Compatible Recurrent Identities of the Sandpile Group and Maximal Stable Configurations

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In the abelian sandpile model, recurrent chip configurations are of interest as they are a natural choice of coset representatives under the quotient of the reduced Laplacian. We investigate graphs whose recurrent identities with respect to different sinks are compatible with each other. The maximal stable configuration is the simplest recurrent chip configuration, and graphs whose recurrent identities equal the maximal stable configuration are of particular interest, and are said to have the complete maximal identity property. We prove that given any graph G one can attach trees to the vertices of G to yield a graph with the complete maximal identity property. We conclude with several intriguing conjectures about the complete maximal identity property of various graph products.

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