SUPPLEMENTARY DATA

Table T-1. sampling locations

dredge number	latitude, deg. N*	longitude, deg. W*	depth, mbsl*	geological structure
L2612	10.708	41.570	5195	Vema Transform Fault
L30-277	13.027	44.869	4089	OCC 13°N
L32-101	13.570	44.916	3407	OCC 13°30′N
1514	12.593	44.516	4116	Ashadze complex
1491	12.990	44.906	3300	Ashadze complex

*dredge track start points

OCC – oceanic core complex (see text).

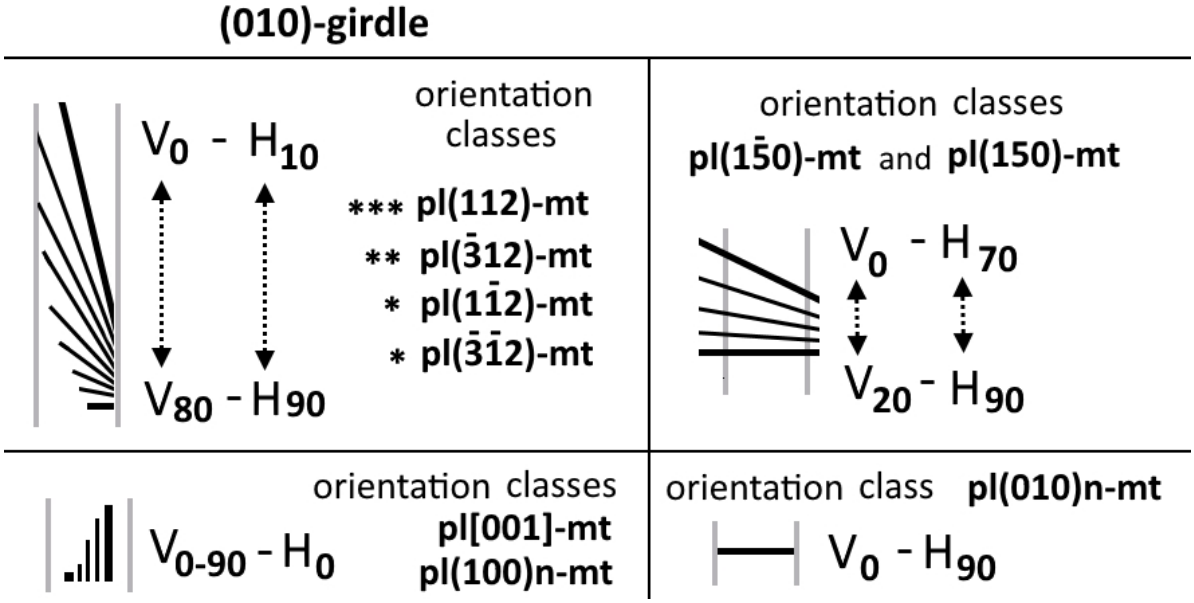


Figure S-I. Determination of the orientation classes in petrographic thin sections.

In cuts, where the albite twin boundaries are approximately perpendicular to the thin section plane the albite twin boundaries are very thin. In these sections the identification the different inclusion orientation classes that play a role in the formation of magnetic anisotropy is possible based on the angular relations of the magnetite needles with the plane of the albite twin boundary (vertical angle) and with the plane of the thin section cut (horizontal angle).

The needle-shaped magnetite micro-inclusions are represented by the black lines. The length of the lines is inversely proportional to the tilt of the inclusions relative to the surface of

the thin section. The cut with the albite twin boundary which is perpendicular to the thin section is represented by the vertical gray lines:

1. For the inclusions of pl(112)-mt, pl(-312)-mt, pl(1-12)-mt and pl(-3-12)-mt classes, the horizontal angle H=10º, when the vertical angle V=0º, and the horizontal angle H=90º, when the vertical angle V=80 º. All possible orientations lie between these two orientations: the vertical (V) angle changes from 0 º to 80 º, the horizontal angle (H) changes from 10 º to 90 º (dashed lines with arrows). The angles H and V have positive correlation. The number of stars indicates the relative abundance of the orientation class of the micro-inclusions. The micro-inclusions belong to the (010)-girdle.

2. The pl(150)-mt and pl(1-50)-mt inclusions always are sub-horizontal with vertical angle (V) from 0º to 20º, and have a large horizontal angle (H) from 70º and 90º with the twin boundary. The angles H and V show positive correlation. The two types of the micro-inclusions often intersect the albite twin boundaries and are observed at about similar proportions.

3. The pl[001]-mt and pl(100)n-mt micro-inclusions are parallel to the albite twin boundaries (H=0º). They change vertical (V) angle from 0º to 90º. The pl[001]-mt class is more abundant than the pl(100)n-mt class. The micro-inclusions belong to the (010)-girdle.

4. The pl(010)n-mt micro-inclusions are rare in the plagioclase of oceanic gabbro. They are horizontal and perpendicular to albite twin boundaries (V=0, H=90).

Note, the image does not reveal the mutual orientations between the micro-inclusions. The angles are rounded to nearest ten.

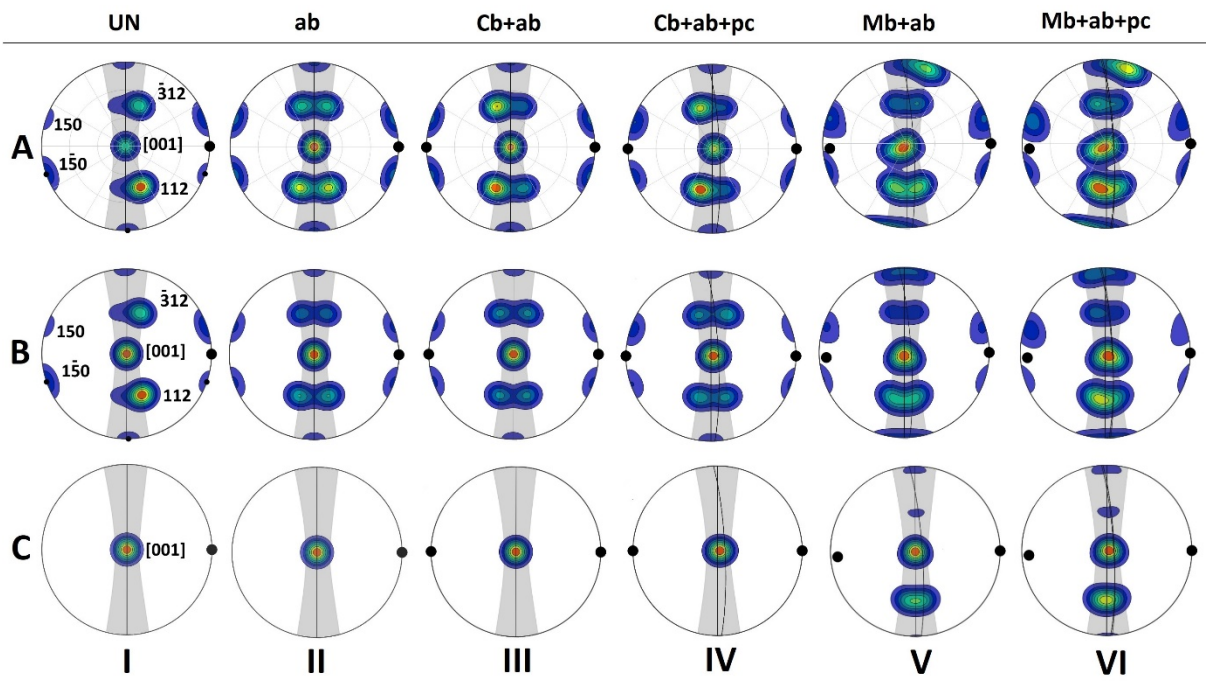


Figure S-II. Schematic plots of orientation distributions showing simulated statistical distributions (halfwidth 30 º) of the magnetite needle orientations in plagioclase with different combinations of twinning (Ab - Albite, p - pericline, Cb – Carlsbad, Mb – Manebach, UN - untwinned). In the first row (A) only the dominating "plane-normal" orientation class of magnetite micro-inclusions is considered. In the second row (B), both, the "plane-normal" and the pl[001]-mt orientation classes are considered. In the third row (C) only the pl[001]-mt orientation class is considered. The proportion of the inclusions pertaining to the different orientation classes are shown in Table 1. The 30º-girdle parallel to the pl(010) plane (gray areas) comprises the micro-inclusions oriented perpendicular to the pl(112), pl($\bar{3}$12), pl(100), pl(1$\bar{1}$2), pl($\bar{3}\bar{1}$2), and along the pl[001] direction.

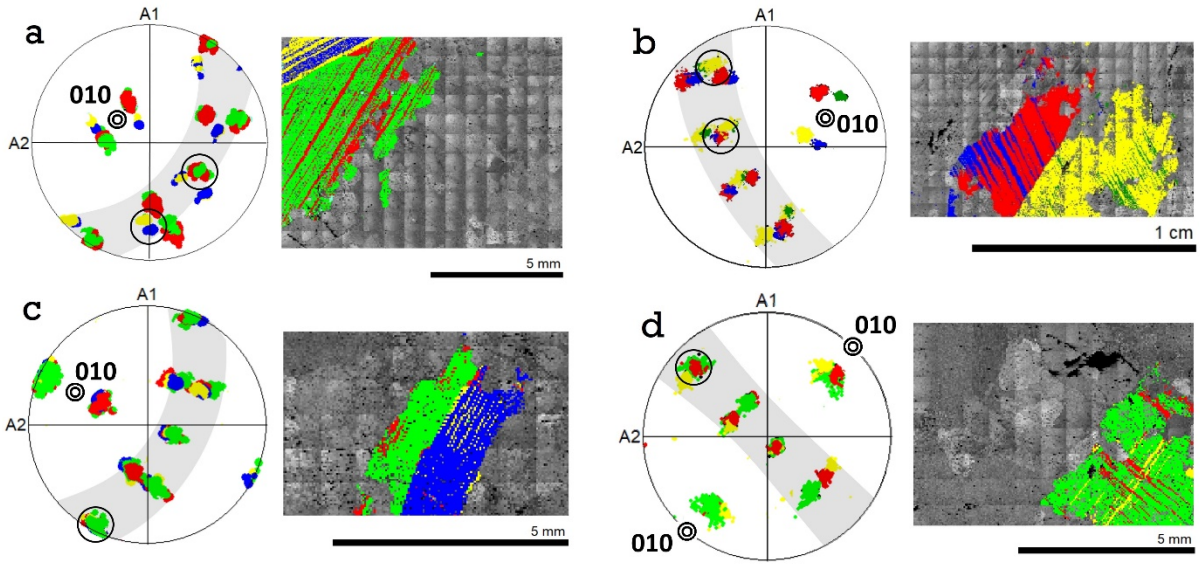
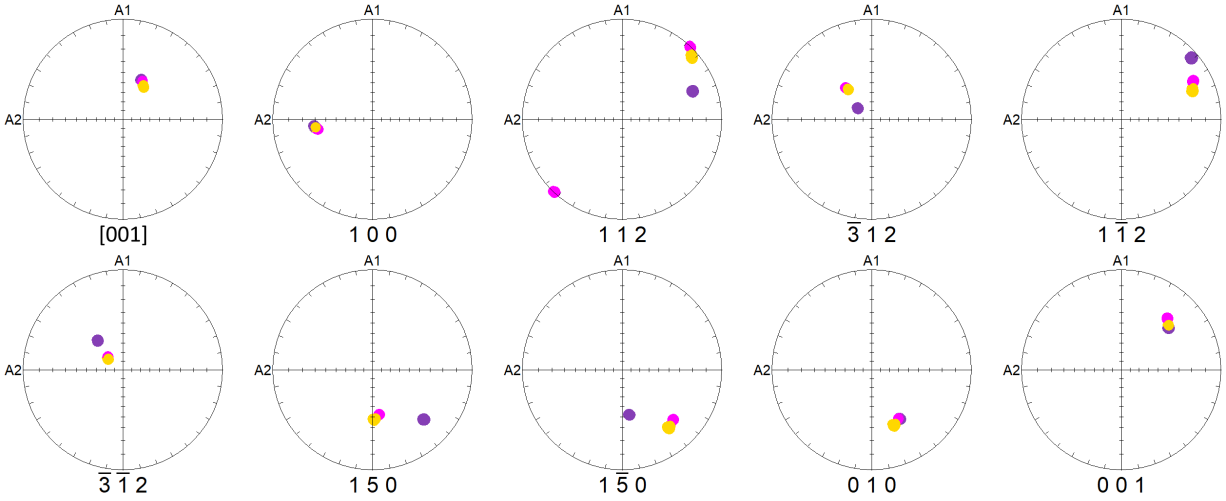
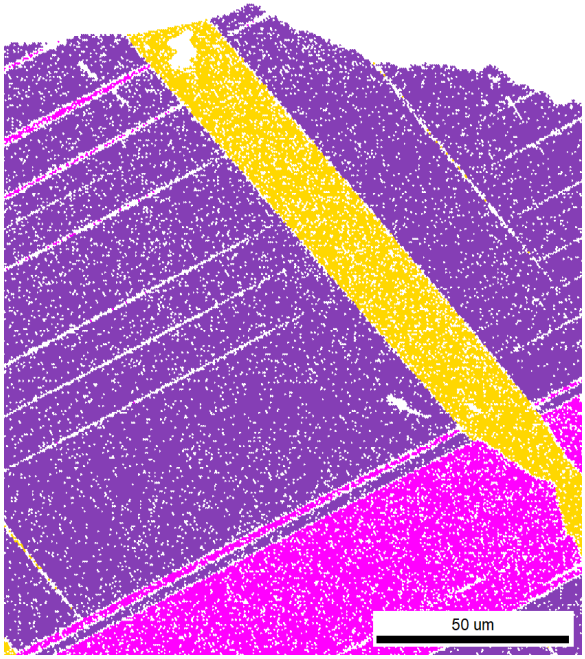
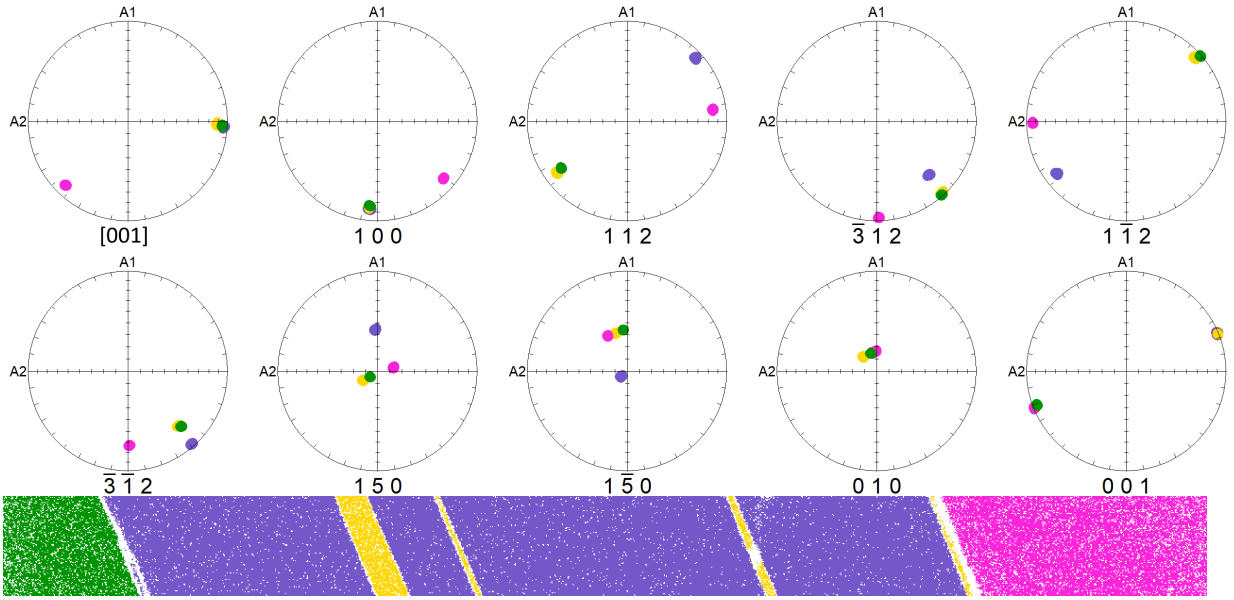


Figure S-III. Pole figures showing the poles of the plagioclase planes (EBSD data), which correspond to the elongation directions of the needle-shaped magnetite micro-inclusions of all eight orientation classes and orientation maps corresponding to these orientations. The plagioclase grains are twinned after the Manebach and Albite laws (a, b); Carlsbad and albite laws (c); and Pericline and Albite laws (d). The "30-degree girdles" containing the elongation directions of the majority of the oriented micro-inclusions are shaded in gray. The double circles indicate the poles of the pl(010) plane.


A1
A2
[001]
1 0 0
1 1 2
$\bar{3}$ 1 2
1 $\bar{1}$ 2
$\bar{3}$ 1 $\bar{2}$
1 5 0
1 $\bar{5}$ 0
0 1 0
0 0 1


50 um

a.



b.

Figure S-IV. Stereographic projections (upper hemisphere) showing the poles of plagioclase lattice planes and directions including those corresponding to the elongation directions of the magnetite inclusions and planes, and orientation maps corresponding to these projections. (a) Sample 1514-17. The plagioclase grain is twinned after the Albite law (highlighted by purple and magenta colors) and by the Pericline law (yellow). See also Figure 9 (a- c). (b) Sample 1491-10. The plagioclase grain is twinned after the Manebach law. One Manebach twin is highlighted by magenta color, another one is twinned after the Pericline law (purple and yellow colors), and the Pericline + Albite law (green). See also Figure 9 (d- f).