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Biogeographic patterns and drivers of soil virosphere across the globe

Bin Ma^{1,2,3}, Yiling Wang^{1,2,3}, and Jianming Xu^{1,2}

¹Zhejiang University, China (bma@zju.edu.cn)

²Zhejiang Provincial Key Laboratory of Agricultural Resources and Environment, Zhejiang University, Hangzhou, China

³Hangzhou Global Scientific and Technological Innovation Center, Zhejiang University, Hangzhou, China

Soil microbes play a crucial role in terrestrial ecosystem biogeochemical cycling¹ and understanding microbial biogeography has provided fundamental information to predict ecosystem function². In contrast, the biogeography of soil viromes has been largely overlooked, even though viruses are key mediators of the soil microbiome and its function³. Here, we introduce the Global Soil Virome (GSV) dataset, the most comprehensive soil virus dataset to date, and present an overview of global biogeographic patterns and drivers of soil viromes. A total of 345,607 double stranded DNA partial viral genomes, of which 97.2% were unknown viral taxa, were assembled from 1,873 deeply sequenced soil metagenomes across the globe. We observed soil virome endemism across continents and plant biomes which were shaped by dispersal limitation and soil moisture. Unlike the scale-free pattern of most biological co-occurrence networks^{4,5}, we found that the degree distribution of the global soil virus co-occurrence network has a random pattern. The GSV dataset provides a critical resource for elucidating soil viral diversity and host-virus interactions; it provides in-depth insight into ecological processes that determine soil viral diversity.