Reliably modelling the temperature of underground electricity cables

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1 Introduction

The use of renewable energy is increasing. This electricity is produced in many locations rather than in a central one. As a result, more

2 Goals and Questions

1. Deduce the temperature of underground power cables using propagation time measurements by the Smart Cable Guard system, and the linear relation

$$T_{\text{cable}}(t) = \alpha_0 + \alpha_1 P(t) + \epsilon(t), \tag{1}$$

   where α_0 and α_1 are constants and at time t, $T_{\text{cable}}(t)$ is the insulation temperature of the cable, $P(t)$ is the measured propagation time, and $\epsilon(t)$ is the error.

2. When little electricity runs through a certain cable, the cable temperature is close to the soil temperature and therefore the correlation between the soil temperature and the propagation time is high: see (1). How can we quickly recognize that this is the case, without knowledge of how much electricity runs through a certain cable at a given time?

3.