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Distribution of virioplankton in Caroline Seamount of the tropical Western Pacific Ocean

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Introduction

Virus are the most abundant life in the ocean with a mean abundance of between 10^4-10^8 mL^{-1} in marine ecosystem. Seamounts are undersea mountains with heights exceeding 1000 m from base to summit. However, little is known about the distribution of viral abundance in seamounts region. Here we report their distributions and relationships with environmental factors in Caroline Seamount of the tropical Western Pacific Ocean.

Study area and sampling

Samples were collected aboard the R/V 'Kexue' in Caroline Seamount of the tropical Western Pacific Ocean (10.3-10.9°N, 139.9-140.4°E) from 7 August to 5 September 2017. Seawater samples were collected at 4 to 13 different depths at each station

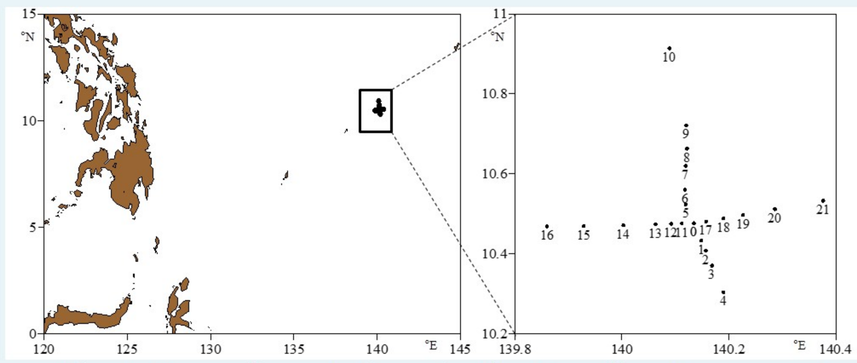


Fig. 1. Sampling stations in the Caroline Seamount

Results

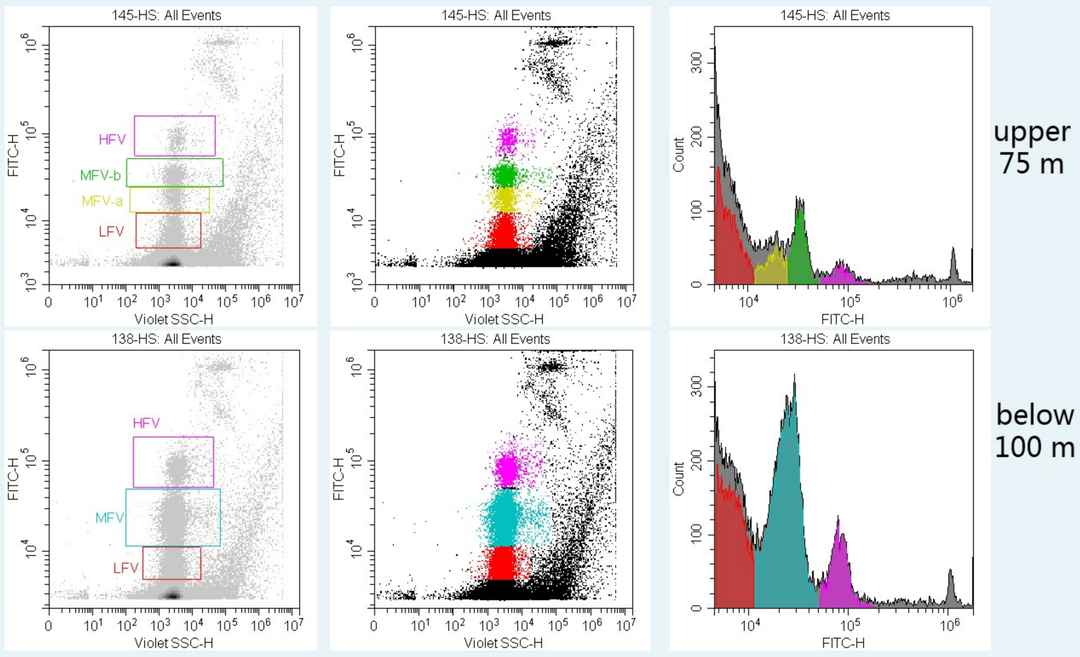


Fig. 2. Flow cytometric cytogram of the typical viral subclusters

Three to four viral subclusters were distinguished according to their green fluorescence determined by flow cytometry. Low, Medium and High Fluorescence Viruses (LFV, MFV and HFV)

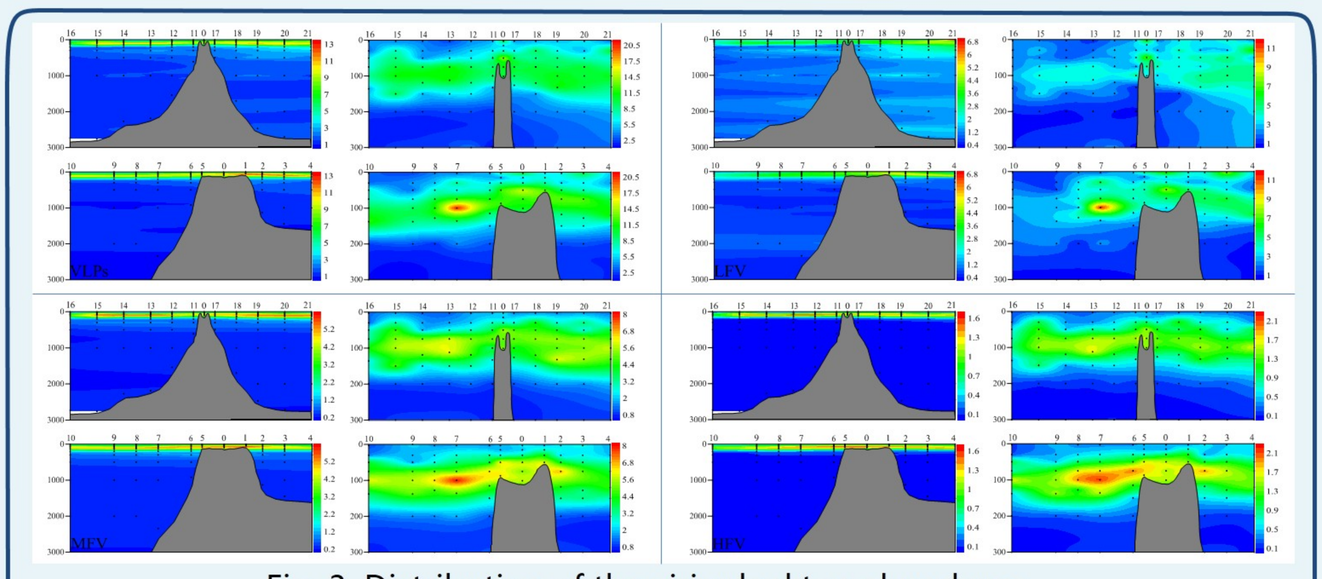


Fig. 3. Distribution of the virioplankton abundance

The average abundance of virus-like particles (VLPs), LFV, MFV and HFV were 5.18×10^6 mL^{-1}, 2.42×10^6 mL^{-1}, 2.29×10^6 mL^{-1}, 0.54×10^6 mL^{-1}, respectively. Vertically, the maximum VLPs abundance appeared at 50–100 m and the abundance decreased with depth in below 200 m. The vertical distribution of viral subclusters was similar to VLPs

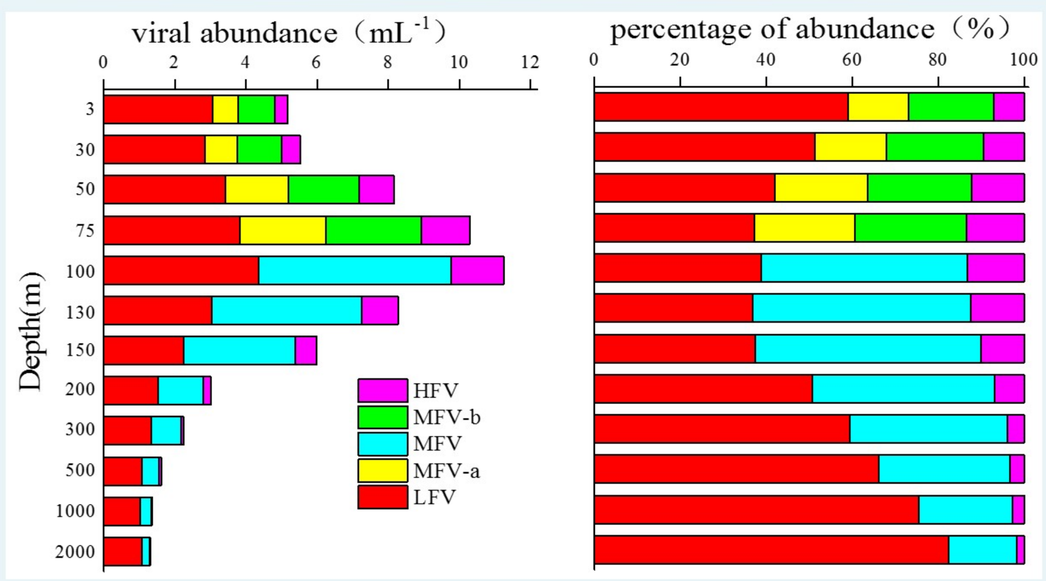


Fig. 4. Vertical distribution of the viral abundance and percentage

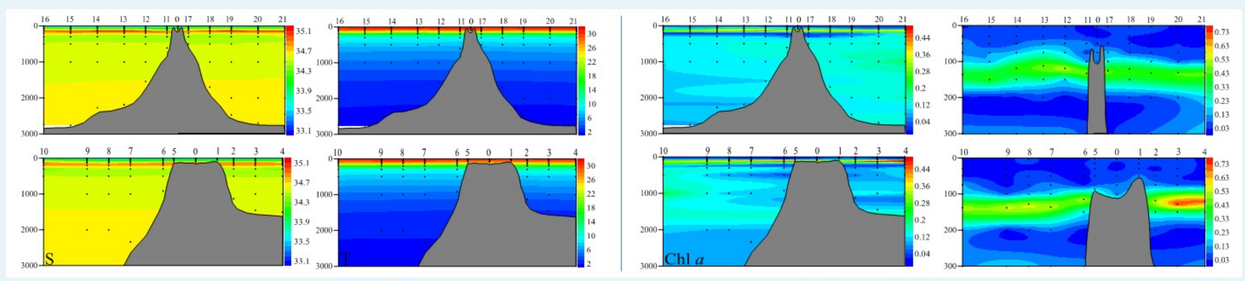


Fig. 5. Distribution of the environmental variables

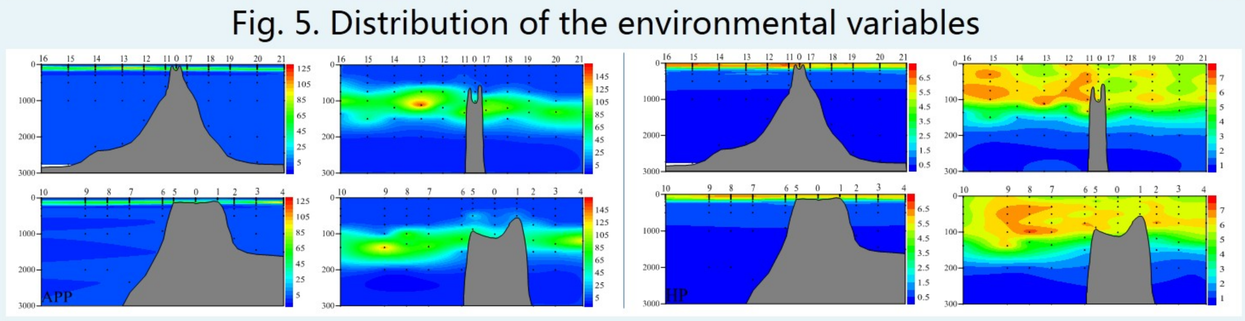
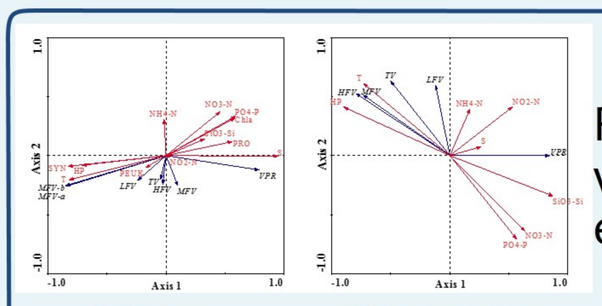


Fig. 6. Distribution of the picoplankton (host cell) abundance



0-200m 200m to bottom

RDA of the picoplankton, virioplankton and environmental factors

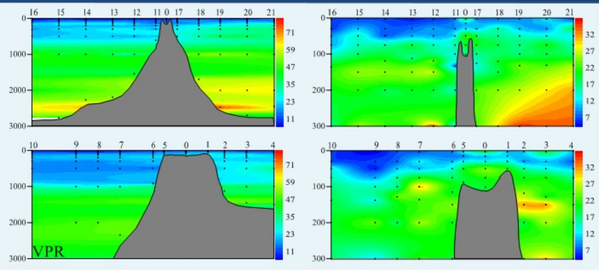


Fig. 7. Distribution of the VPR (Virus-to-Heterotrophic Prokaryote Ratio)

The VPR was on average about 23.9 and increased with depth

Discussion

We found that most LFV are bacteriophages; HFV are algal viruses; MFV contain cyanophages and algal viruses. Our results also revealed that the distribution of VLPs and their subclusters are affected by a combined effect of host distributions and physical process. This is the first report on distribution of virioplankton in seamount. However, whether the vertical distribution pattern of virioplankton in Caroline seamount can represent the whole Western Pacific seamount needs more data for further verification.

Acknowledgements

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