



## **Impacts of space weather and space climate on pipeline network operations**

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The geomagnetic fluctuations are accompanied by geo-electric (telluric) field and telluric currents at the surface of the Earth and in the pipelines. These currents interfere with pipeline corrosion protection, creating pipe-to-soil potential (PSP) fluctuations. It impacts pipeline operations in two ways. One is that non-disturbed “true” level of the protection is not known, which might lead to the wrong conclusions that a pipeline coating is damaged and digging out the section of the pipeline is needed. The other effect is changes in the electrical conditions in the pipeline-soil interface, compromising the corrosion protection and possibly causing enhancement of the corrosion.

The global trend for construction of more pipelines in northern regions means placing them into areas where natural geomagnetic variations are larger and consequently telluric activity is more extreme, in comparison with pipelines located further south.

This paper describes the solutions implemented as the result of the two projects done by NRCan researchers led by the author on request from pipeline companies.

Two methods were proposed and implemented to address the problems. One is the statistical estimation of the telluric activity in the area of the planned pipelines. These statistical considerations then used as guidance in the design of corrosion protection systems to counteract the excessive corrosion.

The other, to deal with the corrupted results during the pipeline surveys, is to forecast the geomagnetic storms for proper planning of the surveys. In addition, the developed telluric activity identification tool can be used in the analysis of the corrupted survey data.