



A PHILATELIC HISTORY OF CLIMATE CHANGE

By Garry Toth and Don Hillger

Although there are still some out there who express skepticism about the legitimacy of anthropogenic climate change, the story of growing concern about the issue can be tracked in some unusual places. One way is through postage stamps. During the past few decades, postage stamps depicting various related images and hailing from diverse places have told, in their own way, a story about anthropogenic climate change.

[Throughout this article, the stamps are referred to by their country, year of issue, and catalogue numbers from the American *Scott* (Sc) and German *Michel* (Mi) catalogues of postage stamps.]

It is a bit surprising that the story can be traced back as far as the 18th century. The earliest precursor of the science of climate change to be recognized on a stamp was Horace de Saussure (1740-1799), a Swiss alpinist and physicist known for contributions to meteorology, including the development of an early hygrometer. De Saussure experimented with an insulated box that was topped by three layers of glass, and found that solar energy entering through the glass would heat the box. In 1986, Monaco issued a stamp (Sc 1558, Mi 1781) commemorating the 200th anniversary of the first successful climb to the top of Mont Blanc in 1786 (by Balmat and Paccard, who are featured along with de Saussure on the stamp). De Saussure is featured because he had offered a prize to the first men to attain the summit, and had previously tried and failed before 1786 to reach the top. He finally made it to the top in 1787, and at that point was able to conduct his desired scientific experiments at the summit.

In the 1820s, de Saussure's early solar oven came to the attention of the French mathematician Jean-Joseph Fourier (1768-1830), who was later featured on a stamp issued in 2011 by the Altai Republic (no catalogue number available). He hypothesized that the earth's atmosphere acts in a manner similar to those panes of glass: it lets solar energy in, but blocks some of the outgoing energy emitted by the earth, acting as a sort of glass-walled greenhouse. As in the oven, the atmospheric temperature must therefore rise. The atmosphere is more complicated, of course, but Fourier's observation is recognized as the first statement of what is now called the atmospheric "greenhouse effect." It is easily shown that due to this effect, the earth is about 33°C warmer than it would be without the atmosphere. In the absence of this natural greenhouse effect, life as we know it would not exist.

In 1978, the Ivory Coast issued a stamp (Sc 460, Mi 546) remembering the work of Swedish chemist Svante Arrhenius (1859-1927). In the mid-1890s, Arrhenius, whose portrait was featured on the stamp, argued that atmospheric "carbonic acid" (CO₂) and other trace gases influence the Earth's radiative balance, and therefore the global temperature, through the greenhouse effect. He was the first to attempt to quantify this link in a publication called "On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground" in 1896, in which



Monaco, 1986, Sc 1558, Mi 1781



Altai Republic, 2011



Ivory Coast, 1978, Sc 460, Mi 546

All stamp images courtesy of <http://rammb.cira.colostate.edu/dev/hillger/weather.htm>



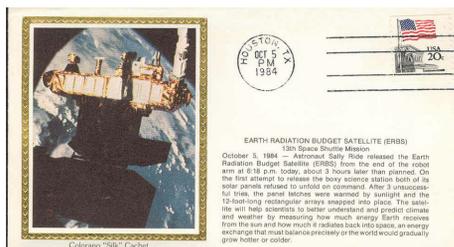
Yugoslavia, 1979, Sc 1432, Mi 1793



French Southern and Antarctic Territories, 2006, Sc 371, Mi 601



Sweden cancellation



Philatelic launch cover



Germany, 1995, Sc 1884, Mi 1785



Japan, 1997, Sc 2599, Mi 2511

he found that a doubling of CO₂ would correspond to a global temperature increase of 5-6°C. In later work, he lowered that estimate. In modern terms, this temperature response is known as the climate sensitivity.

In the first half of the 20th century, Arrhenius' results were more or less ignored. Scientists concentrated instead on natural climate changes over the very long term, such as the coming and going of the Ice Ages. Milutin Milanković (1879-1958) was a Serbian mathematician who, in the 1930s, derived a relationship between long-term cycles in the earth's climate and changes in its orbital eccentricity, axial tilt, and precession. This "Milanković cycle" theory considers time periods of tens or hundreds of thousands of years. Climate changes over shorter periods must be due to other factors. Several stamps feature Milanković, including one from Yugoslavia in 1979 for the 100th anniversary of his birth (Sc 1432, Mi 1793).

In 1958, Charles Keeling (1928-2005) (no known stamps) began a program of measurement of CO₂ concentrations at the Mauna Loa Observatory in Hawaii. Such measurements have continued to this day, at Mauna Loa and many other

locations. They show an unrelenting long-term increase in a curve that has come to be called the Keeling curve. In 2006, the French Southern and Antarctic Territories issued a stamp (Sc 371, Mi 601) showing this curve as measured over a 25-year period at Amsterdam Island in the southern Indian Ocean. Such data made some scientists again consider the possibility of global warming due to increased CO₂ concentrations because of human burning of fossil fuels, following Arrhenius' pioneering work. Furthermore, in the 1970s and 1980s, more and more satellite-based observations of the atmosphere became available and brought a global perspective that had been impossible to achieve before. For example, the Earth Radiation Budget Satellite (ERBS) was deployed from the space shuttle mission STS-41G on October 5, 1984. Its mission was to measure the earth's radiation balance, which as mentioned above determines the global mean temperature. No stamps are known to show ERBS. However, philatelic launch covers (special postal envelopes that present information about the satellite and are issued on its launch date) are available.

Worries about anthropogenic global warming led to the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988. Broadly, its mission is to provide the governments of the world with the best available science on climate and climate change. The Fourth Session of the IPCC was held in Sundsvall, Sweden, from August 27-30, 1990. The event is commemorated in a Swedish cancellation from the opening day of the conference. (A cancellation is the indelible mark applied by the post office to a stamp used on a letter as postage. It often contains the name of the post office or the town where the letter is mailed, along with the date and/or time. This is done so that the stamp cannot be reused.) The Fourth Session Overview formed part of the IPCC First Assessment Report, which was published in 1990. That Report was the first comprehensive summary of scientific knowledge about the climate and global warming caused by the burning of fossil fuels. It served as the basis for the establishment of the United Nations Framework Convention on Climate Change (UNFCCC).

The first UNFCCC meeting took place in Berlin in 1995 and was commemorated by a German stamp with a rainbow above a symbolic globe and text mentioning the conference (1995, Sc 1884, Mi 1785). The third meeting in 1997 was the well-known Kyoto conference, which was commemorated by a stamp (Japan, 1997, Sc 2599, Mi 2511) depicting a mother earth figure playing a flute in a drawing that evokes a sort of

idyll of nature. The text at the top refers to the meeting UNFCCC/COP3.

The 2007 IPCC Fourth Assessment Report (the latest available) gives a climate sensitivity in the range of 2°C-4.5°C. As outlined above, even with the tools and information available over a century ago, the seminal work of Arrhenius produced values not far from this current estimate. Ongoing research is attempting to refine the estimate by improving the treatment of the various feedbacks, which are complicated to handle.

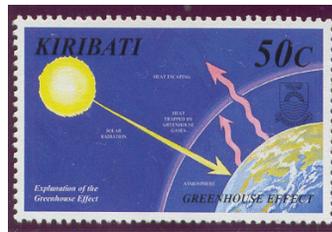
Postage stamps calling out global warming and the greenhouse effect as important issues appeared in the 1990s. A few low-lying island nations were among the earliest to issue such stamps, probably as a result of their vulnerability to rises in sea level. For example, a 1991 stamp from the Maldive Islands (Sc 1516, Mi 1531) features the words “Global Warming” and “melting ice could raise sea level” with two ocean scenes. One year later, Great Britain (1992, Sc 1465, Mi 1416) publicized the issue with a child’s drawing of a greenhouse and the words “Greenhouse Effect.” In 1994, Denmark (Sc 999, Mi 1072) presented a stylized globe as the “O” in CO₂ in a stamp whose theme is saving the earth from increasing CO₂ levels. Some stamps included a simple illustration of the greenhouse effect. In 1998, a design from Kiribati (Sc 732, Mi 791) showed incoming solar radiation reaching the earth, while outgoing radiation is partially blocked (“heat trapped by greenhouse gases” in the text).

Graphics representing the observed global temperature increase have appeared on a few stamps. A souvenir sheet of one stamp issued by Tuvalu in 2007 (Sc 1033, Mi Block 4) includes a ragged temperature trace with clear warming in the latter part of the 20th century. It must be pointed out that research has shown that several factors other than greenhouse gases also have some effect on the temperature. For example, the dust and ash ejected into the atmosphere by a major volcanic eruption have a cooling effect. This happened after the eruptions of Tambora (1815), Krakatoa (1883), and, in the modern era, Pinatubo (1992). Various stamps depict these eruptions. One, from Mali (1999, Sc 1032e, Mi 2429), is an artist’s rendering of the Krakatoa explosion. The oceans also affect the global temperature. For example, the well-known El Niño warming of the eastern Pacific is known to warm the atmosphere, while its opposite, La Niña, has a cooling effect. A beautiful stamp from Peru (Sc 1423, Mi 1938) issued in 2004 showed a sea surface anomaly map that shows El Niño conditions.

Stamps with the theme of anthropogenic climate change have become more common since the beginning of the 21st century. Melting ice is mentioned frequently. In one example, a minish-
 eet of two stamps from Indonesia (2004, Sc 2104,



Maldive Islands, 1991, Sc 1516, Mi 1531



Kiribati, 1998, Sc 732, Mi 791



Great Britain, 1992, Sc 1465, Mi 1416



Tuvalu, 2007, Sc 1033, Mi Block 4



Mali, 1999, Sc 1032e, Mi 2429



Peru, 2004, Sc 1423, Mi 1938



Denmark, 1994, Sc 999, Mi 1072



Indonesia, 2004, Sc 2104, Mi Block 229



Switzerland, 2009, Sc 1334, Mi 2097



Netherlands, 2008, Sc 1297e, Mi 2556



Turkey, 2008, Sc 3122, Mi Block 67



Israel, 2009, Sc 1778b, Mi 2064

Mi Block 229) presents “melting ice, a hot topic” with emphasis on the Arctic as implied by the polar bear. Other stamps feature the melting of land-based glaciers. A swiss stamp (Sc 1334 Mi 2097), issued in 2009, shows a mountain glacier with outlines of decreasing area over the years with increasing temperatures. Climate change might be reflected in other ways as well, such as the possibility of droughts of increased duration or intensity. This idea is seen in some stamps, such as a minisheet of four issued by Turkey in 2008 (Sc 3122, Mi Block 67). Its principal theme is global warming (“Küresel Isınma”), but worries about associated drought are seen in the parched and cracked ground of the rightmost stamp. Forests are of course important because they absorb CO₂, and several stamps present deforestation or afforestation in a climate change context. One stamp from the Netherlands (2008, Sc 1297e, Mi 2556) refers to the “compensation” provided by forests with regard to CO₂ emissions.

Is the earth in a frying pan? A stamp from Israel issued in 2009 (Sc 1778b, Mi 2064) uses such an image. Even if that is exaggerated, anthropogenic climate change has enough potential impacts that it should be of universal concern.



Germany, 2006, Sc B966, Mi 2508

As stated in a stamp from Germany (2006, Sc B966, Mi 2508), “Climate change concerns everyone.” **W**

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