Principles of the Electrotelluric Method As They Pertain To PETRO-SONDE Operation

The PETRO-SONDE electrotelluric sensor is a passive instrument that measures (on the earth's surface) the electric fields generated by naturally occurring telluric currents flowing in subsurface lithological formations. These naturally occurring currents are induced by the ionosphere as pulses with pulse durations depending upon the depth of penetration. (Dobrin, 1976; Wait, 1982)

The instrument is the embodiment of recent experimental discoveries and the latest in low noise electronic solid state circuitry. The sensor for the electric fields on the surface of the earth is a broadband electrometer which changes the pulsating fields into pulsating charges. The pulse durations are measured and translated into depth of the subsurface currents, in feet. The accuracy of this depth determination is theoretically independent of depth and amounts to errors of +/- 15 to 25 feet, provided the depth circuitry is calibrated on a known well. This accuracy exceeds that of seismic depth determination by a factor of 5 to 10. (Horowitz and Hill, 1980)

The pulsating charges are subsequently filtered through low and high band-pass filters and fed to a stereo headphone the high frequencies to the right ear and the low frequencies to the left ear. The experimentally determined procedure allows the operator to identify a change in lithology as a function of depth by observing a change in pitch of the high frequencies and noting the depth setting at which change occurs. The low frequencies, in turn, allow the identification of the presence or absence of minerals, oil, gas, water or airspaces. Except at the most sensitive settings, the readings are insensitive to nearby power lines or electrical machinery. (Berg and Stork, 1982)

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