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Embedded north-seeker for automatic absolute magnetic DI measurements

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In magnetic observatory Earth magnetic field is recorded with a resolution of 0.1nT for 1min sampling (new standards impose 1pT for 1s sampling). The method universally adopted for measuring it is a combination of three instruments. Vectorial magnetometer (variometer) records variations of the three components around a reference value or a baseline. A proton or an overhauser magnetometer is an absolute instrument able to measure the modulus of the field and used to determine the F component baseline of the variometer. The declination and inclination baselines require a manual procedure to be computed. An operator manipulates a non-magnetic theodolite (also called a DIFlux) to measure the D and I angles in different configurations with a resolution of a few arcsec.

The AutoDIF is a non-magnetic automatic DIFlux using the same protocol as the manual procedure. The declination defined according to the true north is determined by means of a target pointing system. Even if the technique is fast and accurate, it becomes problematic in case of unmanned deployment. In particular the area between the target and the DIFlux is out of control. Snow storm, fog, vegetation or condensation on windows are examples of perturbation preventing for finding the target. It is obvious in case of (future) seafloor observatories.

A FOG based north-seeker has been implemented and mounted on the AutoDIF. The first results using a low cost gyro don't meet the Intermagnet specifications yet but are however hopeful. A 0.1° standard deviation has been reached and statistically reduced to 0.01° after less than two days in laboratory. The magnetic disturbance of the sensor is taken into account and compensated by the measurement protocol.