Goethite and hematite below the Morin transition show a spin flop when subjected to high magnetic fields. For the phenomenon to be observed the field must be parallel to the magnetization direction in the crystal, i.e., parallel to the c-axis for hematite below the Morin transition or the b-axis in goethite. At 80 K this field is 6.8 Tesla for crystalline hematite (Blum et al., 1965) while for goethite a field of ~20 Tesla was determined by Coey et al. (1995). For goethite, the temperature dependence of the spin-flop field is only inferred from extrapolation of the 4 K data and estimated to c. 35-40 Tesla, well within the range of 57 Tesla used in earlier high-field anisotropy determinations performed by us. Magnetic history effects may therefore bias the measurements. To investigate the potential influence of the spin flop an oriented highly crystalline goethite aggregate was subjected to pulsed magnetic fields up to 57 Tesla at several temperatures ranging from 4 K to 300 K enabling its actual measurement for the first time. This was done at the French national facility for high magnetic fields in Toulouse. The measured spin flop field values behave in reasonable accord with some of the theoretical extrapolations. Intriguingly, when misorienting the sample a smeared spin-flop-field distribution is the result and not a smaller jump in magnetization at the same field as is the case in a perfectly oriented sample.

Blum et al., 1965, J. Appl. Phys., 36, 1169
Coey et al., 1995 J. Phys. Cond. Matt, 7, 759