How tropical are seven-, eight- and nine-particle scattering amplitudes?

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Using the symbol bootstrap, loop amplitudes of planar $\mathcal{N} = 4$ SYM theory can be obtained from their alphabet, the list of their singularities. The elements of this alphabet, the letters, coincide with the variables of certain cluster algebras. However, at eight and more particles these cluster algebras become infinite, whereas it is believed that the amplitudes only have finitely many distinct singularities. First discussing the application of cluster algebras to the seven-particle (N)MHV amplitude, I will show how the recently introduced mathematics of tropical geometry gives rise to a selection rule and present the thus obtained finite alphabets for eight and nine particles. Furthermore, I will discuss how infinite mutation sequences in cluster algebras also give rise to the algebraic singularities.

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