Unknowns About Climate Variability Render Treaty Targets Premature

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The UN Framework Convention on Climate Change (FCCC) calls for a "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." That level is nowhere defined, however, nor is the definition addressed in any of the reports of the UN Intergovernmental Panel on Climate Change [*IPCC*, 1996]. A reasonable interpretation might be that "dangerous" refers to the stability of the climate system rather than to a simple warming. For example, could higher GH gas (mainly CO2) concentrations produce a sudden, major change in the state of the climate?

Without knowing what level is "dangerous," one cannot define the goal of the FCCC: the present level, or a lower level, or perhaps a higher level. In the absence of such information, it would seem premature to set up mandatory targets on CO2 emissions.

Recently, *Azar and Rodhe* [1997] have attempted to define a CO2 target level. They conclude that the present level (350 ppmv) or higher ones are dangerous; presumably, lower levels are not. But the analysis to back up the conclusion is inadequate. The authors simply accept that a temperature rise of 2°C or higher is dangerous because it is "considered to be high risk by the Stockholm Environment Institute." Even more questionable is their claim that maintaining the present CO2 level can produce a temperature increase of over 2°C. (The range they show is from 0.9 to 2.7°C.) On the basis of IPCC estimates, they then conclude that annual CO2 emissions must be reduced by 50 percent from present values--worldwide.

1) It should be noted, first of all, that temperatures have varied by more than 3°C in the last 2500 years [*Keigwin*, 1996], i.e. within recorded history, without leading to climate catastrophes. Some of the changes have been more rapid than 0.25°C per decade, faster even than projected by the IPCC. [See Fig. 1] Even though this particular temperature record came from an ocean core at one location, an independent investigation documents abrupt changes in the early to mid-Holocene at the equator and both poles, i.e. globally [*Stager and Mayewski*, 1997].]

2) The temperature increases suggested by *Azar and Rodhe* [1997] for present CO2 levels are wildly out of line with observations; satellites and balloon-borne radiosondes show no warming whatsoever [*Spencer and Christy*, 1992].

3) One should not rule out the possibility that a higher CO2 level may be less dangerous to the climate system than a lower one. Observations suggest that climate instability has been greater during the extremely low CO2 values of the Ice Ages (< 200 ppmv) than during the Holocene (< 280 ppmv). For example, *Stager and Mayewski* [1997] point out that the warmer Holocene was relatively more stable than the late Pleistocene. Although abrupt changes occurred in global climate around 8,000 years ago, the fluctuations experienced during the last Ice Age were even greater. A recent review confirms both the climate instability of the Holocene and the even greater variability of the last glacial period [*deMenocal and Bond*, 1997].

I conclude, therefore, that one cannot argue a priori that higher concentrations of GH gases are "dangerous" to the climate system. More likely, the opposite is true.

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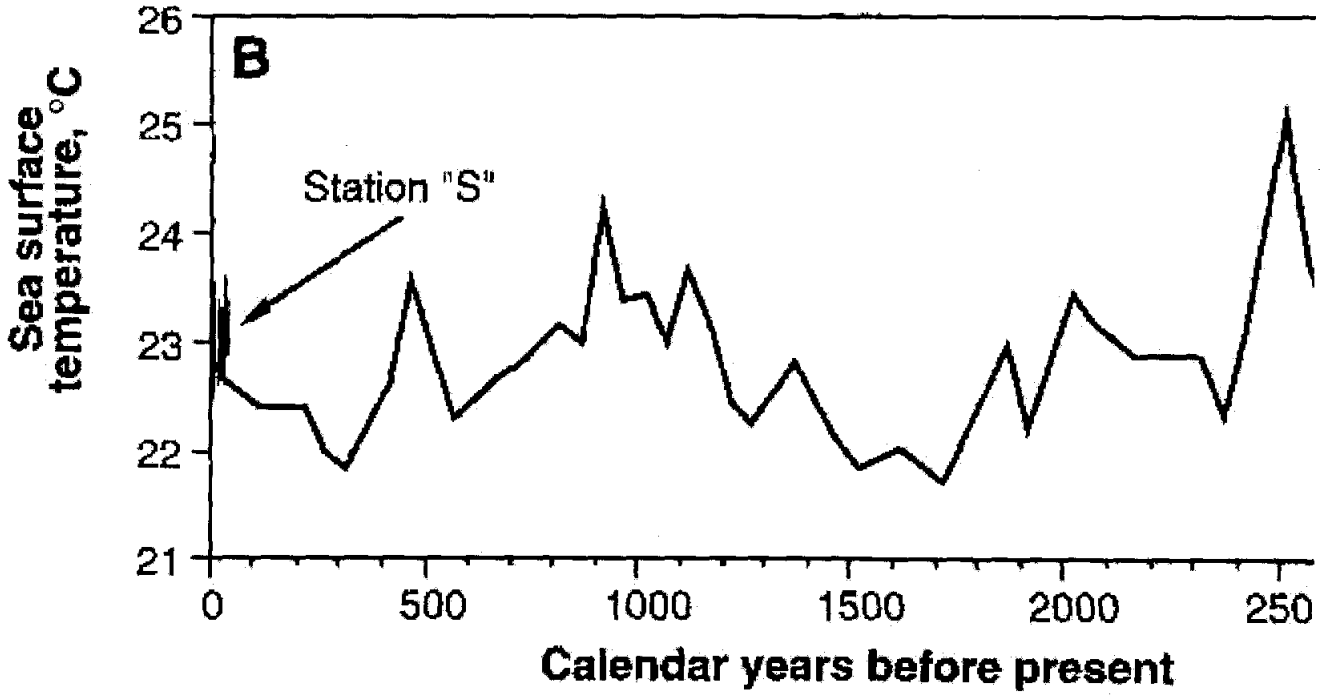

Figure 1: Detailed temperature variations of the past 3,000 years, as determined from ocean sediment studies [Keigwin, 1996]. Note the rapid variations, as well as the much warmer temperatures that existed 2,500 years ago.