Abstract Submitted
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Theoretical analysis of multiphase flow during oil-well drilling by a conservative model RUBEN NICOLAS-LOPEZ, J. HECTOR RODRIGUEZ-HERNANDEZ, MARIO G. GARCIA-HERRERA, Instituto Mexicano del Petroleo — In order to decrease cost and improve drilling operations is necessary a better understood of the flow mechanisms. Therefore, it was carried out a multiphase conservative model that includes three mass equations and a momentum equation. Also, the measured geothermal gradient is utilized by state equations for estimating physical properties of the phases flowing. The mathematical model is solved by numerical conservative schemes. It is used to analyze the interaction among solid-liquid-gas phases. The circulating system consists as follow, the circulating fluid is pumped downward into the drilling pipe until the bottom of the open hole then it flows through the drill bit, and at this point formation cuttings are incorporated to the circulating fluid and carried upward to the surface. The mixture returns up to the surface by an annular flow area. The real operational conditions are fed to conservative model and the results are matched up to field measurements in several oil wells. Mainly, flow rates, drilling rate, well and tool geometries are data to estimate the profiles of pressure, mixture density, equivalent circulating density, gas fraction and solid carrying capacity. Even though the problem is very complex, the model describes, properly, the hydrodynamics of drilling techniques applied at oil fields. *Authors want to thank to Instituto Mexicano del Petroleo and Petroleos Mexicanos for supporting this research.

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