Figure S1: (a, c) Freshwater discharge and NOₓ flux of the Mississippi River and (b, d) Atchafalaya River. The measurements for the period of 1997-2017 (grey x) and the monthly mean values (grey lines) are shown and the 2017 data are highlighted as red dots. Data are from the USGS webpage (http://waterdata.usgs.gov/nwis/qw): station 07373420 Mississippi River at St. Francisville (30°45'30'' N, 91°23'45'' W) and station 07381495 Atchafalaya River at Melville (30°41'26'' N, 91°44'10'' W).
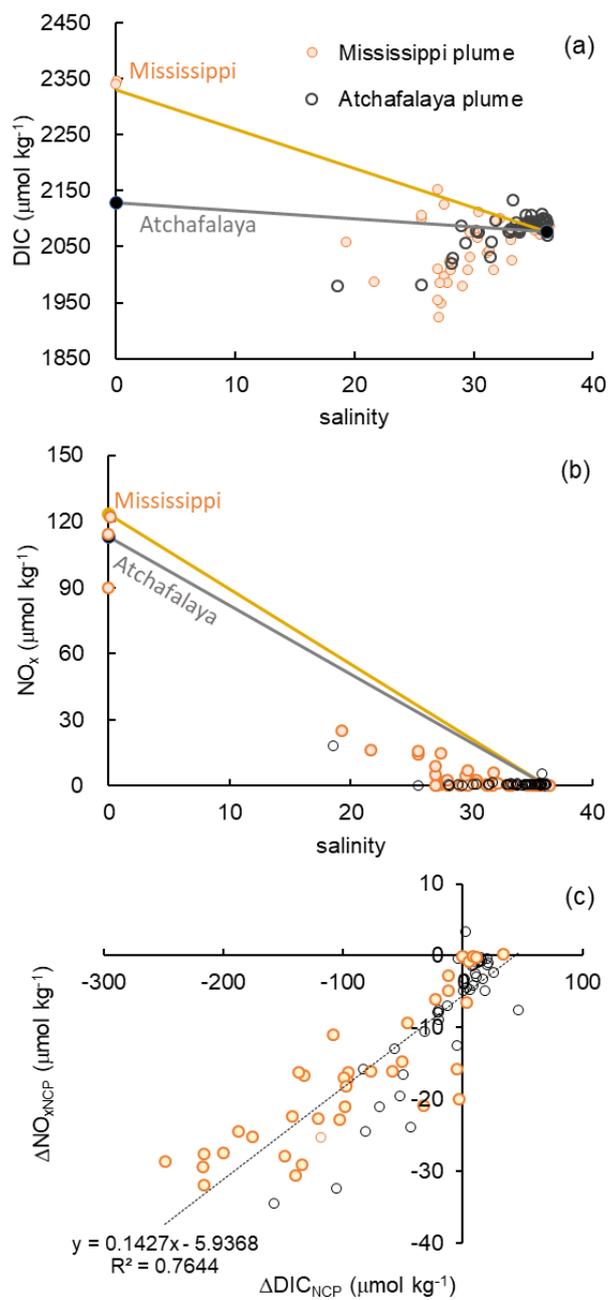
Figure S2: The scatter plots of (a) DIC and salinity, (b) NO$_x$ and salinity and (c) ΔDIC$_{biol}$ and ΔNO$_{x,biol}$ in the Mississippi and Atchafalaya plume. The end member concentrations of the Mississippi river, the Atchafalaya river and gulf water are shown in panels a and b as well as the conservative mixing lines.