Alternative approach to the flux motion in high temperature superconductors

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The commonly accepted picture of the magnetic flux motion in high temperature superconductors is extremely complex. This complexity arises from the apparent inability of the simple Kim–Anderson approach for explaining experimental results. However, a serious reconsideration of available data indicates that this may not really be the case. In my talk I consider the following aspects of the flux motion:

1. It will be shown that the low–temperature flux–creep data may perfectly well be described by the Kim–Anderson approach, if a realistic profile of the pinning potential is taken into account. Furthermore, one may use measurements of flux–creep rates in order to reconstruct the profile of the pinning potential well in real space.
2. It will be shown that very specific features that manifests the flux creep process and which are usually related to the irreversibility line and the vortex–glass transition, not only may be explained by the Kim–Anderson approach, but are direct consequences of this simple model.
3. Using a very general approach to the Ginzburg–Landau theory, we have developed a simple scaling procedure which allows to extract the temperature dependence of the upper critical field from the isothermal magnetization measurements. Quite surprisingly, the analysis of existing experimental data shows that the temperature dependencies of H_{C2} are practically identical for all families of high temperature superconductors.

We consider the possibility that the mixed state in magnetic fields close to H_{C2} may consist from separated superconducting filaments instead of Abrikosov vortices.