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The Role of Landscape Gradients on Dynamics of Stream Carbon

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Understanding the quantities and qualities of stream carbon species provides crucial information for managing water resources and predicting the changes of regional carbon cycle. We investigated the dynamics of stream carbon species across two different landscape gradients; a forest–urban gradient and a forest–cropland gradient under the temperate monsoon climates. We measured [DIC], [DOC], [POC], [PIC], pCO_2, and carbon dioxide efflux at 8 points within streams along the forest-urban gradient, and 7 points along the forest-cropland gradient. The [DIC] of the urban stream increased along the reaches downstream in general, varying from 8 to 103 mg/L, whereas [DIC] of the cropland stream decreased downstream varying from 11 to 30 mg/L. The [DOC] increased downstream for both landscape gradients, but for the forest–urban gradient, the [DOC] varied from 0.8 to 4.5 mg/L, whereas for the forest–cropland gradient, the [DOC] varied from 0.1 to 1.2 mg/L. The [POC] was higher in the urban stream than in the cropland stream. The pCO_2 of the cropland stream was under 700 ppmv, but the pCO_2 of the urban stream varied from 70 to 12,000 ppmv with a tendency to increase downstream. The amount of protein-like components of DOC detected by fluorescence spectroscopy relative to other components was higher in the urban stream than in the cropland stream. The results suggest that the inputs from a metropolitan city compared to cropland can significantly increase riverine CO_2 efflux although the source of urban stream CO_2 further needs to be identified.