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Analyzing Synoptic Variations of the near Surface CO_2 Concentration in East Asia based on Hidden Markov Model

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Synoptic variations of atmospheric CO_2 have a significant influence on global and regional inversions for carbon sources and sinks, which also likely causing representation errors of carbon satellite retrievals. Solar radiation drives both photosynthesis and thermal convection, resulting in a covariance between the biospheric flux and atmospheric transport on many spatial and time scales. In order to better evaluate the synoptic variations of atmospheric CO_2, we need to understand the mechanisms of the coupling between the surface carbon flux and atmospheric transport. The cloud generated by frontal and cyclone process affects the strength of biospheric photosynthesis through reducing solar radiation and causes synoptic variations of CO_2 concentration, which may introduce representativeness errors of satellite retrievals. Thus, this project utilizes near surface CO_2 observations and meteorological reanalysis data to investigate the synoptic variations of near surface CO_2 concentration in East Asia by combining a Hidden Markov Model and a three-dimensional global chemical transport model-GEOS-Chem. Further quantitative analysis of driving factors that controlling synoptic variations of CO_2 could promote better knowledge of the atmospheric carbon dioxide transport mechanisms. These results will provide valuable information for taking full advantages of carbon satellite data and decrease the uncertainty of regional inversions of carbon fluxes in East Asia.