The Thermodynamics of Pelagic Bacteriophage Communities

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We describe measurements from a differential calorimeter capable of measuring the small amounts of heat produced by marine microbes and viruses at natural concentrations. Our measurements show that heat production in the presence of viruses is an order of magnitude larger than in their absence. This increased heat output occurs despite a net decrease in the number of microbes. This provides direct evidence for top-down control of microbial populations by viruses. A comparative statics model predicts that approximately 25% of the total heat production during the growth phase of a pelagic microbial community is due directly to viral activities. Our results have implications for the energy budget of our planet and for climate prediction.