DI-flux measurement of the geomagnetic field using a three-axial fluxgate sensor

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Abstract: In geomagnetic observatories DI-flux measurements are the commonly used instruments for absolutely determining the Earth's magnetic field components. Introduced in the late 1980s, these instruments traditionally consist of a non-magnetic theodolite equipped with a single-axis fluxgate sensor. Angles of magnetic field declination and inclination are taken in positions where the fluxgate signal is zero. Nowadays, three-component fluxgate sensors are available small enough to fit on the telescope of a theodolite and able to measure the full range of the Earth's magnetic field with adequate linearity. By replacing the single-axis fluxgate sensor by a three-axial system, additional magnetic information can be used to improve the absolute measurement significantly without changing the standard procedure. The rotation of the fluxgate sensor allows us to calibrate and align the fluxgate sensor completely. Therefore, each of the angle readings provides the complete field vector in the geographic reference system which leads us to a welcome high number of single absolute measurements. This can be used to simplify the measurement procedure, to eliminate systematic effects or to suppress the random measurement error.

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