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Slow spin dynamics in a 2D dipolar spin ensemble on the surface of diamond ALEXANDER SUSHKOV, Boston University, KRISTINE REZAI, Boston University, Harvard University, SOONWON CHOI, Harvard University, PHILLIP WEINBERG, Boston University, EMMA ROSENFELD, MIKHAIL LUKIN, Harvard University — We observe remarkably slow local spin dynamics in a two-dimensional disordered many-body dipolar spin system, formed by naturally-occurring electronic spins on the surface of a diamond crystal. Shallow NV centers are used to access individual spins, or small spin sub-ensembles. Effective disorder and spin-spin interactions can be controlled by driving the spin system. Local spin diffusion is suppressed by up to a factor of 100, compared to the timescale given by the spin-spin interactions. This slow-down of spin relaxation can dramatically improve the sensitivity of nanoscale-resolution field sensing.

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