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Anomalous Hall effect in the Presence of Strong Spin-orbit Coupling and Non-trivial Magnetization JIANPING LIU, HUAWEI GAO, JACOB GAYLES, ARTEM ABANOV, JAIRO SINOVA, Texas A&M University — AHE in ferromagnets with strong spin-orbit coupling (SOC) and homogeneous magnetization has been studied extensively, using both Kubo formalism and semi-classical Boltzmann equation. In the opposite limit of weak SOC in the presence of non-trivial magnetization texture and strong exchange coupling with the carriers (adiabatic limit), the electron spins always align themselves with the direction of the local magnetization and they experience an effective magnetic field arising from this non-trivial magnetization, giving rise to the topological anomalous Hall effect. We study here the transition between the two limits and the joint effect that a strong SOC and non-trivial magnetic textures have on the AHE. We will report on results from both perturbative analytical approaches and bulk numerical simulations. Some of these effects may be present and exploited in current induced manipulation and detection of domain walls.

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