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Impact of space weather on pipelines in high latitude regions

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One of the most significant factors of space weather is geo-induced currents in technological conductive grounded systems, caused by sudden changes in the geomagnetic field dB/dt . This is especially true for high-latitude regions, since geomagnetic disturbances are most pronounced there. Such changes in the geomagnetic field create fluctuations in the soil-pipe potential, which can remove the pipeline voltage from the safe range of protection against electrocorrosion (usually cathodic protection feeds a negative potential of about 2 V). If cathodic protection in pipelines is violated, corrosion at grounding points or insulation damage increases, and electronic control systems fail. Therefore, when organizing cathodic protection systems for pipelines, it is necessary to be able to calculate variations in the soil-pipe potential under geomagnetic disturbances. To do this, we developed a software code to calculate the pipeline potential for a given disturbance of the electrotelluric field in the surface layers of the earth.

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