Kandilli Observatory and Earthquake Research Institute

Geophysics Department - Geomagnetism Laboratory

The **IZN Geomagnetic Observatory**, operated within the **Geomagnetism Laboratory of the Geophysics Department at Kandilli Observatory and Earthquake Research Institute (KOERI)**, monitors the Earth's magnetic field. Our observatory has been a **member of INTERMAGNET** since 2007, fulfilling its rigorous membership requirements. The total magnetic field and its components are recorded at **one-second intervals**. Absolute measurements are conducted **at least twice a week**. Definitive magnetic field values are calculated within **the first six months of the new year** and shared with INTERMAGNET and shared with INTERMAGNET. As with all other observatories, the data from IZN is transmitted to the INTERMAGNET center in **near real-time (updated every 15 minutes)**. Additionally, we **publish our data near real-time on our website** and provide monthly bulletins.

Purpose of Geomagnetic Observatories

The primary aim of geomagnetic observatories is to **continuously observe, measure, and analyze** the Earth's magnetic field. These observatories contribute to scientific research and applications by studying **temporal and spatial variations** in the geomagnetic field.

Using the data from **IZN Geomagnetic Observatory**, we:

- **Record long-term variations** in the Earth's magnetic field (secular variation) and **short-term fluctuations** (storms and pulsations).
- **Monitor the impact of solar wind and geomagnetic storms** on the Earth's magnetic field.
- **Provide data for global geomagnetic models** such as the **International Geomagnetic Reference Field (IGRF)**.

Recent discussions on social media have suggested that **geomagnetic observatory data can be used for earthquake prediction**. Given these claims, we would like to clarify some key scientific facts regarding the role of magnetic data in earthquake studies.

Earthquake prediction is one of the most complex and challenging areas of Earth sciences. Earthquakes result from **complex geodynamic processes**, and fully understanding these processes requires an **interdisciplinary approach** that integrates data from multiple scientific fields. **While magnetic data can**

provide valuable insights into geomagnetic variations, it is insufficient on its own for reliable earthquake forecasting.

Sources of Magnetic Field Variations

The Earth's magnetic field is influenced by **both internal and external sources**:

- **Core Dynamics:** The primary magnetic field is generated by the **geodynamo action** in the Earth's **liquid outer core**, causing **long-term secular variations**. Accurate monitoring of these variations requires **long-term, continuous data from fixed geomagnetic observatories**.
- **Ionospheric and Magnetospheric Effects: Solar activity and geomagnetic storms** significantly impact the measured magnetic field. Notably, we are currently experiencing the **maximum phase of Solar Cycle 25**, leading to **frequent and intense geomagnetic disturbances**.
- **Crustal Magnetic Anomalies:** Magnetic properties of rocks **vary along fault zones, volcanic regions, and ore deposits**, contributing to localized anomalies.

Given these diverse influences, directly correlating **magnetic field changes** with earthquakes is highly **challenging** and requires careful analysis.

Geomagnetic Anomalies and Earthquakes

Some studies suggest that **minor magnetic fluctuations** may precede major earthquakes. However:

- **Inconsistent Findings:** While some anomalies have been observed before earthquakes, **they do not occur consistently** in all cases.
- **External Interference: Solar wind and geomagnetic storms** can obscure earthquake-related magnetic signals, making accurate interpretation difficult.
- **Lack of Reproducibility:** Magnetic anomalies detected in one region may **not appear in another** before an earthquake, making it difficult to establish a **universal predictive model**.

Instead of relying solely on **magnetic data**, earthquake prediction must integrate **multiple geophysical and geochemical parameters**.

In summary; Geomagnetic observatories are **not established for earthquake prediction**. Their primary mission is to **monitor and analyze** the Earth's magnetic field for scientific and practical applications. While magnetic variations may contribute to a better understanding of geodynamic processes, predicting earthquakes requires **interdisciplinary collaboration** and the integration of diverse datasets.

Sincerely,

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