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Patterns of foliation drag near walls of reoriented dykes

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Abstract. Drag patterns of foliation are graphically constructed around very competent dykes under bulk strain of pure shear, simple shear and a combination of pure shear and simple shear. Four different types of drag patterns may be produced, depending on the nature of the bulk deformation and the initial orientations of the dyke and the foliation. The drag pattern can be symmetric or asymmetric, inward curving or outward curving. Both the magnitude and the sense of drag may vary along a dyke wall. A uniform sense of drag develops all along a dyke wall only in certain special situations. The type of foliation drag near a dyke may give us a rough idea of the nature of bulk deformation and the relative orientations of the dyke and the foliation with respect to the bulk strain axes.

Keywords. Drag pattern foliation; dyke; pure shear; simple shear.

1. Introduction

Gneissic terranes often contain mafic dykes of several generations. The dykes may be emplaced more or less syntectonically with respect to a certain phase of deformation and reoriented in continuation of the same deformation. On the other hand, in areas of polyphase deformations, a set of early dykes may be deformed in a later phase of deformation. Mafic dykes usually show a strong rheological contrast with the host gneiss. Although intense deformation may finally produce a broad concordance between the gneissic foliation and the deformed dykes, their initial discordant nature may be preserved in some places. A consequence of the occurrence of the discordant dykes is a change in orientation of the gneissic foliation near the walls of the dykes (Sengupta 1993). In certain instances this foliation drag may be so intense that the swerving foliation of the host gneisses becomes subparallel to the dykes along narrow zones near their walls.

The magnitude of drag near the dyke wall will depend upon the rheological contrast between the dyke and the host gneiss. Evidently, in the absence of a competent contrast, the orientations of the gneissic foliation near the dyke and away from the dyke will be identical, and there will be no foliation-drag. The drag patterns develop because the competent dyke deforms to a smaller extent than a dyke-parallel passive marker line occurring within the gneiss. The following discussion will consider the situation in which the dyke behaves as an extremely competent body, so that, in comparison with the incompetent gneissic host, it behaves more or less as a rigid body.