

**Title:** Supplementary Movie 1

**Description:** Zero-field cooling spin dynamics with the magnetisation projected along (left)  $M_x$  and (right)  $M_z$  components. All interactions included in Eq. 1 are considered except DMI which is set to zero ( $|A_{ij}| = 0$ ).

**Title:** Supplementary Movie 2

**Description:** Spin dynamics along the (left) in-plane  $M_x$  and (right) out-of-plane  $M_z$  components of the magnetisation after laser excitation at  $0.03 \text{ mJ cm}^{-2}$  on CrGeTe<sub>3</sub>.

**Title:** Supplementary Movie 3

**Description:** Similar as movie S1 but at a fluence of  $0.06 \text{ mJ cm}^{-2}$ .

**Title:** Supplementary Movie 4

**Description:** Similar as movie S1 but at a fluence of  $0.14 \text{ mJ cm}^{-2}$ .

**Title:** Supplementary Movie 5

**Description:** Similar as movie S1 but at a fluence of  $0.20 \text{ mJ cm}^{-2}$ .

**Title:** Supplementary Movie 6

**Description:** Similar as movie S1 but at a fluence of  $0.30 \text{ mJ cm}^{-2}$ .

**Title:** Supplementary Movie 7

**Description:** WFKM measurements (as in Supplementary Fig.4) with the out-of-plane magnetic field applied by an air-core electromagnetic coil. The movie shows the evolution of the domain structure within the field range  $-74 \text{ mT}$  to  $+36 \text{ mT}$ . The images in the movie are  $25 \times 25 \text{ mm}$ .

**Title:** Supplementary Movie 8:

**Description:** The domain structure evolution during the magnetization reversal from  $-H$  ( $-250 \text{ mT}$ ) to  $+H$  ( $+250 \text{ mT}$ ) (red circles in Supplementary Fig.5).