Abstract Submitted
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Autoignition: Modes of reaction front propagation evolving from hot spots with defined temperature gradients DAVID R. KASSOY, Retired: University of Colorado, Boulder — An asymptotic mathematical model, based on the compressible reactive, conservation equations, including transport terms and an arbitrary energy source, is used to quantify the thermo-mechanical consequences of an imposed temperature gradient, ΔT/ l. The mathematical model explains the physics of the gradient system in terms of the local conduction time l^2/(kappa), where kappa is the characteristic thermal diffusivity, the local acoustic time l/a_0, where a_0 is the characteristic acoustic time scale, the characteristic time scale of energy deposition from the source, t_{ds}, and the characteristic energy deposition into and through the gradient region on that time scale. The primary objectives are to predict the magnitude of the induced gas motion and determine when and if transport effects are important. The methodology, related to that in several earlier studies [1-5], can be used to distinguish between detonation and deflagration initiation as well as spontaneous reaction wave propagation. This analysis will help to explain the somewhat enigmatic results in Refs. 6-8. 1,2. Clarke, J.F, Kassoy, D.R. and Riley, N. (1984) Proc. Roy. Soc. A393, 309-351; 3. Kassoy, D.R. (2010), J. Eng Math, 68, 249-262. Kassoy, D.R. (2013), CTM, 18, 101-116. Kassoy, D.R. (2014), AIAA J., doi10.2514, /1J052807. Zeldovich, Y.B. (1980), Combust. Flame, 39, 211-214.. Gu, X.J., Emerson, D.R., Bradley, D. (2003), Comb. Flame, 133, 63-74. Sankaran, R., Hong, G. Hawkes, E.R. Chen J. H., (2005) Proc. Combustion Inst., 30, 875-882.

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