The NV center in diamond is one of the most promising system in emerging quantum technologies. In particular, NV magnetometry shows impressively high-resolution magnetic field imaging and record-high sensitivities. To improve on the latter aspect, larger densities of NV centers are required, which ultimately comes at price: as the density grows, depolarization mechanisms appear which, in turn, lowers the sensitivity. In this manuscript we uncover important depolarization mechanisms with dipolar interacting ensembles in closely packs NV centers. Moreover, we actually harness these mechanisms to realise a new efficient and robust magnetometer.