IN SEARCH OF AUTONOMOUS CONTROL PROCESSES IN THE ATMOSPHERE.

Summary

The scientific basis of the current equilibrium model for the earth's greenhouse effect requires reconsideration. The model has been used by the UN Intergovernmental Panel on Climate Change (UN IPCC) for several decades and has been accepted with little question by many climatologists. However, the energy transfer processes that underlie the greenhouse effect are dynamic and involve many short term interactions that are far from equilibrium. The formation and remarkable long term stability of such dynamic systems was initially recognized about 40 years ago. This area of study was originally called 'chaos' theory because small changes in input variables led to widely differing solutions. The designation 'chaos' has unfortunately lingered. However, a better description is research on a-periodical behaviour of interactive variable forces that should be called complexity theory.

The use of the equilibrium greenhouse effect shows that the increase in atmospheric CO_2 concentration from the use of fossil fuels will perturb the earth's greenhouse climate and increase the surface temperature. However, there is no conclusive evidence for this.

An obvious starting point in the search for a dynamic stabilization mechanism for the greenhouse effect is the diurnal surface temperature cycle. The surface is heated by solar radiation during the day and cools by infrared emission at night. This produces a 'dynamic equilibrium state' with a 24 hour period that is the starting point for further research into the operation of the greenhouse effect.

The dynamics of this diurnal cycle may be described using five varying forces (or fluxes):

a) Surface heating by absorption of solar radiation during the day
b) Simultaneous surface cooling by IR emission during the day
c) Night time surface cooling by IR emission.
d) Absorption and re-emission of the surface IR radiation by water vapor. This reduces the net IR cooling radiation from the surface. This is the main cause of the greenhouse effect. More heat is retained at the surface than in the non-absorbing case without IR-active molecules in the atmosphere.
e) Surface cooling by convection and removal of latent heat through the evaporation of water at the surface

In the working paper, this dual effect of water is examined quantitatively using a model of the temperature variation during the diurnal cycle. This model is tested using known surface temperature data. When the evaporative cooling term is removed in the model, the surface temperatures rise far above the measured values. The small increase in optical density produced by the observed increase in atmospheric CO_2 concentration from 280 to 400 ppm can only have a minor impact on surface temperature because of the effectiveness of the water thermostat.

The critical reader is invited to compare the surface temperature response of both the diurnal dynamic balance model and the conventional equilibrium greenhouse model

The following points are recommended for further discussion:

1. Autonomous regulatory mechanisms in the atmosphere have been ignored.
2. The diurnal cycle contains a strong attracting dynamic equilibrium state.
3. Capricious weather changes mask this.

4. Between 22 March and 21 September (between 0 and 60 degree North) the surface temperature would at current optical density rise strongly above observed values.
5. At the current optical density of the atmosphere this temperature rise is undone by upward air convection and water evaporation at the earth surface.
6. A linear relationship can be identified between increasing optical density and increasing heat transport from the surface.
7. This leads to the suggestion that an increase of the surface temperature will be cancelled by the water thermostat.
8. In turn, this requires a reassessment of major assumptions on which the current greenhouse gas theory is based.
9. Point 2 and 4 are the running bells in this summing-up that seem to have escaped sufficient attention so far.

Content of the working paper.