Announcements:
Next time, wrap up and workshop preparation day.
Biology BBQ Thursday at Noon – greenhouse patio
Papers due Monday – tomorrow is the last day I will accept rough drafts

Global Ecology – Global modelling and Anthropogenic effects

The Earth as an integrated biophysical system – recent anthropogenic changes are not the first large changes to the planet

Gaia Hypothesis: Lovelock (1970s), Lenton

Biological feedbacks mediate the habitability and physical conditions of the Earth as a whole.

First proposed as an outgrowth of the search for life on other planets

Simple model of environmental regulation: Daisyworld and planetary albedo

1. Black daisies and white daisies compete on a grey world
2. Black daisies absorb solar energy and heat up the world relative to grey
3. White daisies reflect solar energy and cool down the world
4. Both species share common optimum growth temperature as well as upper and lower limits to growth.

Result: Over a wide range of solar luminosity, the competitive mixing of daisies regulates temperatures to a narrow and habitable range even though the two forms are competing.

What does such a simple model tell us?

More complex, historically relevant situation – still a simple model. The effect of the colonization of land by plants on atmospheric oxygen levels Lenton et al. 2001

Plants colonized land about 420 Mya (million years ago)

Oxygen was then about 12% of the atmosphere – now it is 21%

Increased rates of phosphorus weathering, which increased terrestrial and marine productivity.

Previous models show a huge peak in oxygen (up to ~35%) which is hard to reconcile with the persistence of forests
Fire feedback regulates this fluctuation in a revised model.

*What do these geological time scale models tell us about anthropogenic effects?*

**Back to anthropogenic effects**

*How do we deal with a (geologically) instantaneous doubling of N fixation from the atmosphere coupled with a release of millions of years of accumulated carbon?*

*Beyond immediate effects – what will be the long term effects? What about coupling these biogeochemical effects to habitat fragmentation, species loss, and biotic homogenization?*