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Interactive Comment

Interactive comment on "The radiative forcing potential of different climate geoengineering options" *by* T. M. Lenton and N. E. Vaughan

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Dear Prof. Lenton and Ms. Vaughan:

Thank you for a fine analysis of the dynamics of the Global Climate, and the likely effect of the various geoengineering options. However, for the sake of completeness, it might be interesting to consider also the inertia of the system; indeed at a time when the likes of James Hansen are concerned that we are fast approaching “Climate Tipping Points”, invoking every potential source of stability might buy us the time to take appropriate action.

1. Deep Ocean Cooling

Clearly the thermal inertia of the deep ocean could be used to absorb an amount of

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excess surface heat. Depending which scenario you use, a century of anthropogenic warming would only raise deep water temperatures by fractions of one degree. Naturally it is necessary to avoid zones where methane hydrate and other such horrors could be destabilised, but it still leaves plenty of water which would not return to the surface for many hundreds of years.

2. Intervention in ‘Natural’ Instabilities

We are becoming aware that the earth has its own sources of instability.. methane hydrate has already been mentioned and is a useful case to study.

2.1 Methane Hydrate

It should be possible to identify zones of potential instability of this substance, and intervene by mining the stuff. Generally this would be in a water depth of up to 500m, where the offshore technology already exists and could be readily adapted. Methane Hydate crystals are easily transportable and could provide an ‘alternative’ energy source so that ‘fossil’ carbon could be left in the ground. Even if carbon capture were not employed when burning this methane, it would still be preferable to release the CO2 and avoid the heavy Greenhouse amplification effect of allowing pure methane into the atmosphere.

2.2 Ocean Vents

Large discharges of greenhouse gases occur from vents in the ocean floor. These form columns of hot water which rise to the surface waters. Intervening and diverting these ‘chimneys’ so they cool and deposit their GHG’s as hydrates at depth should not be an impossible task. Quantification of the effects of this activity would be interesting.

2.3 Volcanically Active Zones

Similar logic applies to volcanically active zones on land. Drilling into such structures could tap gas which otherwise would escape into the atmosphere. Trapping it while it

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is still under pressure shifts the economics of disposal to a favourable degree.

3. CO2 storage

A further way of using the inertia factor in our favour is in CO2 storage. Injection into saline aquifiers, depleted oil fields etc is an energy-hungry and limited means of disposal. Formation of hydrate rocks which were then stored in selected deep-ocean valleys, although not a ‘permanent’ solution, would buy us time to come up with more elegant methods.

Most of the above ideas are discussed, somewhat superficially, on the site GlobalWarmingResponse.org but would benefit from the same mathematical rigour which you have applied to the various flux intervention models. Of course, there is some overlap with proposed mitigation efforts, and all to the good as working engineering solutions are likely to be ‘combined’ schemes in order to achieve economic viability. CO2 scrubbing from air, for example, needs to be piggy-backed onto some other industrial process which is already compressing vast amounts of air for its own purposes.

So to conclude, these concepts are put forward in the hope that your analysis of geoengineering potential will become truly exhaustive.

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