# Topographical Effects on Predicted Ground Level Concentrations using AERMOD

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## Introduction

Dispersion models compute ambient concentrations as a function of source configurations, emission strengths and environmental aspects, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources. Environmental aspects that influence the dispersion potential, amongst others, include atmospheric conditions and topographical influences. The sensitivity of topography on the predicted ground level concentrations from an elevated release using the AERMOD Gaussian Dispersion Model is assessed.

## Methods

An elevated point source was modeled using the AERMOD Gaussian Dispersion Model. Elevated and flat terrain options were assessed to ascertain the sensitivity of the AERMOD dispersion model to topographical influences.

The AERMOD model developed by AERMIC is aimed at short-range dispersion from stationary industrial sources, improving on the EPA Industrial Source Complex Model, ISCST3 in the parameterization of the treatment of plume/terrain interactions (EPA, 2004).

The area selected for the assessment was 30km south east of Nairobi, Kenya.

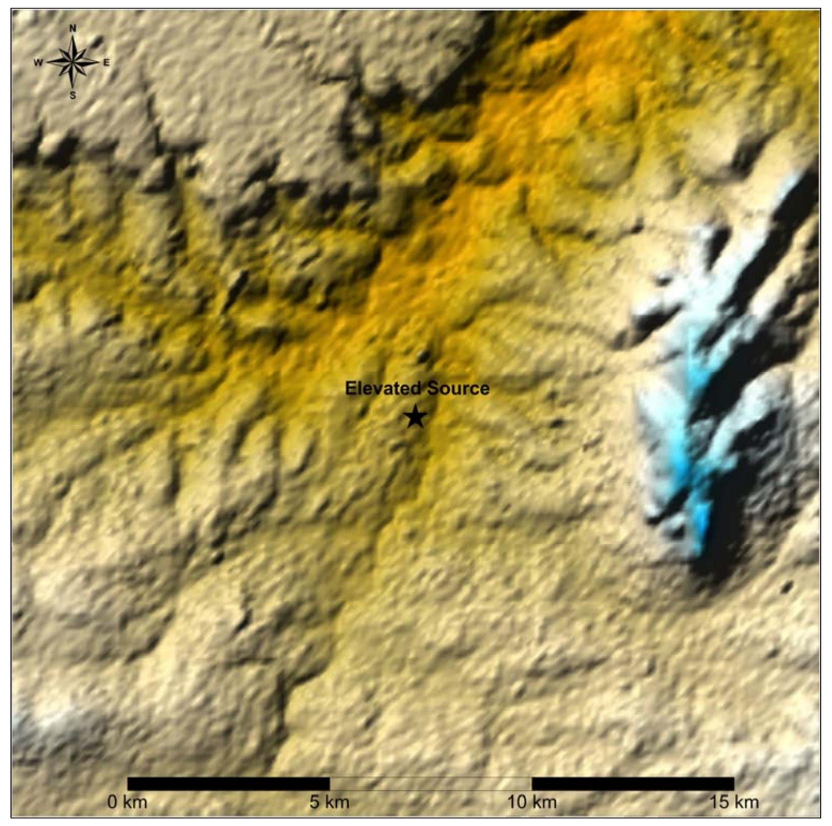


**Figure 1**. Illustration of relief at the study area selected for the assessment.

## Results

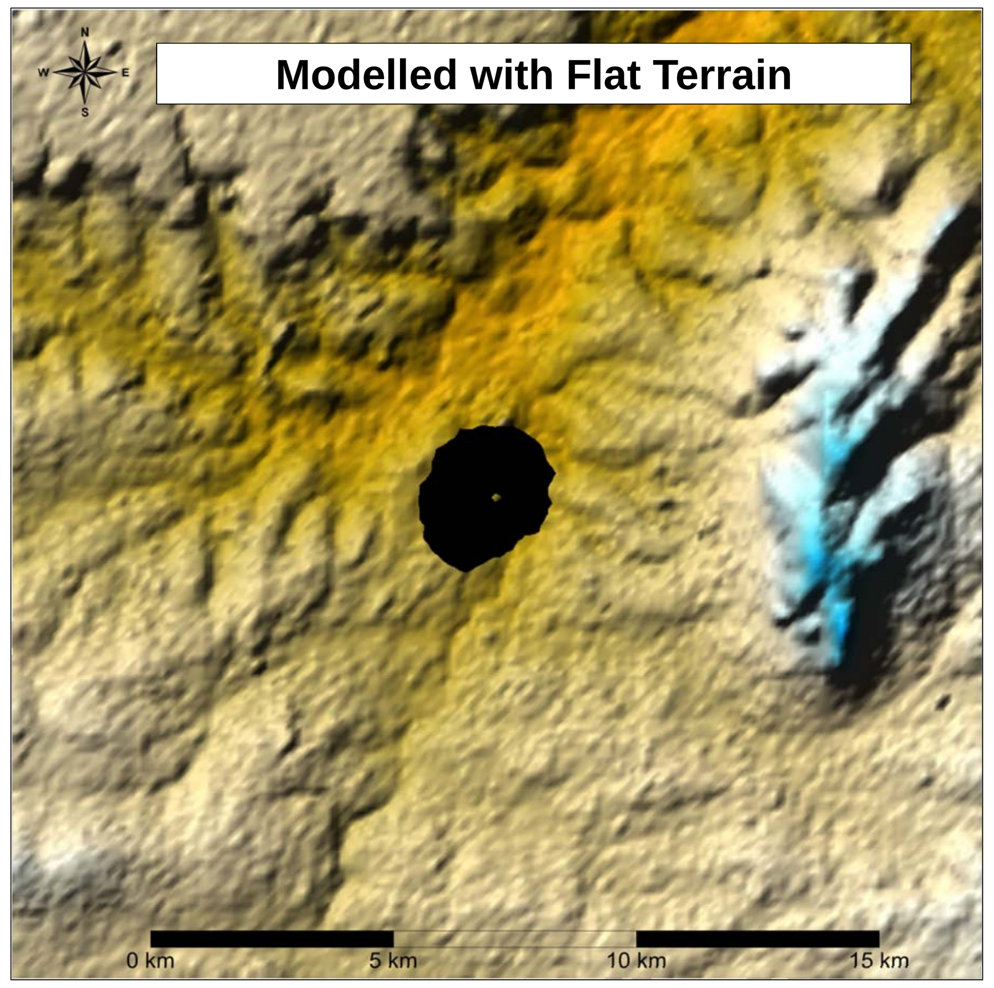


**Figure 2**. Predicted highest ground level concentrations (presented as 80 µg/m³) modeled in flat terrain option.

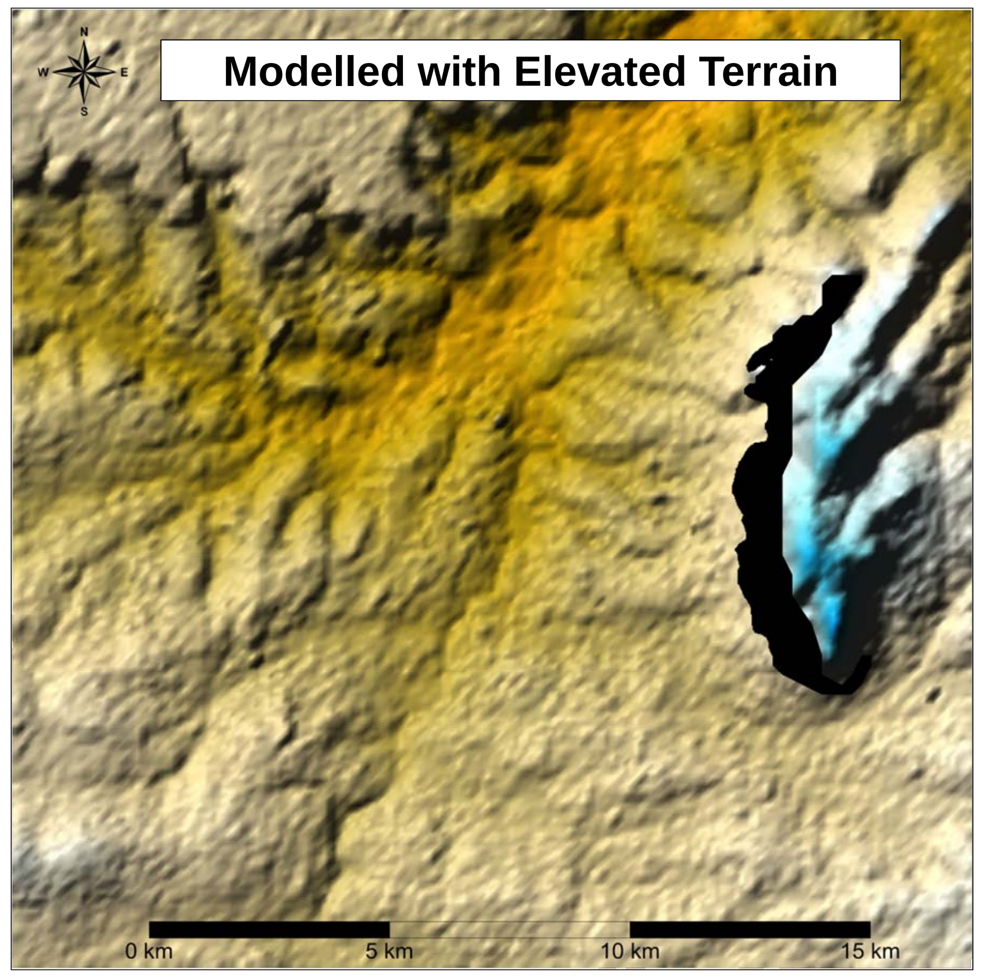


**Figure 3**. Predicted highest ground level concentrations (presented as 80 µg/m³) modeled in elevated terrain option.

**Time Series**

A time series of the predicted ground level concentrations were assessed for two selected discrete receptors (i.e. near the emission release source and at the topographical feature.

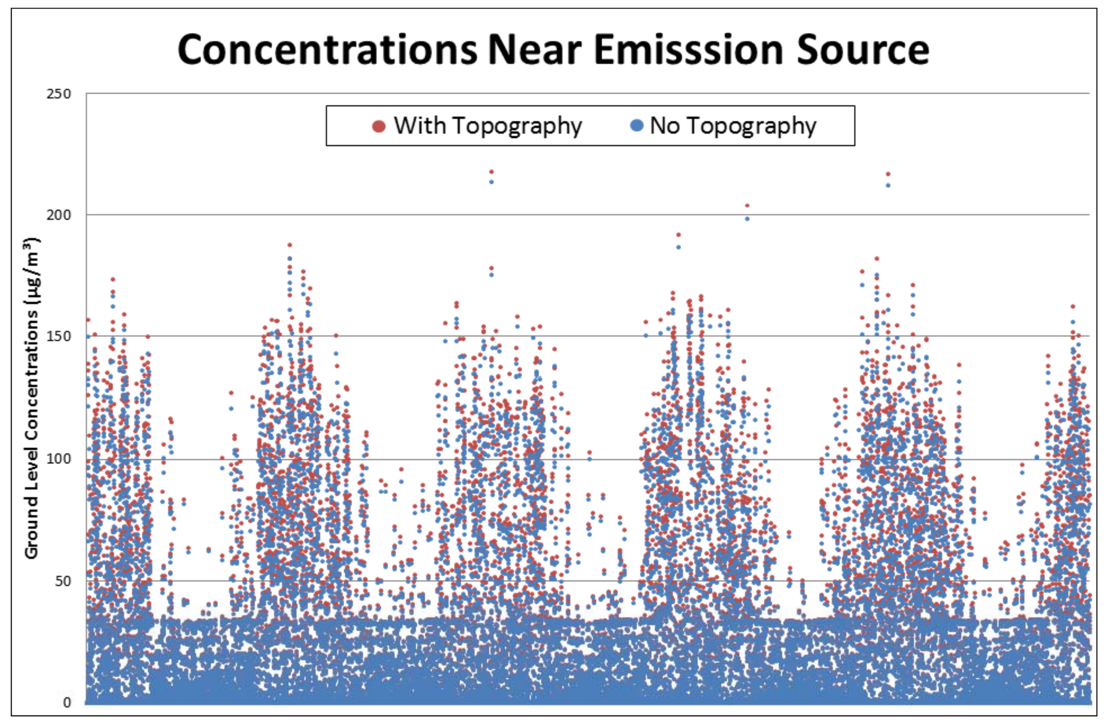


**Figure 3**. Time series for predicted ground level concentrations at a discrete receptor near the emission source.

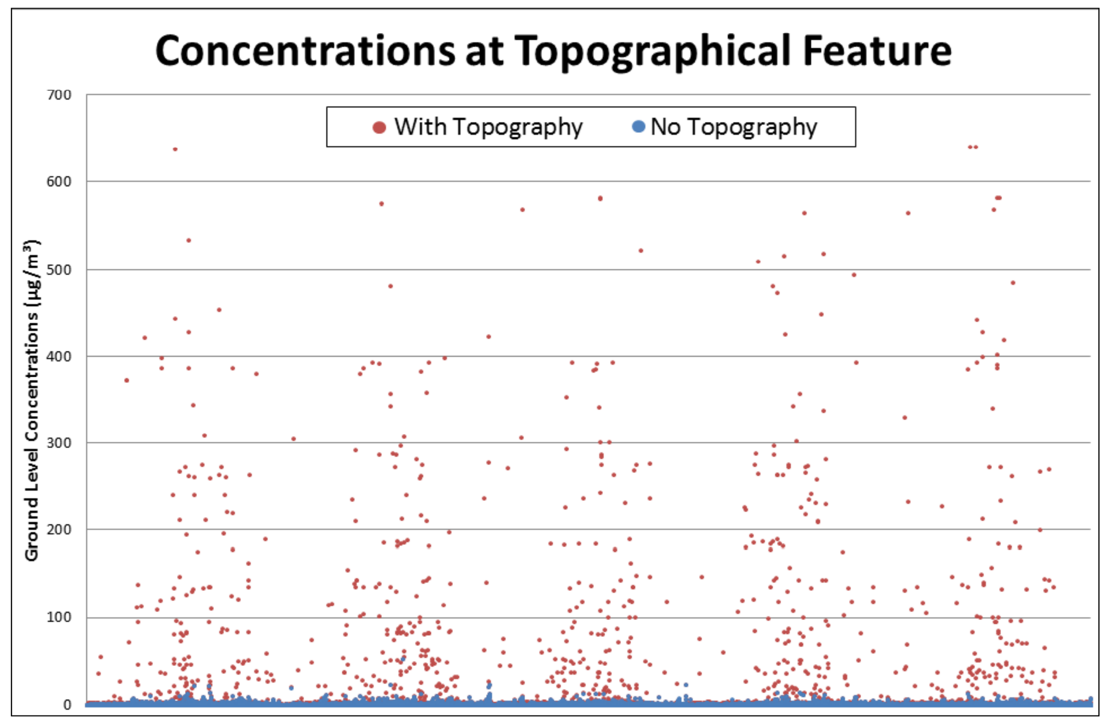


**Figure 4**. Time series for predicted ground level concentrations at a discrete receptor near the topographical feature.

## Discussion

When modeling short-term output, the highest predicted ground level concentrations were near source for the flat terrain model option and at the topographical feature for the elevated terrain model option. The highest predicted concentration at the source are no longer evident when elevated terrain model option

The elevated concentrations at the source occurred during convective day-time conditions with elevated concentrations at the topographical feature occurring during stable night-time conditions. The high concentrations should thus still be evident at the source with the introduction of topography as convective conditions will still exist.

A time series plot for two discrete points (i.e. near the emissions source and at the topographical feature) were assessed to understand why elevated concentrations were no longer near the emission source with the introduction of topography.

The time series, however, showed that elevated concentrations were still predicted near source with increased concentrations occurring at the topographical feature when the model was run with elevated terrain. These results are what would be expected at these two locations.

**QUESTION:**
**Why would the elevated concentrations disappear near the source when the short-term predicted concentrations are selected for AERMOD using elevated terrain mode?**

Further investigation needs to be undertaken by the AERMOD model developers to understand these results.

**STATEMENT:**
**Caution needs to be exercised when using this model with terrain features.**

## Literature cited

EPA, 2004. AERMOD: Description of Model Formulation United States Environmental Protection Agency, September 2004.