Computation of de Sitter-invariant graviton propagators in linearized gravity has been an attentive subject in quantum gravity. Note that in linearized gravity the diffeomorphisms of general relativity can be considered as the gauge symmetries of perturbed metric fields from the background. Choice of the de Sitter space is particularly interesting since it is in accord with the presently observed expanding universe.

The subject itself sounds well-defined but, as the authors of this article carefully describe in the introduction, there remain discrepancies on this matter in literature. For example, controversies include the very existence and the infra-red nature of the de Sitter-invariant graviton propagators. There are many references on these issues; the interested readers may refer to those in the article.

In this article the authors revisit the computation of de Sitter-invariant graviton propagators in linearized gravity, equipped with a mode-sum method in a spatially flat coordinate patch (Poincaré patch) of the de Sitter space and a standard Pauli-Fierz regularization scheme. The resulting propagators are claimed to be de Sitter invariant and free of infra-red divergences in the massless limit of the regularization. These results are partly obtained by use of analytic continuations.