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A New Method for Gas-Flux Calculation in Atmospheric Boundary Layer Based on the Active Detection of LiDAR System

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The Flux information based on momentum, energy and matter is an important link between different components of the earth system. Flux observation is of great significance for understanding the energy and matter exchange in each circle of the earth system, revealing the carbon cycle process at the same time. Fluxes between the atmosphere and the Earth's surface must pass through the atmospheric boundary layer and have considerable influence on the state of the atmospheric boundary layer. Therefore, the observation and analysis of vertical turbulent flux in the atmospheric boundary layer has become a hot topic of atmospheric research. Based on the development of turbulence theory, the method of calculating gas-flux in the atmospheric boundary layer is constantly improved. In recent years, with the development of lidar detection system, doppler lidar system and differential absorption lidar system have also been effectively used to measure the mean wind speed and small-scale dynamic turbulence parameters, which can be applied to directly detect gas flux of the atmospheric boundary layer. For major scientific issues in the global carbon cycle and carbon emission reduction monitoring needs, this paper has developed a new method of gas-flux calculation of atmospheric boundary layer, while obtaining the wind profile information and gas concentration profile information at the same time and at the same place by the detection of lidar system. This method calculates flux takes into account the atmospheric stability judgment, surface friction velocity and the Monin-Obukhov stability parameter based on the turbulent transport theory of atmospheric boundary layer. It can quickly and effectively realize the active remote sensing detection of the gas flux information of atmospheric boundary layer under different atmospheric stability conditions□which has been proved to be effective and accurate by comparing with other gas-flux data.