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High stability integrated Tri-axial fluxgate sensor with suspended technology

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The relative geomagnetic record of China Geomagnetic Network of China(GNC) has been digitized, network, meanwhile achieving second data acquisition and storage during after 9th five-year and 10th five-year plan upgraded. Currently the relative record in geomagnetic observatories are generally two sets of the same type instrument with parallel observation, which could distinguish the differential between observation instrument failures and environmental interference, and ensure the continuity and integrity of the observation data. Fluxgate magnetometer has become mainstream equipment for relative geomagnetic record because of its low noise, high sensitivity, and fast response.

There is a problem about data inconsistency by the same type of instrument in the same station though few years observation data analysis. The researchers have done a lot of experiments and found three main error sources:1. The instrument performances, due to the limitation of manufacturing and assembly process level it is difficult to ensure the orthogonality of the instrument; other performances of scale, zero offset and temperature coefficient; 2. horizontal error, which introduced by the initial installation process due to horizontal adjustment and pillar tilling due to long-term observations; 3.The observation environment, the temperature and humidity, power supply system.

The new fluxgate magnetometer uses special nonmagnetic gimbaled (made by beryllium / bronze material) construction for suspension, so the fluxgate sensor is fixed at the suspended platform in order to automatically keep the horizontal level. The advantage of this design is to eliminate horizontal error introduced by the initial installation process due to horizontal adjustment and pillar tilling due to long-term observations. The signal processing circuit board is fixed on the top of the suspended platform with certain distance to ensure the static and dynamic magnetic field produced by circuit board no effect to the sensor, so we could get flexible instrument due to signal attenuation resulting signal transmission cable limited length.