Human-driven changes in climate to blame for altered natural processes

New research adds to the body of evidence which suggests that global warming driven by human activities is affecting physical and biological systems. The study found a number of changes in the behaviour of the Earth’s natural processes – such as water systems and the seasonal responses of plants and animals - that are not attributable to natural climate variations.

A team of international researchers examined previous studies, using data from between 1970 and 2004, which documented significant changes to natural systems on all continents and in oceans across the world.

Major changes, consistent with the anticipated effects of warmer temperatures, were found in the cryosphere (the Earth’s collective store of ice – including ice caps and glaciers), global water systems and in terrestrial biological systems. Physical changes included retreating glaciers on all continents, thawing permafrost, advanced peak flow of rivers from earlier snow melts and coastal erosion. Elsewhere, evidence of species moving to higher altitudes and latitudes in the northern hemisphere, advanced signs of the arrival of spring, such as early unfurling of leaves and blossom times, and changes to the distribution of marine communities were seen in biological systems. Approximately 95 per cent of observed changes in physical systems and 90 per cent in biological systems were associated with warmer temperatures as a result of climate change.

When mapped against measured temperatures across the world, the researchers found a significant association between rising temperatures and the changes seen in the natural systems. Given the evaluation by the Intergovernmental Panel on Climate Change (IPCC) \(^1\) Fourth Assessment Report, that greenhouse gas emissions from human activities are the most likely significant cause of global warming, the study suggests that the rising temperatures caused by humans are most probably causing significant and widespread impacts in physical and biological systems on both global and continental scales.

Many of the previous studies were concentrated in Europe, North America and North Central Asia. The lack of information for Africa, South America, the Indian Ocean and parts of the Pacific Ocean is a concern, as many developing countries are located in these tropical and sub-tropical regions.

The research found that alternative explanations for changes seen in these natural systems, such as alterations of land use or the possible effects of higher levels of CO\(_2\) on plants, were unlikely to be the causes of the impacts observed in these areas. The study suggests that the observed changes, which are attributable to warming temperatures, are caused by human influences, as natural climate variations could not have been responsible for the rise in global temperature.


Contact: crosenzweig@giss.nasa.gov

Theme(s): Climate Change and Energy