逆解析手法による南アメリカおよびアフリカ領域のCO_2フラックス推定値と地上要素との関係
Relationships between CO_2 flux estimated by inverse analysis and land surface elements in South America and Africa

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Inverse analysis estimates the regional flux of greenhouse gases between the earth's surface and the atmosphere by using observed atmospheric concentration data that include satellite data. In particular, this method is effective in estimating the flux in regions where observational flux data are limited. However, inverse analysis is basically a mathematical optimization method. Therefore, confirmation of the causal validity of the spatial and temporal changes in the estimated flux is necessary. One confirmation method is validation of the relationship with physical and biological observation data (analysis data) of confirmed accuracy. In this study, the features and validity of changes in the CO_2 flux estimated by inverse analysis were verified by interrelation analysis with changes in precipitation, short-wave radiation, surface temperature, and Normalized Difference Vegetation Index (NDVI) in regions of South America and Africa where CO_2 flux observation data are limited. Sufficient accuracy of the land surface elements is required for the analysis results to confirm the CO_2 flux estimated by inverse analysis. An examination of the correlation of anomalies showed consistent relationships among the precipitation, short-wave radiation, surface temperature, and NDVI data used in this study, which were created independently. The relationships between change in the estimated CO_2 flux and characteristic changes of the land surface elements in South America and Africa were consistent in each region. This study confirmed the physical and biological validity of the changes in the CO_2 flux estimated by inverse analysis. During the period of this study, the NDVI anomaly was influential in South America, and the precipitation (soil wetness) anomaly was an essential factor in Africa for the CO_2 flux anomaly. The short-wave radiation anomaly was also influential in both South America and Africa. These relationships are detected more clearly in the results of inverse analysis using both ground-based CO_2 concentration data and GOSAT satellite data than in the results using only ground-based CO_2 concentration data. This demonstrates the usefulness of GOSAT data in regions with limited atmospheric CO_2 concentration data.

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