Applications in Contamination Monitoring

07

Geoelectrical Monitoring for Mapping of Gas Migration in Landfills

Dahlin Torleif[1], Johansson Sara[1,3], Rosqvist Håkan[2], Svensson Marie[3]

[1]*Engineering Geology, Lund University, S-211 00 Lund, Sweden*

[2]*Dept. of Geology, Lund University, S-223 62 Lund, Sweden*

[3]*Tyréns AB, Kungsgatan 6, S-252 21 Helsingborg, Sweden*

Short term resistivity and induced polarisation (IP) monitoring field experiments were conducted at the Filborna landfill in Helsingborg and the Albäck landfill in Trelleborg, Sweden. The objective was to detect variations in gas and fluid content due gas migration in the landfill. The monitoring resulted in a couple weeks of monitoring data with a 3D data set measured every 3 hours for each site, which may also be called 4D data sets. Methane is a powerful greenhouse gas and a growing concern regarding global climate changes. Landfill gas is regarded as one of the major sources for methane migration to the atmosphere. The migration of methane and carbon dioxide from a specific landfill depends on several aspects, such as the nature of the soil cover system, the gas collection system, and daily management.

We present results from short term monitoring performed in June-July and September 2011 respectively. The test sites measured 40 by 22 meter and were placed on old Municipal Solid Waste (MSW) landfills. Twelve parallel lines with 21 electrodes each were monitored with a remote controlled system during a couple of weeks. In addition to the resistivity-IP monitoring the weather was recorded locally.

The resistivity and IP measurements showed results that agree with existing documentation of the internal landfill structure, and are in line with results reported from previous investigations in waste. Variations in resistivity can partly be explained by the presence and migration of landfill gas. However, changes in soil moisture content and temperature may also have a considerable influence on the resistivity data showed in this study, and rainfall events followed by water infiltration into the landfill during the monitoring period are clearly imaged. Such events are often

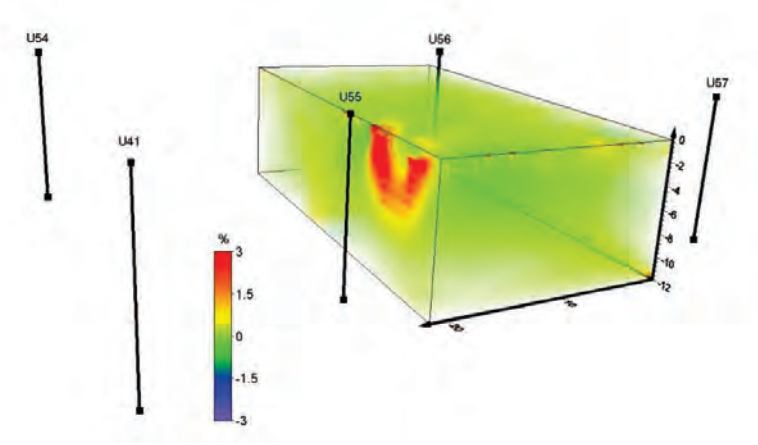

Figure 1. Percent change in resistivity 2011-09-15 16:00-19:00. Increase in resistivity is evident close to U55 which is the only open gas well.

followed by increase in resistivity that is interpreted as gas pressure build-up deeper below the water saturated upper part of the soil.

At the Albäck site the existing gas extraction system was used to study the impact on soil resistivity of gas wells being turned on and off (Figure 1). The measurements provided successful results showing an increase in resistivity in areas close to an active gas well, especially when all gas wells had been turned off for a longer period before. The results illustrated the importance of disturbed gas pressure balance on the gas dynamics in the soil.