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

Name: SA33 - pressure-dependent Tmax

Description: the hottest temperature that is habitable (Tmax in the model) may be caused by one of two things: (a) the average planetary surface temperature at which water is boiling away somewhere on Earth (i.e. if the average temperature is 80C then the maximum may be >100C, and hence boiling if under 1 atm of pressure) − if temperatures are too high for liquid water to persist on the surface of the Earth then this creates difficulties for life as it is assumed that there is an absolute requirement for liquid water; and (b) the temperature at which proteins including DNA denature, i.e. lose their normal coiled shape because of the high temperatures. In this sensitivity analysis the problem with proteins ceasing to function correctly is ignored and it is assumed instead that the boiling point of water is the fundamental problem. The boiling point of water at the surface of water bodies is a strong function of the atmospheric pressure, i.e. the amount of gas in the atmosphere, increasing from 0°C at pressures of 0.006 atm or lower (below which water sublimates directly from liquid to gas phase) to about 300°C at a pressure of about 100 atm. In this sensitivity analysis atmospheric pressure (, units of Pa)is included as an additional state variable and *Tmax* (Celsius scale) is made to depend on it according to the relationship

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

array\_transfers.m

calc\_asymmetry.m

calc\_attractor\_properties.m

calc\_planet\_freqs.m

calc\_planet\_properties.m

calc\_run\_freqs.m

calc\_runaways.m

determine\_feedbacks.m

determine\_initial\_values.m

determine\_perturbations.m

determine\_trends.m

events\_pl.m

initialise\_master.m

initialise\_slave.m

planets\_ODE.m

plot\_feedbacks.m

plot\_history.m

plot\_planet\_histograms.m

plot\_run\_histograms.m

plot\_scatterplots.m

set\_constants.m

ts\_slave.m

ts\_master.m

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

Tmax\_vs\_P.m

Tmaxvar.m