This directory contains the code for one particular sensitivity analysis of the planets simulation:

Name: SA34 - multiple environmental factors

Description: Although low temperature is the primary factor determining habitability, other environmental variables (such as nutrient availability, water availability, and pH) also need to stay within habitable limits for intelligence to be able to evolve. In order to implement the dependence of continued habitability on the values of multiple environmental variables, three additional environmental variables (*X1*, *X2* and *X3*) were added through the addition of three ODEs:

where *f1* to *f3* are randomly assigned feedbacks as for temperature in the standard model and to are randomly assigned temporal forcings as for temperature in the standard model. The planet was deemed to have gone uninhabitable if any variable left its habitable range (-100 to +100 for the additional variables, in arbitrary units).

The ODE for temperature (and all factors affecting it) are left unchanged from the standard model.

The following files were altered in order to implement this sensitivity analysis [*assumed to be the same set of files as in SA28, with sole exception of not needing determine\_coefficients.m*]:

determine\_perturbations.m

calc\_attractor\_properties.m

calc\_runaways.m

calc\_planet\_properties.m

determine\_feedbacks.m

calc\_planet\_freqs.m

ts\_master.m

ts\_slave.m

planets\_ODE.m

events\_pl.m

initialise\_slave.m

initialise\_master.m

plot\_scatterplots.m

plot\_planet\_histograms.m

set\_constants.m

calc\_run\_properties.m

array\_transfers.m

summary\_for\_paper.m

The following files were created in order to implement this sensitivity analysis:

determine\_initial\_values.m

determine\_trends.m

*The files determine\_initial\_T.m and dcetermine\_trend.m were removed (replaced with determine\_initial\_values.m and determine\_trends.m)*