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Virtual assessment of air pollution dispersion from anthropogenic sudden explosion

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The control of air pollutants from anthropogenic sources seems almost impossible due to numerous influencing factors present in the atmosphere. In this study, we carried out a virtual mathematical experimentation using MathCAD, Matlab and analytical approximation to estimate the dimensional impact of initial pollutant plume cloud from a sudden volcanic blast and the dynamics of its wind field. The high point of the experimentation is the period of the first one-tenth of a second (1 deci-second) to 1 minute (60 s) of the blast at the point source. We also assessed the long range air pollution dispersion within the first 1 to 10 minutes of plume cloud released under practical assumptions. The model revealed a plume cloud impact of 6.8×107 µgm-3 in the first 1 millisecond (0.01 s) which decayed suddenly to a value of 1.7×107 µgm-3 in the first 1 deci-second (0.1 s). The impact concentration at the point source by the end of the first second (1.0 s) was 3.2×105 µgm-3 which implied a 99.5% sudden decay when compared with 0.01 s concentration value at the emission point source. It is observed that air pollutants released from explosives/blasts get transported into the atmosphere in the first few seconds by forceful injection instead by gradual dispersion as is the case with normal air pollutants plume releases. A mathematical control process was propounded (which is still subject to further research) to reduce the quick flow of air pollutants.

Biography

M L Akinyemi is working at Covenant University, Nigeria. Her international experience includes various programs, contributions and participation in different countries for diverse fields of study. Her research interests reflect in wide range of publications in various national and international journals.

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