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Simulating laser speckle dynamics that result from surface evolution WILL WARREN, ERIK MORO, MATTHEW BRIGGS, Los Alamos National Laboratory — In Photon Doppler velocimetry (PDV), motion along a laser beam's axis is quantified via frequency shifts in the backscattered light. The local intensity of the backscattered field varies spatially due to interference between coherent reflections. The randomly arranged bright and dark regions that result from this interference are commonly referred to as laser speckles. As a consequence of surface evolution, new microfacets become illuminated and the speckle pattern changes. While strain-induced speckle dynamics have been experimentally observed, little work has been done towards understanding the direct relationships between surface evolution and quantifiable speckle properties. We present a computational model that simulates the scattering of electromagnetic waves off of a rough surface and that simulates conditions inherent to PDV experiments. The results contribute to our understanding of how surface evolution relates to the speckle dynamics measured in PDV.

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