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| **Large-scale retrieval of LAI based on spaceborne LiDAR ICESat-2** |
| **Introduction/Aim:**  Spaceborne LiDAR (Light Detection and Ranging), due to its superior canopy penetration ability and the capability to acquire three-dimensional canopy structure information, provides an important data source for the inversion of large-scale forest Leaf Area Index (LAI). The clumping effect is a significant factor affecting the accurate inversion of forest LAI by spaceborne LiDAR, and to date, no studies have fully utilized the three-dimensional structural information provided by spaceborne LiDAR to correct the clumping effect on a large scale.  **Methods:**  Therefore, this study focused on large-scale clumping effect correction and LAI inversion across forest areas in China based on the spaceborne LiDAR ICESat-2 and a point cloud segmentation path length distribution method.  **Results:**  The results show that the ICESat-2 LAI is in good agreement with the ground-observed LAI, indicating that the clumping effect has been corrected to a certain extent. Furthermore, comparing ICESat-2 LAI with MODIS LAI and GLASS LAI, it was found that ICESat-2 can capture higher LAI values (LAI > 6.0), while the MODIS and GLASS LAI products saturate near an LAI of 6.0, indicating that ICESat-2 LAI mitigates saturation issues.  **Conclusion:**  The point cloud segmentation path length distribution method is feasible in correcting the clumping effect and inverting forest LAI in China. This study may provide useful insights for future research on the global inversion of forest LAI based on spaceborne LiDAR ICESat-2. |