Coupling of bacterial diversity and DOM chemodiversity

The interactions between the two complexities in the ocean, microbes and dissolved organic matter (DOM), are remained to be a large mystery unveiled. Here in the case study of viral-induced DOM (vDOM) from picocyanobacteria, we showed how picocyanobacterial vDOM are transformed by bacteria and the impact of this process on bacterial community structure. By adding the viral lysate of picocyanobacteria to coastal seawater and incubated for 90 days, we tracked the variations of both bacterial biodiversity and DOM chemodiverisy. The transformation of vDOM was analyzed by ultrahigh-resolution mass spectrometry and the shift of bacterial populations analyzed using high-throughput sequencing technology. Addition of picocyanobacterial vDOM introduced abundant nitrogen components into the coastal water, which were largely degraded during the 90 days' incubation period. However, some DOM signatures were accumulated and the total assigned formulae number increased over time. In contrast to the control (no addition of vDOM), bacterial community enriched with vDOM changed markedly with increased biodiversity indices. The network analysis showed that key bacterial species formed complex relationship with vDOM components, suggesting the potential correspondence between bacterial populations and DOM molecules. We demonstrate that coastal bacterioplankton are able to quickly utilize and transform lysis products of picocyanobacteria, meanwhile, bacterial community varies with changing chemodiverisity of DOM. vDOM released from picocyanobacteria generated a complex labile DOM pool, which was converted to a rather stable DOM pool after microbial processing in the time frame of days to weeks.