Garland *et al.* Respond: The primary criticism of the preceding Comment by Gray[1] is that the relaxation term in the model of Garland and VanHarlingen[2] (GV) violates a principle of flux conservation. We do not believe that any conservation law conflicts with the GV model, which pertains to thin superconducting films in the resistive temperature regime between T_c and T_{c0}. In this regime, there is no long-range phase coherence because the order parameter is dominated by continual random phase-slip events.

The magnetic flux in the GV model arises from a shift in the thermally excited vortex distribution, resulting in an imbalance in the vortex-antivortex population. Because the nonequilibrium vortices return to equilibrium by diffusing a distance of order $v_d \tau_f \approx 0.1$ Å, GV characterize this process by a local relaxation *Ansatz.*

We agree with Gray that this mode does not involve vortex-antivortex recombination, but we do not agree that it is forbidden by flux conservation considerations. However, the phenomenological treatment of this process is clearly a shortcoming of the GV model and suggests the need for a more fundamental understanding of vortex relaxation.

Gray also proposes an interpretation of the data of Lee, Rudman, and Garland[3] (LRG) that is an extension of a vortex edge injection model by Gray, Brorson, and Bancel.[4] According to Gray, the measured flux could result from the asymmetric unbinding of current-induced edge vortices.

We do not believe that the Gray model is applicable to the LRG experiment. The LRG experiment measures magnetic flux and is insensitive to the location of vortex cores (a negligible flux is associated with circulating vortex currents). In particular, the experiment would not detect the depinning of self-field–induced vortices at the sample edges. Instead, the experiment would respond to the current-induced flux whose spatial variation is governed by the current distribution in accord with Maxwell's equations. For the thin-film samples used in the experiment, however, the flux arising from the current distribution has a dipolelike distribution with a spatial average of zero.

Additionally, an intrinsic feature of the Gray self-field model is that it produces quadratic (or higher) I-V power-law behavior, one factor of I coming from the flux flow of the vortices and the other from the fact that the vortex density is itself proportional to I. In contrast, linear I-V characteristics are actually observed in all of the LRG data. Further, no evidence of a depinning current threshold or magnetic field threshold was found (H_{c1} for the LRG samples is of the order of 10^{-6} G), as might be expected for an edge barrier arising from the condition of the sample edges. Finally, an asymmetrical injection rate resulting from the unequal temperatures of the sample edges would result in a flux that varied exponentially with temperature difference ΔT. Although Gray believes that the linear ΔT response seen in the LRG samples is simply the leading term in this exponential process, such a conclusion is not warranted by the data; at large values of ΔT, the measured flux falls below a linear response, instead of increasing more rapidly than linear, as one would expect for activated behavior.

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