to the surface (typical height: several hundreds of meters over the Antarctic Ice Sheet to a few meters over melting valley glaciers). Katabatic flows are special in the sense that, in spite of the very stable stratification, they continuously generate turbulence. Because in these flows the forcing term in the momentum budget increases towards the surface, the momentum and thermal fields are strongly coupled and it is not clear *a priori* that the Monin-Obhukov similarity theory can be used to derive turbulent fluxes. In fact, recent studies have shown that the use of profile analysis to determine surface fluxes is difficult when the wind maximum is found close to the surface.

The purpose of the workshop was to review the theory of katabatic flows, and to discuss methods for the calculation of turbulent fluxes in such flows. Workshop participants were invited to submit papers to Tellus for publication. We were happy to see that the number of accepted papers was sufficiently large to combine them into a special issue. The eight papers in this issue deal with katabatic flows on smaller and larger scale. There is a mix of observational and theoretical approaches. We hope that this collection of papers will prove to be useful for all those interested in the dynamics of katabatic flows and the implications for turbulent exchange over ice sheets and glaciers, and that they will stimulate further research on katabatic flows.

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