American Meteorological Society Annual Meeting

Abstract Title: (425) The Photochemistry of Gas Molecules in Earth's Atmosphere Determines the Structure of the Atmosphere and the Average Temperature at Earth's Surface

Abstract Type: Poster

Conferences: 23rd Conference on Atmospheric Chemistry

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Abstract Schedule:
Date: Tuesday, January 12, 2021
Time: 2:00 p.m. - 3:30 p.m.

Abstract Description:

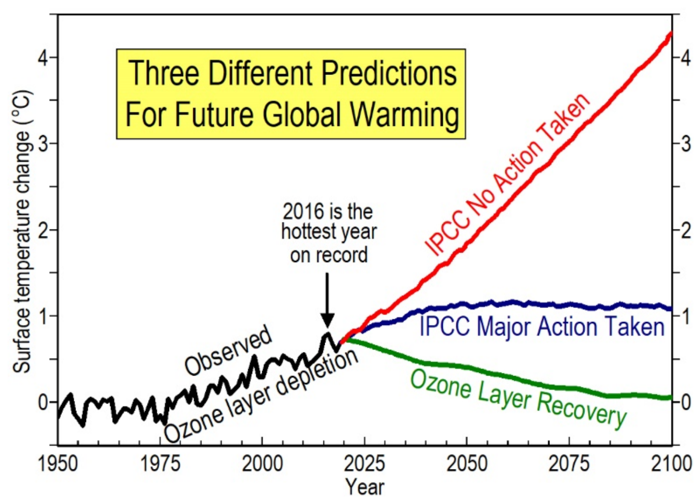
A molecule of oxygen absorbing solar ultraviolet-C radiation is photo-dissociated into two atoms of oxygen that fly apart at high velocity, converting kinetic energy of oscillation of the molecular bond directly and completely into kinetic energy of linear motion of the oxygen atoms. This increases air temperature. Two oxygen atoms can then collide forming a new oxygen molecule that can then be dissociated again as long as sufficient ultraviolet-C radiation exists. This continual dissociation of oxygen molecules is the primary reason for the stratopause being 30 to 40 degrees warmer than the tropopause and for all ultraviolet-C radiation being absorbed before reaching the lower stratosphere. Furthermore, an oxygen molecule and an oxygen atom can collide to form a molecule of ozone, which is photo-dissociated by solar ultraviolet-B radiation. Normally, 97 to 99 percent of ultraviolet-B radiation is absorbed in the ozone layer, warming the lower stratosphere.

By 1970, however, humans manufacturing chlorofluorocarbon gases caused up to 70% depletion of ozone, cooling the ozone layer and allowing more ultraviolet-B to reach Earth where it photo-dissociates ground-level ozone pollution, raising air temperatures, especially in the most polluted areas. Ultraviolet-B also penetrates oceans tens of meters, efficiently raising ocean heat content. Earth's surface warmed 0.6ºC from 1970 to 1998 with warming twice as great in the northern hemisphere containing 90% of global population.

In 2014, Bárðarbunga volcano in central Iceland extruded 85 km^2 of basaltic lavas in six months, depleting the ozone layer and warming Earth another 0.3ºC by 2016.

Throughout Earth history, basaltic lava flows covering areas of up to millions of square kilometers are contemporaneous with sudden global warming the larger the lava flow, the greater the warming.

Large explosive volcanic eruptions, on the other hand, typically form aerosols in the lower stratosphere that spread throughout the world, reflecting and scattering sunlight, cooling Earth approximately 0.5°C for two to four years. Computer modelling shows the effects of this global cooling can still be observed in ocean temperatures a century later. Several large explosive volcanic eruptions per century, continuing for millennia, cool oceans incrementally down into ice-age conditions.



Detailed measurements of air temperatures in ice cores at Summit Greenland over the past 122,000 years show that the footprints of climate change are sudden warming within years, followed by slow, incremental cooling over millennia, in highly erratic sequences averaging only a few thousand years in length. Ozone depletion and aerosols are particularly effective at changing global temperatures because they occur worldwide.

More information at WhyClimateChanges.com. This paper is available at WhyClimateChanges.com/photochemistry.pdf.