



# INDONESIAN GEOMAGNETIC MODEL

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**Abstract.** As has been done by some countries on geomagnetic calculator. Using primary data from BMKG or Meteorological Climatological and Geophysical Agency of Indonesia, we'd like to make a geomagnetic calculator especially in Indonesia which we call Indonesian Geomagnetic Model. The data used is the geomagnetic epoch 2010, International Geomagnetic Reference Field (IGRF), and the result of geomagnetic survey in 2012 and 2013 as data validation. Compared with the used geomagnetic calculator from other countries at some location, the result of the geomagnetic data computation from Indonesian Geomagnetic Model more accurate for Indonesian region. The result of the geomagnetic calculator will be more thoroughly if the primary data used more dense as well as the quality data that can be accounted. As an example, with a comparison of accuracy for the total intensity (F) components is 37 nT versus 49 nT, and for inclination (I) components is 3.5 minutes versus 3.6 minutes. This is probably due to the structure of the first parts of Indonesia is tectonic overwhelmed by IGRF models, and the second is the least number of stations used by the IGRF.

**Keywords:** BMKG, IGRF, calculator and geomagnetic.

## INTRODUCTION

- Accurate geomagnetic field is important in many fields ranging from navigation, mineral exploration to defense.
- In Indonesia, in compliance with IAGA resolutions no. 23/1963 and 9/1995, BMKG conducted extended survey every five years since 1985.
- As the quality of IGRF increases, the accuracy of geomagnetic field calculator data from IGRF model increases too. There is a question whether regional geomagnetic model derived from measurements at repeat stations is still required.

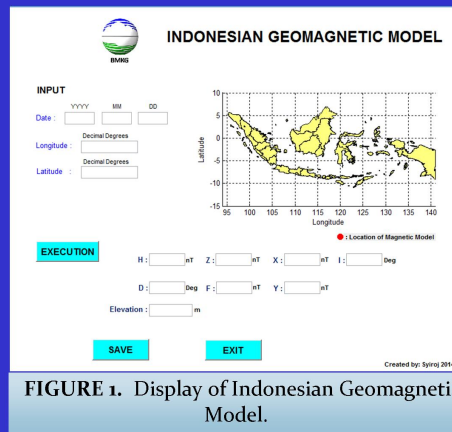


FIGURE 1. Display of Indonesian Geomagnetic Model.

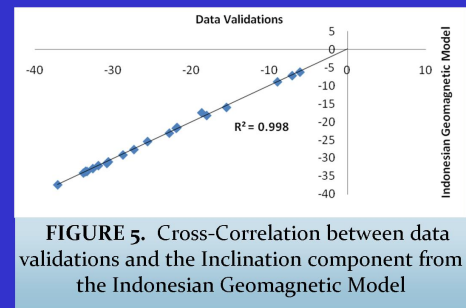


FIGURE 5. Cross-Correlation between data validations and the Inclination component from the Indonesian Geomagnetic Model

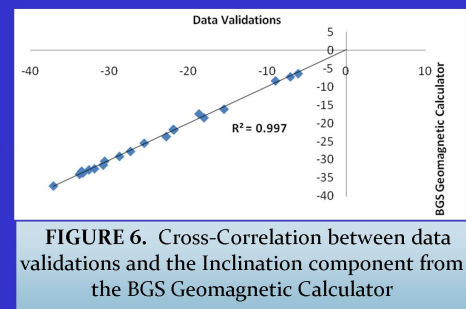


FIGURE 6. Cross-Correlation between data validations and the Inclination component from the BGS Geomagnetic Calculator

## METHODOLOGY

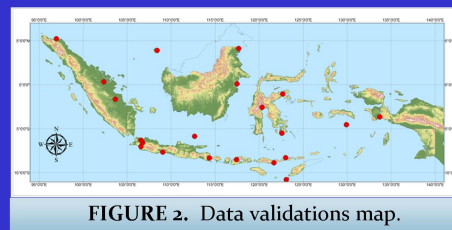
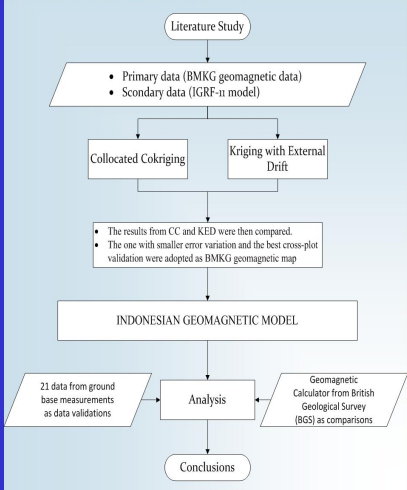


FIGURE 2. Data validations map.

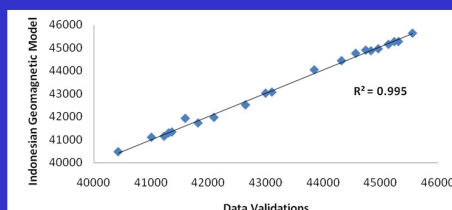


FIGURE 3. Cross-Correlation between data validations and the Total Intensity component from the Indonesian Geomagnetic Model

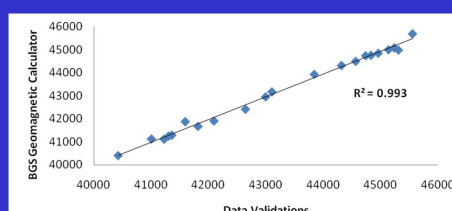


FIGURE 4. Cross-Correlation between data validations and the Total Intensity component from the BGS Geomagnetic Calculator

## RESULTS

Indonesian Geomagnetic Model have better cross-correlation with 21 data validations from ground base measurement than geomagnetic calculator result data from BGS at all components (total intensity, declination, and inclination).

## CONCLUDING REMARKS

- Indonesian Geomagnetic Model has more accurate to compute geomagnetic data than the Geomagnetic calculator from other countries for Indonesia region, the ratio between the accuracy or error rate calculator magnetic field data for total intensity component (F) 37 nT versus 49 nT with correlation 0.9957 versus 0.9937, and for Inclination components (I) 3.5 minutes versus 3.6 minutes with correlation 0.9985 versus 0.9975.
- The first possibility it is caused by the tectonic structure of Indonesia that is not overwhelmed by IGRF models, and the second is the least number of ground base stations used by IGRF in Indonesian region.

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