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Correlating Anomalous Diffusion with Membrane Obstacle Structure Using Single Molecule Tracking and AFM[1] MICHAEL SKAUG, MARJORIE LONGO, ROLAND FALLER, UC Davis — Anomalous diffusion has been observed abundantly in the plasma membrane, but the underlying mechanisms are still unclear. In general, it has not been possible to directly image the obstacles to diffusion in membranes, so the dynamics of diffusing particles are used to deduce the obstacle characteristics. We present a supported lipid bilayer system in which we characterized the anomalous diffusion of lipid molecules using single molecule tracking, while at the same time imaging the obstacles to diffusion with atomic force microscopy. To explain our experimental results, we performed lattice Monte Carlo simulations of tracer diffusion in the presence of the experimentally determined obstacle configurations. We correlate the observed anomalous diffusion with obstacle area fraction, fractal dimension and correlation length. We further discuss our results in the context of confinement models and the generating stochastic process.

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