# ABSTRACT

## A Numerical Study of a Composite
## Reservoir with a Linear Discontinuity

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The project presents a numerical study of the expressions for pressures at a well in a reservoir with a linear discontinuity. On either side of the discontinuity, rock and fluid properties, such as permeability, porosity, viscosity and compressibility are constant, but change suddenly on crossing the discontinuity.

The numerical solutions generated are presented graphically. Variables analysed include dimensionless time, compressibility ratio and mobility ratio. Values ranged from .1 to 100 for dimensionless time, 0.001 to 1000 for both mobility ratio and compressibility ratio.

The above can be used in application of detection of geological changes or fluid-fluid contacts. Also, it is possible to estimate the distance to a linear discontinuity from a knowledge of actual time and the corresponding dimensionless time.

The project is essentially a FORTRAN based computer programme to generate the solutions as presented by the indefinite series of equations.

The project highlights an algorithm whereby the above solutions can be generated more accurately and quickly over that as given by Bixel, Larkin and van Poollen[1].

Evaluation of the equations developed by the above authors requires the use of numerical methods. As a result, the indefinite integral functions were solved using the trapezoidal rule. A characteristic feature of these functions is the pulse-like nature of the curves for large dimensionless time at certain values of z at which point, considerable area is concentrated. To accurately calculate this area, the functions were differentiated to find their maximum turning points, and therefore, in this region the interval steps used in the trapezoidal rule were further decreased. This would lead to a more reliable estimate of pressures at a well in a reservoir with a linear discontinuity.

The solutions are presently in tabular and graphical forms for various values of mobility and storage capacity ratios. These values compare reasonably well to within two percent maximum deviation over those read from the charts given by the authors[1].

Although, the authors present graphical solutions for unit mobility ratio and varying storage capacity ratios (Fig. 10)[1], their equation (29) do not support this particular case. As a result, a technique is presented here to estimate values of pressures for this case which compare very well with those values given by the authors.