

Climate Change: A Meteorological Perspective

William Kininmonthⁱ

The near hysteria in some sections of the community about the potential for human-caused global warming and dangerous climate change rest on two claims:

1. Prior to industrialisation the climate was stable. As a consequence, most of the global warming of the 20th century must be due to industrial and agricultural activities.
2. Increasing concentrations of greenhouse gases in the atmosphere, especially carbon dioxide from burning fossil fuel, will push the climate past a 'tipping point' leading to irreversible climate change.

The first of these claims is patently false. Climate naturally fluctuates on a range of timescales from the interannual El Niño-La Niña to the 100,000 year ice age cycles. Twenty thousand years ago the earth was at the last glacial maximum with great ice sheets several kilometres thick covering large parts of North America and northern Europe. Sea levels were about 130 metres lower than today. The onset of rapid warming led to the melting of land ice and the current interglacial. Even during the last 5,000 years as earth has cooled from the Holocene Optimum there are identifiable impacts as subtropical areas in particular have dried.

Of particular importance to humankind are the fluctuations of temperature and land ice that have impacted on the recorded history of civilisation. The relative warmth of the Greco-Roman era, the medieval period and the recent 200 years are in contrast to the Dark Ages of the early first millennium and the Little Ice Age of the middle second millennium. Humanity seemed to prosper during the warmer periods while human suffering characterised the colder times.

The second claim of dangerous global warming is a gross exaggeration. The claim is based solely on projections made with flawed computer models of the climate system.

There is a greenhouse effect. The increasing emissions of carbon dioxide from burning fossil fuel will enhance the greenhouse effect. However, the magnitude of the enhancement is constrained by two factors:

1. Carbon dioxide, as a radiation forcing agent, has diminishing incremental impact with increasing concentration.
2. The earth's surface is 70 percent ocean and the land surfaces are largely covered by transpiring vegetation. It is well known that evaporation of latent heat constrains surface temperatures (see Priestley – Agricultural Meteorology, 1966). As surface temperature increases then evaporation of latent heat from the surface (at about 7 percent increase with each degree Celsius temperature rise) dominates carbon dioxide forcing of radiation and constrains any surface temperature rise.

It is now well established (see Held and Soden – J of Climate, 2006; Wentz et al – Science, 2007) that the computer models used by IPCC for the temperature projections in its 2007 assessment report are flawed by a gross underestimation of the rate of increase of evaporation with temperature. As a consequence, these computer models have grossly exaggerated the likely global temperature response to carbon dioxide forcing. It is also the underestimation of evaporation increase that results in the misleading projection of further drought as global temperatures rise, a finding that is at odds with paleo data that point to wetter climates during warmer interglacials and drier climates during cold glacial periods.

The IPCC estimates a likely range of temperature rise between 2°C and 6°C for a doubling of carbon dioxide concentration. Some activist scientists have recently written to the Prime Minister claiming that the upper estimate is conservative! In reality, increased evaporation of latent heat will draw energy from the surface and constrain global temperature rise to about 0.5°C.

There are many uncertainties and unknowns as to the cause of past climate variability and change and how climate will change in the future. However, carbon dioxide emissions from modern industry and agriculture will have only limited influence. Carbon dioxide is not a pollutant but benefits plant growth through enhancing photosynthesis.

ⁱWilliam Kininmonth is a former head of Australia's National Climate Centre and consultant to the World Meteorological Organization on climate matters. He is author of Climate Change: A natural Hazard (2004, Multi-Science Publishing Co., UK)