



Sectional Modeling Soil Respiration Based on the Soil Water Retention Parameters in a Poplar Plantation in the Suburb of Beijing, China

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Based on the analyses of 3 years (from 2007 to 2009) continuous measurements of soil CO₂ efflux or soil respiration (Rs) in a poplar plantation located at Daxing district of Beijing, China, We found that soil water content at the 5 cm depth (W) is the dominate factor of Rs variation when W is too high or too low, and soil temperature at the 5 cm depth (T) becomes the dominate factor in the optimum W. Similar relationship displayed in six typical precipitation processes. General models (including linear, exponential, combination of exponential and power, Arrhenius, Quadratic, and Asymptote model) of Rs and T-W were examined and none fitted very well (all R² is less than 0.57) in the whole growing seasons. Soil water retention parameters were measured with soil water retention curve and cutting ring method, and Rs was divided into three sections where W>11% (near the water content of rupture of capillary 11.58%), 6%<W<11%, and W<6% (near the wilting point 5.49%). Exponential model provided better fits than others in all the three sections, the highest R² can reach 79%. Rs variation can be much better described by three different models under corresponding soil water environments then the ones without considering the W ranges. The segmentation of data based on soil water retention parameters provides ideas for improvement of the estimation of Rs.