SOIL THERMAL PROPERTIES DETECTION USING INVERSE HEAT TRANSFER ANALYSIS

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Abstract

In this work, the inverse heat transfer analysis (IHTA) utilizing the Finite Element Method (FEM) has been used to detect the thermal properties of the soil where in situ soil temperature (ST) measurements together with that obtained theoretically are used in the solution. The initial values of the unknowns such as the soil thermal diffusivity are proposed and together with the theoretical and experimental values of the temperature, an iteration procedure is used to obtain the soil thermal diffusivity. The necessary information about the temperatures could be detected remotely where the surface temperatures of the soil is measured by a thermal camera assume the accuracy of the readings is the main affecting factor on the accuracy of value of the detected property. Using the same procedure, the work could be extended to detect the thermal conductivity, specific heat of the soil and its density. The only limitation in increasing the number of detected properties (output data) is the accuracy of the measurement device and the number of readings. The proposed method could achieve a good nearby result comparing with experimental measurements and can be used with confidence assume the output data is found to be depend mainly on the accuracy of temperature readings.

Keywords: *soil temperature; inverse heat transfer analysis; thermal properties.*