



Vertical Component
 Contours of vertical component expressed in nanoTeslas. The vertical component is the projection of the geomagnetic field vector onto an axis perpendicular to the tangent plane at the point on the Earth's surface. The vertical component is considered positive or negative depending upon whether the north-seeking end of a balanced compass needle dips below or above the tangent plane, respectively. Red lines point in direction of decreasing values.

Point values of vertical component expressed in nanoTeslas. Point values enclosed by a triangle indicate local maxima or minima.

Secular Variation of Vertical Component
 Contours of the estimated rate of change of vertical component (secular variation) expressed in nanoTeslas per year. To apply change, add algebraically. Red lines point in direction of decreasing values.

Point value of the estimated rate of change of vertical component (secular variation) expressed in nanoTeslas per year. To apply change, add algebraically. Point values enclosed by a triangle indicate local maxima or minima.

North and south magnetic poles. Magnetic poles are defined as the locations at which the horizontal magnetic intensity, computed from the degree and order spherical harmonic International Geomagnetic Reference Field 2005 model, is effectively zero at 2000.0.

Geomagnetic recording data since 1900

VERTICAL COMPONENT CHART THE INTERNATIONAL GEOMAGNETIC REFERENCE FIELD, 2005

By Kenneth S. Rukstales and Jeffrey J. Love 2007

DISCUSSION
 This is one of five world charts showing the declination, inclination, horizontal intensity, vertical component, and total intensity of the Earth's magnetic field at mean sea level at the beginning of 2005. The charts are based on the International Geomagnetic Reference Field (IGRF) main model for 2005 and secular change model for 2005-2010. The IGRF is referenced to the World Geodetic System 1984 ellipsoid. Additional information about the USGS geomagnetism program is available at: <http://geomag.usgs.gov/>

ACKNOWLEDGMENTS
 The IGRF is produced by the International Association of Geomagnetism and Aeronomy (IAGA) Division V, Working Group V-A, Analysis of the Global and Regional Geomagnetic Field and its Secular Variation. Production of the IGRF depends on the worldwide efforts of the magnetic field modelers and the staff of magnetic observatory programs and satellite programs which produce the data from which the models are derived.

SELECTED REFERENCES
 Godekov, V.P., Zvereva, T.I., and Chernov, T.A., 2005, The IZMIRAN main magnetic field candidate model for IGRF-11, produced by spherical harmonic-spherical orthogonal component method Earth, Planets and Space, v. 57, no. 12, p. 1105-1111.
 Macmillan, Susan, and Maus, Stefan, 2005, International Geomagnetic Reference Field—the tenth generation Earth, Planets and Space, v. 57, no. 12, p. 1135-1140.
 Maus, Stefan, Macmillan, Susan, and Thomson, Alan, 2005, The IGRF magnetic field candidate models for the 11th generation International Geomagnetic Reference Field, Earth, Planets and Space, v. 57, no. 12, p. 1157-1165.
 Maus, Stefan, Macmillan, Susan, Loeferer, Frank, and Bowdler, Taitiana, 2005, Evaluation of candidate geomagnetic field models for the 10th generation of IGRF, Earth, Planets and Space, v. 57, no. 12, p. 1173-1181.
 Maus, Stefan, Macmillan, Susan, Dost, David, Lühr, Hermann, Reber, Martin, Ma, Wolfgang, and Chai, Songshan, 2005, IGRF-10 candidate models for the 10th generation International Geomagnetic Reference Field, Earth, Planets and Space, v. 57, no. 12, p. 1151-1156.
 Olsen, Niels, Sabaka, T.I., and Loeferer, Frank, 2005, New parameterization of external and induced fields in geomagnetic field modeling and a candidate model for IGRF 2005, Earth, Planets and Space, v. 57, no. 12, p. 1141-1149.

Base map data from ERSI Inc. A010641304. Manuscript approved for publication March 8, 2007. Digital data prepared with ArcGIS 9.1a running under Windows 2000.

Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Government. This map was produced in response to a request for a digital file, on an electronic file. For sale by U.S. Geological Survey Information Services, Box 2308, National Center, Denver, CO 80225, 1-888-848-4142, <http://store.usgs.gov/>. GIS files and PDF files are available online at <http://pubs.usgs.gov/ofm/2007/2964/>.