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ESTIMATION OF SOIL MOISTURE STATUS AND ACTUAL EVAPOTRANSPIRATION USING REMOTELY- SENSED DATA

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Two digital models are described which relate soil surface temperatures estimated from aerial radiometric measurements to average daily soil moisture status and actual evapotranspiration. Both models estimate times series of surface temperatures from meteorological and soil measurements. The surface temperatures estimated using the models and the radiometer are compared, and the parameters of the models optimized until the differences are small. The parameters are carefully chosen to have unique relationships with soil moisture status and actual evapotranspiration, which may then be found.

The numerical models are expensive to implement, as are the models of atmospheric effects which must be used when estimating the surface temperatures from radiometric data, and so look-up versions of the models are used. The models are implemented for those input data which occur most frequently, these inputs being found by estimating joint frequency distributions from the inputs, and results for other inputs are found by interpolation within the look-up tables. In order to do this, the input data must be accurately registered geometrically and procedures for doing this, for estimating the joint frequency distributions efficiently, for constructing the look-up tables and then making maps of actual evapotranspiration and soil moisture status are described. The procedures are illustrated using data from a field experiment in Buckinghamshire, England in September 1977.