Viralization and Microbialization dominate global ecology

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Abstract

Measurements are critical for the practice of science by allowing to classify entities in categories, for example. In biology, some fundamental classifications are subjective, because they are not based in objective measurements. The classification of ecosystems is an example of this phenomenon. Here, we propose a new metric to classify ecosystems in two different categories: viralized or microbialized ecosystems. The balance of viruses to microbes is correlated to the dominant metabolism in the ecosystem and it can be measured in the lab or in the field. We test our metric on different datasets.

Introduction

Hypothesis and background

*Measurements and classifications are a very important feature in sciences. Classification of entities in different groups allows for studying specific areas of knowledge. Metrics and measurements on the other hand produce objective data that can be used to test hypotheses.

Knowledge gap

*Unlike commonly called hard sciences, there is a lack of objective metrics in biology. We can think of taxonomical classification: what differentiates two closely related biological species? More specifically, we can think of classifications of ecosystems. What distinguishes a forest from a grassland ecosystem?

How to fill the knowledge gap

Here, we propose an objective, scale-free and binary metric to clearly classify ecosystems. Within our metric, ecosystems can only be in two different states: microbialized or viralized. Microbes (bacteria, particularly) and viruses are the most abundant biological entities on Earth. They have a big impact on upper levels of the trophic chain and also on abiotic factors, effectively shaping entire ecosystems. *Viralized ecosystems are characterized by the dominance of bacteriophages with lytic activity and a catabolic metabolism, whereas in microbialized systems, phages are dormant, microbes are thus dominant, and there is an anaerobic metabolism.* Importantly, the viral-bacterial dichotomy can be measured (using Virus to Microbe ratios, for instance)

Methods

Results

Discussion