

## **$^{14}\text{C}$ variation of dissolved lignin in arctic river systems**

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Currently, there is scant  $^{14}\text{C}$  information on dissolved organic matter (DOM) components in riverine systems due to the complex composition and dilute concentration of DOM. Such information is however critical to gain insights into DOM sources and dynamics. Here we employed a recently modified method to determine radiocarbon contents of lignin phenols isolated from DOM of two contrasting arctic river systems. While dissolved lignin had relatively invariant  $^{14}\text{C}$  contents in the Mackenzie, it was present in greater concentrations and  $^{14}\text{C}$ -enriched during freshet but relatively diluted and  $^{14}\text{C}$ -depleted in the summer flow or permafrost thaw waters in the Kolyma. Remarkably, the covariance between dissolved lignin concentrations and its  $^{14}\text{C}$  contents nicely followed the Keeling plot, indicating mixing of a young pool of dissolved lignin with an aged pool of a constant concentration within the river. Using model parameters, we showed that, while the young pool had similarly modern ages in both rivers, Kolyma had a much higher concentration of aged dissolved lignin and/or with older ages. With this approach, our study not only provided the first set of  $^{14}\text{C}$  data on dissolved lignin phenols in rivers, but also shed light on ways of assessing the age and abundance of the old DOM pool in the context of permafrost release in the changing Arctic.