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The interaction of lightning impulse with Pinaceae Pinus (pine tree)

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ABSTRACT

The work presented extends and contributes to research in lightning and *Pinacaea Pinus* (pine trees) and focuses on the initial interaction between the current impulse and the tree trunk. Although previous work in this area has produced some general hypotheses of the outcome of this interaction, no modelling has been attempted to provide estimations as to which factor might be of most importance, in particular whether or not the biological components of the tree play a major role. Resin as a specific constituent of pine is excluded as a contributor, through laboratory experimentation as the impedance is too high to allow for substantial current flow. Using computer simulations of macro-geometrical structures of water vessels, the volume of water and moisture content levels are found to be the main factors in determining the amount of resistive power loss (heat) observed in the wood material. The wood variation is modelled using twelve combinations of permittivity and conductivity and the lightning impulse is simulated using a $10\,\mathrm{k}A$ peak Heidler current waveform. The high permittivity values of the wood allow for an energy exchange to occur between the wood and water when the conductivity of the wood is not high.