EFFECTS OF SPACE WEATHER ON PIPELINE PERFORMANCE

1. Geomagnetic disturbances during cathodic protection surveys
2. Corruption of survey data
3. Reduction of expected lifetime

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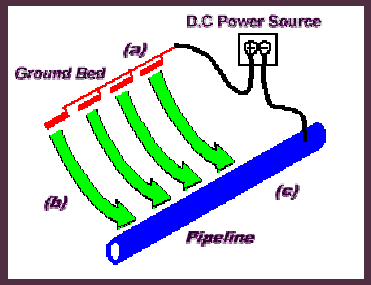
CATHODIC PROTECTION

CORROSION REACTION

$Fe^{o} \longrightarrow Fe^{++} + 2e^{-}$

Corrosion control system= coating + cathodic protection



Industry standards

Potential of -0.850V to –1.350 V at the pipe steel/earth interface

-1.35 < PSP < -0.85 V

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TELLURIC CURRENTS

PRODUCED BY INTERACTION OF

1. GEOMAGNETIC FIELD + 2. EARTH + 3. PIPELINE

PSP variations occurred where telluric currents are going in and out of cathodically protected pipeline

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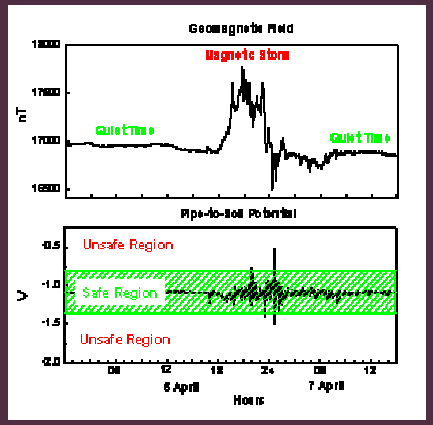
1. GEOMAGNETIC FIELD VARIATIONS EFFECTS ON PIPELINE PERFORMANCE



Henriksen et al., study on cathodically protected pipeline in Norway, 1971

" telluric current corrosion in auroral zones has about the same magnitude as the normal corrosion in soil where telluric corrosion is lacking"

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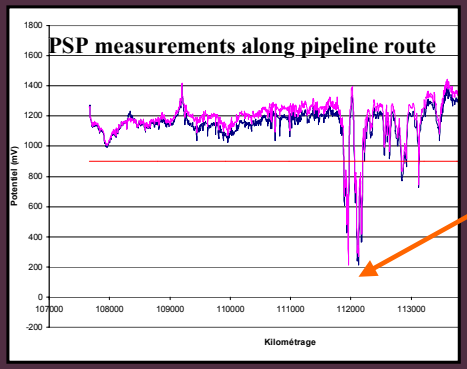
2. EARTH CONDUCTIVITY EFFECTS ON PIPELINE PERFORMANCE



Location of low resistivity formation

TQM pipeline, installed in 1998 1.5 mm pit found in 2001

R. Gummow, presentation at ESPRIT, 2002

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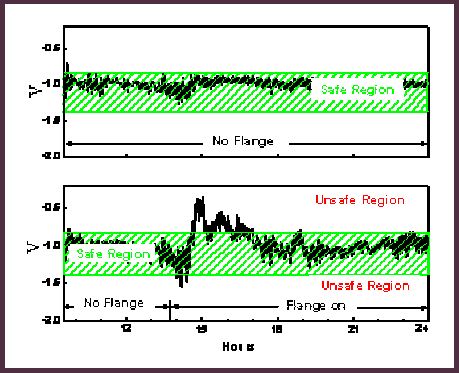
3. PIPELINE STRUCTURE EFFECTS OF INSULATING JOINTS/FLANGES ON PIPELINE PERFORMANCE



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SPACE WEATHER SERVICE FOR PIPELINE OPERATIONS

1. Prediction of disturbances during cathodic protection (CP) surveys
2. Interpretation of CP survey data
3. Estimation of expected lifetime

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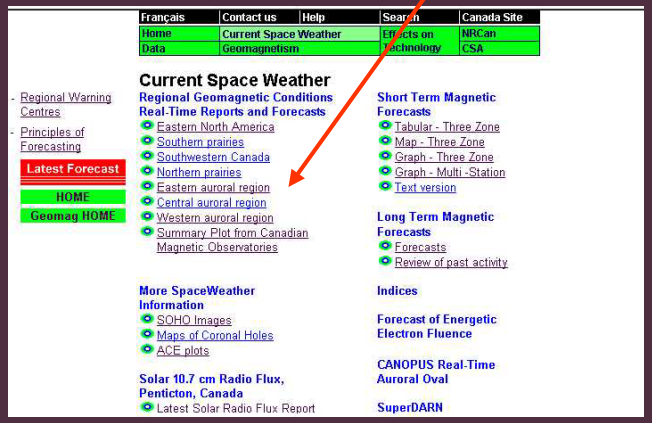
http://www.spaceweather.gc.ca

Regional Geomagnetic Conditions Real-Time Reports and Forecasts



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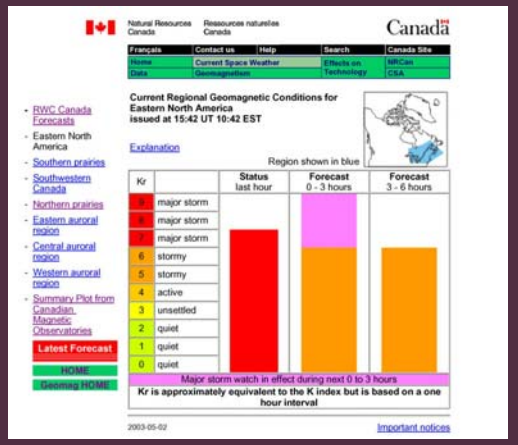
Regional Geomagnetic Conditions Sample: Eastern North America



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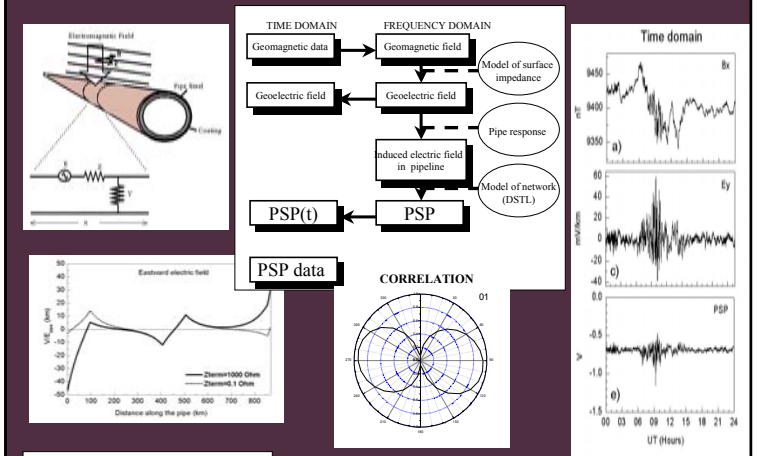
Interpretation of CP surveys: Modeling of different pipelines



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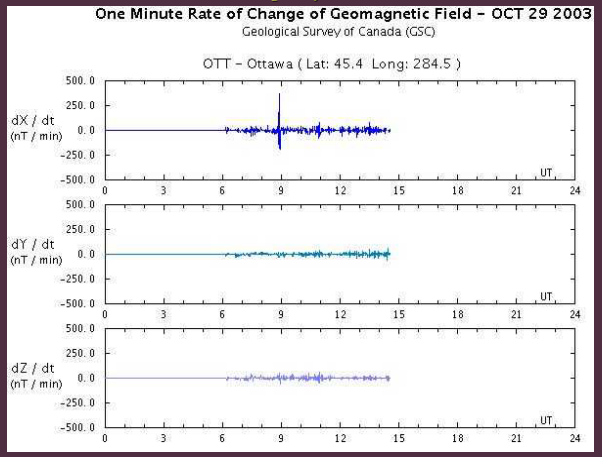
Real time interpretation of CP surveys
Real Time dB/dt as proxy indicator for PSP



http://www…….currently under construction

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Future

- Real time geo-electric field
- Improved real time models
- Adjustments for modern pipeline materials
- Estimate expected lifetime of pipelines

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