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Structure of solutions of the buoyancy – drag equation SERGE BOUQUET, EMERIC FALIZE, CEA-LUTH, PIERRE GANDEBOEUF, PIERRE PAILHORIÈS, CEA — In this paper, the well-known buoyancy-drag equation (BDE) is studied. This equation describes the non linear regime of Rayleigh – Taylor instabilities and also the structure of the mixing zone where both fluids are present. Analytical solutions of the BDE are derived for time-dependent accelerations, $\gamma(t)$, of the form $\gamma(t) \sim t^n$ where the exponent n can be positive, negative or zero. It is shown, first, that the width, h(t), of the mixing zone behaves like $h_n(t) \sim t^{n+2}$ and, second, provided the initial conditions satisfy some constraints, the special solution $h_n(t)$ is an attractor for t going to infinity. On the other hand, the behavior of the asymtotic solutions for $\gamma(t) \sim t^n$ is examined in terms of the drag coefficient, C_d, that is present in the drag force (proportional to the square of the derivative dh/dt) in the right hand side of the BDE. Critical values for this coefficient are derived analytically and it is shown that the asymptotic behaviors are strongly dependent on the value of C_d. These results are also evidenced from numerical simulations achieved with the CLAWPACK numerical package.

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