**B.2 Determining the growth coefficients**

The governing equation for height is

The governing equation for liquid composition is

The governing equation for height can be expanded as follows

The expanded equation can be simplified to the following

To break the above equation down, a series of sub-terms are considered

Define Term 1=

Define Term2a=

Define Term 2b=

Define Term 2=Term2a+Term2b

Define Term 3=

Define Term 4=

Define Term 5=

Define Term 6=

The terms 1-6 defined above are now combined, in a series of product terms P1-P3.

Define P1=Term 1Term 4

Define P2=Term 2 Term 5

Define P3=Term 3Term 6

The above terms relate to the outward convection component of the governing equation. The evaporation component also needs to be considered.

The base solution terms from the evaporation component and P1-P3 of the convection component are now collected.

The terms that are linear in the height perturbation, are now collected

The terms that are linear in the liquid composition perturbation, are now collected.

By considering only the real component of the terms within the governing equations, the system can be written as follows

The matrix coefficients and are

To find the matrix coefficients and , the same method must be applied to the governing equation for liquid composition.

Define Term 7 = and use a general binomial expansion to find an expression for

Define Term 8a=

Define Term 8b=

Define Term 8 =(Term8a+Term8b)

The base solution terms are now collected

The terms that are linear in the height perturbation, are now collected

The terms that are linear in the liquid composition perturbation, are now collected

The Matrix coefficients and are hence

To perform the linear stability analysis, the droplet shape and liquid composition profile have to be set. The base solution height, , is taken to be a spherical cap shape, such that

The liquid composition is considered a short time, , after evaporation commences. From an initial homogeneous distribution, , the partial differential equation is solved up to and the resulting profile is used for . Using discretised steps of size , the spatial derivatives of the liquid composition profile are estimate using a centralised finite difference approximation.

In addition, the relative volatility, , and surface tension ratio, , are set. The capillary number,, is taken to be , such that surface tension dominates viscous effects.

The growth rate, , can then be found by determining the eigenvalues of the stability matrix.

For each value of, the growth rates are determined. The system is unstable if either is positive at any wavenumber.

The global stability loci can be found by scanning through the full range of, for each parameter set, and.