

Telluric current

From Wikipedia, the free encyclopedia

A **telluric current** (from Latin *tellūs*, "earth"), or **Earth current**,^[1] is an electric current which moves underground or through the sea. Telluric currents result from both natural causes and human activity, and the discrete currents interact in a complex pattern. The currents are extremely low frequency and travel over large areas at or near the surface of the Earth.

Contents

- 1 Description
- 2 In fiction
- 3 See also
- 4 References
- 5 Further reading
- 6 External links

Description

Telluric currents are phenomena observed in the Earth's crust and mantle. In September 1862, an experiment to specifically address Earth currents was carried out in the Munich Alps (Lamont, 1862).^[2] The currents are primarily geomagnetically induced currents, which are induced by changes in the outer part of the Earth's magnetic field, which are usually caused by interactions between the solar wind and the magnetosphere or solar radiation effects on the ionosphere. Telluric currents flow in the surface layers of the earth. The electric potential on the Earth's surface can be measured at different points, enabling the calculation of the magnitudes and directions of the telluric currents and hence the Earth's conductance. These currents are known to have diurnal characteristics wherein the general direction of flow is towards the sun.^{[3][4]} Telluric currents continuously move between the sunlit and shadowed sides of the earth, toward the equator on the side of the earth facing the sun (that is, during the day), and toward the poles on the night side of the planet.

Both telluric and magnetotelluric methods are used for exploring the structure beneath the Earth's surface (such as in industrial prospecting). For mineral exploration the targets are any subsurface structure with a distinguishable resistance in comparison to its surroundings. Uses include geothermal exploration, mining exploration, petroleum exploration, mapping of fault zones, ground water exploration and monitoring, investigation of magma chambers, and investigation of boundaries of tectonic plates. Earth batteries tap a useful low voltage current from Telluric currents, and were used for telegraph systems as far back as the 1840s.^[5]

In industrial prospecting activity that uses the telluric current method, electrodes are properly located on the ground to sense the voltage difference between locations caused by the oscillatory telluric currents.^{[6][7]} It is recognized that a low frequency window (LFW) exists when telluric currents pass through the earth's substrata. In the frequencies of the LFW, the earth acts as a conductor.^[8]

In fiction

In William Hope Hodgson's novel *The Night Land*, the "Earth-Current", a powerful telluric current, is the source of power for the Last Redoubt, the arcology home of man after the Sun has died. Hodgson's Earth-Current is a spiritual force as well as an electrical one, warding off the monsters of the Night Lands.

The main plot of the novel *Foucault's Pendulum* by Umberto Eco revolves around search for the *Umbilicus Mundi* (Latin: "The Navel of the World"), the mystic "Center of The Earth" which is supposed to be a certain point from where a person could control the energies and shapes of the Earth, thus reforming it at will. The novel takes this even further by suggesting that monuments like the Eiffel Tower are nothing more than giant antennae to catalyze these energies.

Telluric currents are also used as a means of travel by the woman Hsien-Ko and her minions in the Doctor Who "Missing Adventures" novel, *The Shadow of Weng-Chiang*, by David A. McIntee.

Telluric currents, along what are effectively ley lines, are discovered to be a means of mysterious communication in Thomas Pynchon's *Mason and Dixon*, and are associated with the book's Chinese-Jesuit subplot. As with Eco, cited above, Pynchon also reflects upon hollow Earth theories in this work.

In Michel Houellebecq's novel *The Possibility of an Island*, it is claimed that New Age literature generally holds human beings to be especially sensitive to the telluric currents that underlie volcanic areas, and that they incite sexual promiscuity.

In the television series of *Teen Wolf*, telluric currents are used as a source of power given off by the Nemeton, an ancient worship ground for Druids. The darach uses the telluric currents to move from place to place, killing each victim at the center of each current, the Nemeton.

See also

- Geomagnetically induced current
- Electrical resistivity tomography
- Magnetotellurics
- Seismo-electromagnetics

References

1. In Chisholm, H. (1910). "Earth current". *The Encyclopædia britannica: A dictionary of arts, sciences, literature and general information*. New York: The Encyclopædia Britannica Company. Page 813-816 (<https://books.google.com/books?id=SywOAQAAMAAJ&pg=PA813>).

2. Lamont, J. V. (1862). *Der Erdstrom und der Zusammen desselben mit dem Erdmagnetismus*. Leipzig und Muenchen: Leopold-Voss-Verlag.
3. U.S. Patent 3,361,957 (<https://www.google.com/patents/US3361957>), D. L. Hings, Telluric current responsive device having spaced conductors for positioning adjacent the Earth's surface
4. Jahr, Emil, "U.S. Patent 690,151 (<https://www.google.com/patents/US690151>) *Method of utilizing electrical earth currents*".
5. Turnbull, Laurence (1853), *The electro magnetic telegraph: with an historical account of its rise, progress, and present condition. Also, practical suggestions in regard to insulation, and protection from the effects of lightning. Together with an appendix, containing several important telegraphic decisions and laws* (2 ed.), Philadelphia: A. Hart, p. 162
6. Dobrin, "*Introduction to Geophysical Prospecting*", McGraw Hill (3rd Ed. 1976) pg. 592.
7. U.S. Patent 4,686,475 (<https://www.google.com/patents/US4686475>), C. L. Kober, Passive geophysical prospection system based upon the detection of the vertical electric field component of telluric currents and method therefore
8. Burrell et al., "Pulse Propagation in Lossy Media Using the Low Frequency Window for Video Pulsed Radar Application", Proceedings of the IEEE, Vol. 67, No. 7, July 1979, pgs. 981-990.

Further reading

General

- "Telluric current" *A Dictionary of Earth Sciences*. Ed. Ailsa Allaby and Michael Allaby. Oxford University Press, 1999.
- Lanzerotti, Louis J.; Gregori, Giovanni P. (1986). "Chapter 16: Telluric Currents: The Natural Environment and Interactions with Man-made Systems". *The Earth's Electrical Environment*. US National Academies Press, Commission on Physical Sciences, Mathematics and Applications. ISBN 0-309-03680-1.

Other

- Wait, J.R., "*On the relation between telluric currents and the earth's magnetic field*", *Geophysics*, 19, 281-289, 1954.
- Gideon, D. N., A. T. Hopper, and R. E. Thompson, "*Earth current effects on buried pipelines : analysis of observations of telluric gradients and their effects*". Battelle Memorial Institute and the American Gas Association. New York, 1970.
- Seeley, Robert L., Tippens, C. L., and Hoover, Donald B., "*Circuitry of the U.S.G.S. telluric profiler*". U.S. Geological Survey open-file report ; 87-332, Denver, Colo. : U.S. Dept. of the Interior, Geological Survey.
- Berdichevskii, Mark Naumovich, "*Elektricheskaya razvedka metodom telluricheskikh tokov*". Boston Spa, Yorkshire : National Lending Library for Science and Technology, 1963. LCCN 92140338 (Tr., "Electrical surveying by means of telluric currents"; Translation by J.E.S. Bradley)
- Hoover, Donald B., Pierce, H. A., and Merkel, D. C., "*Telluric traverse and self potential data release in the vicinity of the Pinson Mine, Humboldt County, Nevada*". U.S. Geological Survey open-file report; 86-341. U.S. Dept. of the Interior, Geological Survey, 1986.

External links

- MTNet (<http://www.mtnet.info>), Scientists engaged in the study of the Earth using electromagnetic methods, principally the magnetotelluric technique (magnetotellurics).

Retrieved from "https://en.wikipedia.org/w/index.php?title=Telluric_current&oldid=746261819"

Categories: Geophysics

- This page was last modified on 26 October 2016, at 08:30.
- Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy. Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.