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Numerical Simulation of Japan Sea Effect Snowfall

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I. Introduction

During the winter monsoon season in the Far East, snow frequently falls over the mountains of Central Japan and the adjacent coastal areas of the Japan Sea. The cold airmass from the Asian continent picks up heat and moisture as it flows over the warm sea of Japan. This addition of heat and moisture makes the airmass relatively unstable and cumulus clouds develop remarkably over the coastal area where the warm Tsushima current flows. The condensation and precipitation are especially enhanced where the airmass is lifted by the mountains.

The snowfall described above, which is associated with the Siberian northwest monsoon, is somewhat similar to the so called lake-effect snowfall over the Great Lakes of the United States. Over both Japan and United States the snowfall occurs after cold airmasses are heated and moistend as they flow over the warm water surfaces. However, the precipitation mechanisms are somewhat different. In Japan, especially over the mountain regions, the primary mechanism is orographic lifting. Over the United States Great Lakes region where high mountains do not exist, the primary mechanism is upward motion due to lake-

described by Matsumoto et al. (1967), during the integration.
The absence of the disturbances may be due simply to inappropriate
initial conditions or incorrect model parameters. Or, it, could
be due to the lack of vertical resolution of the model. It is
interesting to speculate whether this weakness of the model, and
other deficiencies which are not mentioned here, can be remedied
by minor changes in the model. If this can be done without
unduly complicating the model, one may be able to forecast Japan
Sea effect and lake effect snowfalls on an operational basis.

Acknowledgements

References

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Matsumoto, S., K. Ninomiya and T. Akiyama, 1967: Cumulus
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摘　　要

日本島及日本海冬季季風期內之大氣結構可分三層：
低層能量恒送、中層近地混合、高層穩定空氣。應用原始
模式計算混合中層之水平風向量、位溫、比濕及逆溫層高
度，並以參數化方式處理低層及高層對本層之交互作用。
地形因素、地面粗糙度、溫濕分佈等因素擾動大氣層而達

平衡狀態。本文模擬七個模式，研究初始狀況、邊界條件拖拉係數等因子對模式之效應；發覺本模式在預測雨量型式及降水量方面均與實際降水之定性與定量均頗爲吻合。