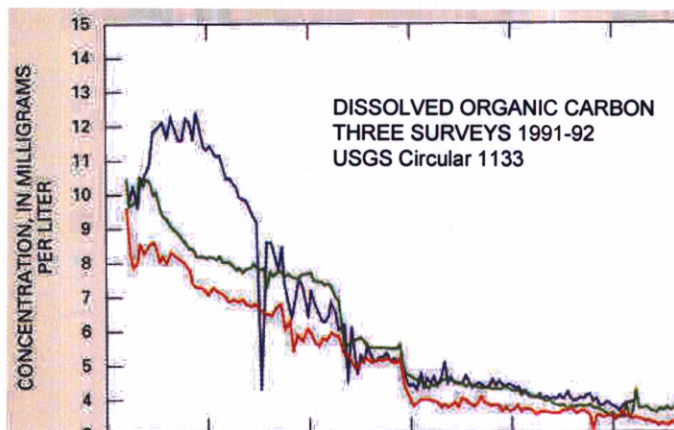


the Gulf over similar time periods during residence on the shelf, particularly in oxygen-limited sediments.

Several lines of evidence indicate that the fraction of the organic carbon loading that is labile or oxidizable is substantially less than 35%. Average concentrations of total organic carbon (dissolved and particulate) in the lower river at St. Francisville averaged 6.38 mg L^{-1} during 1996-98⁵, while the mean 5-day biochemical oxygen demand (BOD) over the same period was 1.58 mg L^{-1} . It would require complete oxidation of 9% of that organic carbon pool to meet that oxygen demand if the only substance oxidized was reduced carbon (nitrite, ammonia and other oxygen demanding materials also contribute to BOD).

In addition, the longitudinal distribution of dissolved organic carbon in the Mississippi River system strongly suggests that the organic carbon contained in the lower river is a very refractory residual from the microbial degradation that takes place along the long



course to the sea. DOC concentrations averaged about 10 mg L^{-1} at Minneapolis/St. Paul (nearly 3,000 km upriver from the Gulf), but declined to 4.2 mg L^{-1} at a point 1,500 km upriver from the Gulf (just below the entry of the Ohio River). DOC concentrations remained relatively constant downstream, with average concentrations dropping only to 3.7 mg L^{-1} over the remaining

1,500 km. After the confluence of the Arkansas, the last major tributary to join the Mississippi, the decline in DOC concentrations suggested that less than 7% of the DOC was degradable over the last 800 km of transit. It is reasonable to assume that the processes that degrade the DOC also act on the POC during transit down the river.

All of this indicates that the organic carbon discharged into the Gulf is predominantly refractory—the recalcitrant remains from hundreds of years of soil processing and a 3,000 km long secondary treatment system—and that the proportion of the residual that could be further degraded over time scales of weeks to months is less than 10%. Although there are other suggestions⁶ that a greater percentage (up to 50%) of the particulate organic carbon discharged by large rivers such as the Mississippi cannot be accounted for in the sediments in depositional areas, this does not necessarily mean that that “missing carbon” contributes to shelf metabolism. It could be lost due to desorption and transported away as dissolved organic carbon or other mechanisms.

⁵ USGS NASQAN data.

⁶ Keil, R.G. et al. 1997. Loss of organic matter from riverine particle in deltas. *Geochemica Cosmochemica Acta* 61: 1507-1511.