**INSTABILITY ANALYSIS OF A HORIZONTAL EVAPORATING BINARY LIQUID LAYER WITH TRANSIENT REFERENCE PROFILES1**

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In this study, the system in question is an evaporating horizontal binary-liquid layer (aqueous solution of ethanol with mass fraction 0.1) in contact with inert air. The instability mechanisms that are taken into account are solutal and thermal Rayleigh-Bénard-Marangoni instabilities. The model also takes the Soret effect into account in the liquid. First, transient horizontally homogenous reference profiles are calculated for both the temperature and mass fraction in both the liquid and gas phases by means of a finite difference method. Subsequently, perturbations with respect to the time dependent reference state are considered and the corresponding linear stability problem is solved using the frozen-time approach. The results show that there is a certain critical liquid thickness, below which no instability ever occurs. Also, for thicknesses larger than this critical value, we determine the critical times at which the time dependent reference profile becomes unstable. Defining *H* as the ratio of the total thickness of the system to the liquid thickness, Fig. 1 shows the results for values of *H* = 2, 11 and 101. It is also proven that all the curves tend to an asymptote (dotted line in Fig. 1) for large values of the liquid thickness.

 

Fig. 1: Critical times (*tc*) versus the liquid thickness (*dl*) for different values of *H*