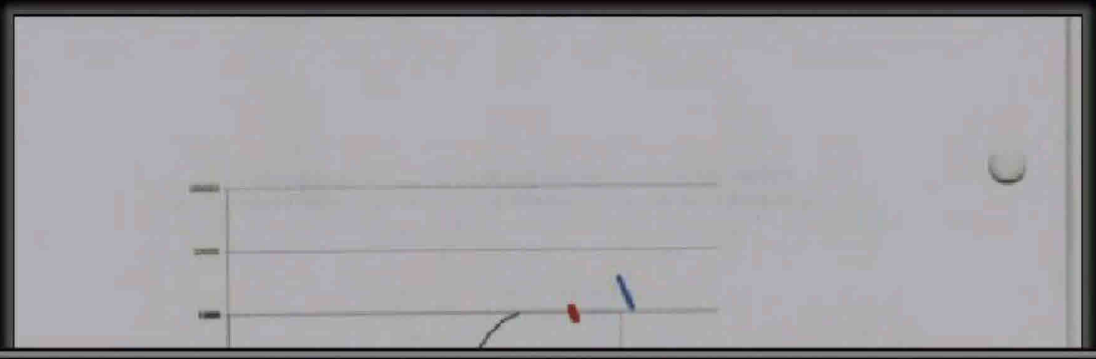

Mass Flux Map

where the variables in the axis labels of Figure 9 are:

ρ_l is the liquid density
ρ_g is the gas density
U_l is the superficial liquid velocity
U_g is the superficial gas velocity

Using the industry-standard OLGAS 2Ph correlation in a Maximus model of the well also indicates that the flow regime is annular rather than homogeneous.

Third, Dr. Griffiths incorrectly separates the gravitational and frictional pressure drops in the well, which is inappropriate for a multiphase flow through two flow paths (here, the casing and the drill pipe) where frictional and gravitational pressures in the two paths differ considerably. Considering the flow in the well, the pressure and temperature at any point dictate the amount of gas that comes out of solution and thus the amount of free gas present (*i.e.*, the vapor-liquid equilibrium, VLE). This affects the mixture density of the fluids which, in turn, affects the velocities of the fluids and the flow regime. Also, the PT-B pressure will affect at what elevation in the well gas begins to come out of solution. Therefore, both the frictional and gravitational pressure drops in the well will be affected by local pressure and temperature through the two flow paths that exist in the well. Dr. Griffiths assumes that gravitational pressure drop is constant and that frictional pressure drop varies only with stock tank oil flow