Eddy-resolving Lidar Measurements and Numerical Simulations of the Convective Internal Boundary Layer

Shane D. Mayor, Gregory J. Tripoli, and Edwin W. Eloranta
Department of Atmospheric and Oceanic Sciences, University of Wisconsin
Madison, Wisconsin, 53706, USA

INTRODUCTION

The University of Wisconsin-Larsen lidar system was used to monitor low-level, strongly convective boundary layers and to develop the necessary techniques for analyzing lidar data. The system uses an Nd:YAG laser to obtain backscatter measurements in the visible and infrared. Scans were performed on a 1-s cadence and at a range gate resolution of 0.5 m. The lidar system was used to obtain data on the internal boundary layer and to verify numerical simulations. The lidar data were used to study the structure and dynamics of the boundary layer, including the development of the internal boundary layer and the entrainment of warmer air. The simulations were run on a J50 donated by the University of Wisconsin, and the results were compared with the lidar data to evaluate the accuracy of the simulations.

CROSS-CORRELATION of aerosol backscatter data provide quantitative measurements of mean eddy shape, size, orientation, wind speed and direction.

The advection scheme used in Model Run A encouraged fine-scale roll-circulations to develop. The winter advection scheme was used in Model Run B, which resulted in more pronounced roll-circulations. The correlation functions were summed over 12 s time-lags and distance intervals to measure the downwind component of the flow. The results showed that the advection scheme used in Model Run A was able to simulate the observed roll-circulations.

SUMMARY OF COMPARISON OF OBSERVATIONS WITH SIMULATIONS

The simulations provided a good quantitative agreement with the lidar data, particularly in the represents that the advection scheme used in Model Run A was able to simulate the observed roll-circulations. The simulations were run on a J50 donated by the University of Wisconsin, and the results were compared with the lidar data to evaluate the accuracy of the simulations.

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