Surface defects, tt* Toda equations and BPS spectra

We show that the partition functions of 4d supersymmetric gauge theories with 8 supercharges in presence of surface defects obey tt* equations for a suitable isomonodromic deformation problem, and we comment on its M-theory origin. The solution to these equations provides new recursion relations for instanton counting for all simple groups from A to E. The uplift to 5d is a discrete flow generated by automorphisms of the associated BPS quiver. We show that for a class of theories, the 4d reduction of these discrete flows displays an intriguing new relation with Argyres-Douglas SCFTs.

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