

Biography: Owen Brian Toon, TC4 Mission Scientist

Dr. Brian Toon is a Mission Scientist for the TC4 mission. He led the group that developed the mission concepts for TC4 and has spent more than five years working to make this mission a reality. Along with Dr. Dave Starr, he will lead the effort to plan the aircraft flights and to maximize the scientific return on this large international investment.

Dr. Toon completed an A. B. in physics at U. C. Berkeley in 1969 and a Ph.D. in physics at Cornell University in 1975 with Professor Carl Sagan. He joined the NASA Ames Research Center in 1978 and became a Professor at the University of Colorado in 1997. He became Director of the Program in Atmospheric Science at the University of Colorado in 2000, and was the founding Chair of the Department of Atmospheric and Oceanic Sciences at the University of Colorado in 2006.



Dr. Toon's scientific research is focused on radiative transfer, cloud physics and atmospheric chemistry as well as the search for parallels between the Earth and the terrestrial planets. He studied the physics and chemistry of the clouds of Venus and used that work to better understand the climatic impact of stratospheric volcanic clouds on Earth. He contrasted Martian and terrestrial ice ages, and compared the greenhouse effects on Earth and Venus. He studied the asteroid impact 65 million years ago that may have led to the extinction of the dinosaurs. He showed that major temperature declines, and light levels so low that photosynthesis and vision would be impossible, were likely after-effects of large impacts. The asteroid impact study led to the discovery of the nuclear winter phenomena. The initial line of the Intermediate Range Nuclear Forces Treaty between the U.S. and U.S.S.R. suggests that nuclear winter played a significant role in the large reductions in nuclear weapons that have occurred since 1986. Following the discovery of the ozone hole, Dr. Toon proposed that clouds of nitric and hydrochloric acid form in the winter polar stratospheres; that such clouds allow reactions producing ozone-reactive chlorine; and that the clouds alter the nitrogen oxide balance of the stratosphere allowing chlorine to destroy significant amounts of ozone. These clouds have since been found to be critical to the formation of the ozone hole in the ways predicted. Most recently Dr. Toon has led research on aerosols in the Earth's troposphere and how such aerosols affect clouds, to which the climate is quite sensitive. He is also leading an effort to understand the dangers of regional nuclear conflicts between newly developing nuclear nations.

Dr. Toon is the author, or coauthor, of more than 250 papers in the reviewed literature. He received NASA's medal for Exceptional Scientific Achievement in 1983 for studies of the climates of Earth and the planets, and again in 1989 for work on the ozone hole. He was a co-winner of the American Physical Society's 1985 Leo Szilard Award for Physics in the Public Interest for his work on nuclear winter. He received the Washington, DC Jaycees' 37th Annual Arthur Flemming Award for outstanding individual performance in the Federal Government. He was elected a Fellow of the American Meteorological Society in 1990, and a Fellow of the

American Geophysical Union in 1992. He received an Honorary Doctorate in 1995 from the University of Southern Utah. He was recognized by ISI Thomson Scientific for being one of the most highly cited, influential researchers in Geosciences in 2002.

Dr. Toon has significant experience in earth science field campaigns, and was the Deputy Project Scientist for the 1987 Airborne Antarctic Ozone Expedition, and the DC-8 Flight Scientist in the 1989 and 1992 Airborne Arctic Stratospheric Expeditions which sought to understand the reasons for polar ozone loss. He was the co-Project Scientist for the Tropical Ozone Transport Experiment a 1995-96 aircraft mission to investigate stratospheric transport processes in the Arctic and in the tropics. He was also the Project Scientist for the Subsonic Aircraft: Contrail and Cloud Effect Special Study, a 1996 multi-aircraft campaign whose goal was to learn about the formation, and radiative properties of cirrus clouds and the effects that aircraft may have on them. He was a Co-project Scientist for the SAGE III Ozone Loss and Validation Experiment, a multi-aircraft field mission that examined Arctic ozone loss in 2000. He was also a Co-project scientist for The Cirrus Regional Study of Tropical Anvils and Cirrus Layers –Florida Area Cirrus Experiment, which took place in 2002. He has also been involved in numerous satellite missions including Aura and Calipso.