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Excitation transport in open quantum systems: the role of environmental correlations. MOHAN SAROVAR, YUAN-CHUNG CHENG, BIRGITTA WHALEY, University of California, Berkeley — The recent discovery of quantum coherent phenomena in photosynthetic complexes [Engel et.al., Nature, 446, 782 (2007), Lee et. al., Science, 316, 1462 (2007)] has prompted several studies into the efficiency of transport processes in open quantum systems. Several of these studies have revealed a subtle interplay between coherent and decoherent dynamics in the overall efficiency of transport in these open systems. Some have shown that decoherence can improve efficiency. However all studies have used simple uncorrelated models of decoherence that are not accurate for photosynthetic complex environments, which are known to be spatially and temporally correlated. In this work we investigate the role of environmental correlations in quantum transport in open systems and show that the exact nature of the correlations can have a large impact on the efficiency of energy harvesting. We illustrate our results using the Fenna-Matthews-Olsen photosynthetic complex.

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