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Dissolved trace metal-organic Copper and Uranium complexes in the Gironde fluvio-estuarine system (France) during two contrasted hydrologic situations

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Dissolved metal-organic complexes play an important role in Cu and U transport in rivers. Spatial and/or temporal variations of organic matter key parameters as DOC, POC and chlorophyll a concentrations are closely related to hydrological and/or seasonal changes and may induce changing trace metal partitioning between the hydrophilic and the hydrophobic fractions. The objective of the present study was to assess, whether the abundance of the dissolved metal-organic Cu and U fractions is controlled by the hydrologic situation or by specific river properties such as watershed size, typical POC, DOC or chlorophyll a concentrations. Dissolved metal-organic Cu (hDO-Cu) and U (hDO-U) complexes were extracted by the C18 sep-pak method (Mills and Quinn, 1981) in three different drainage basins (Garonne, Dordogne and Isle Rivers) including their respective outlets into the Gironde estuary during two contrasting hydrologic situations: a winter flood and a springtime low discharge period. The winter situation was representative of a number of winter floods. In contrast the spring samples showed high chlorophyll a concentrations and chlorophyll a/POC ratios suggest very high phytoplankton activity at all sites except for the Gironde estuary, where phytoplankton was limited by high SPM concentrations. There was no direct relationship between DOC concentrations and dissolved metal-organic complexes, suggesting that the observed variations of hDO-Cu and hDO-U were related to changing properties of dissolved organic matter rather than to variations in DOC concentration. For each hydrological situation, distribution coefficients of the organic matter (POC/DOC ratio) showed linear correlations with Kd values of Cu and U measured at the different sites. Linear relationships were also observed between POC/DOC ratios and the ratios of dissolved metal-organic Cu and U concentrations to particulate Cu

and U concentrations, respectively. However, for a given POC/DOC ratio, Kd values of Cu and U and their metal-organic complexes were higher in winter than in spring. Consequently, we propose that hydrological variations (rather than watershed properties) control equilibria between dissolved Cu and U and their dissolved metal-organic complexes on the one hand and particulate Cu and U concentrations on the other hand.