Satellite Meteorology History: A View from Madison

Model of the Russian satellite Sputnik 1.
Credit: NASA

First rocket launch from Cape Canaveral, July 1950. Using a V-2 missile base, the upper stage was able to reach nearly 400 kilometers, higher than modern space shuttles have flown.
Credit: NASA

1957
In October, the Soviet Union successfully launches Sputnik 1 as a contribution to the International Geophysical Year, triggering the space race between the United States and the U.S.S.R.

Scientists from 67 countries, including the U.S., participated in the International Geophysical Year (IGY),1957-1958. Meteorology was an area of global observation.
Credit: National Academy of Sciences

1950
First rocket launch from Cape Canaveral.

Satellite weather pioneer Verner E. Suomi measured the heat budget of a corn field in support of his doctorate from the University of Chicago. He measured the difference between the amount of energy absorbed and the amount of energy lost in a cornfield. This led him to think about the Earth's heat budget.

1953

Suomi (second from right) and colleagues study the heat budget of a cornfield in 1953.
Credit: Iowa State College (University) Experiment Station, courtesy Space Science and Engineering Center, UW-Madison

U.S. announces plans to launch world's first man-made satellite.

1955

Congress passes the Space Act, creating the National Aeronautics and Space Administration, or NASA.

The United States successfully launches its first satellite, Explorer-1, on 31 January 1958.

1958

Parent and Suomi work on their early satellite instrument.
Credit: UW-Madison Communications

Suomi and Parent's instrument for measuring the heat balance of the Earth was carried on Vanguard SLV-6, launched on 22 June 1959. A faulty second stage pressure valve resulted in the mission's failure.
Credit: NASA

Suomi and Parent had instruments on three launch attempts in 1959, an unprecedented effort. Two of the launches ended in failure, but the third, Explorer 7, was successful, resulting in the first meteorological experiment of Earth from space.
Credit: Wisconsin State Journal, Friday July 17, 1959, reprinted with permission

1959
Failed Vanguard SLV-6 launch 22 June 1959.

1959
Failed Explorer 7x launch 16 July 1959. (See WSJ article above.)

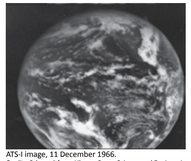
1959
Finally, success: Explorer 7 launches successfully 13 October 1959.

Radiometer instrument designed by Suomi and Parent to conduct the first Earth radiation experiment flies on Explorer 7. With this experiment, Suomi establishes the critical role played by clouds in absorbing solar energy, setting the stage for the integration of satellites into the field of meteorology.

1959

Suomi and NASA scientist Herman LeGow inspect Explorer 7. This photograph shows the actual satellite, not a model.
Credit: NASA Glenn Research Center (NASA-GRC)

Explorer VII launches successfully on 13 October 1959.
Credit: NASA Glenn Research Center (NASA-GRC)



ATS-I image, 11 December 1966.
Credit: Schwerdtfeger Library, Space Science and Engineering Center, UW-Madison

Man-computer Interactive Data Access System (McIDAS).
Credit: UW-Madison Communications

1966
ATS-I, the first geostationary satellite, launched on 7 December 1966 (UTC). It carried Parent and Suomi's Spin Scan Cloud Camera (SSCC), the technology that made viewing Earth from geosynchronous orbit possible. The launch of ATS-I ushered in the era of continuous viewing of weather from space. Suomi understood the benefits of observing a single weather phenomenon over time; he noted, "the weather moves – not the satellite." These kinds of observations were not possible using the early, low-alttitude polar-orbiting satellites.

The TIROS Program (Television Infrared Observation Satellite) was NASA's early program to determine if satellites could be useful in the study of the Earth.

1960

First picture of Earth from TIROS-I.
Credit: NOAA

1968
Visualization software developed at SSEC allowed display and manipulation of the ATS images.

1972
Introduction of Man-computer Interactive Data Access System (McIDAS): the world's first system to visualize satellite images and obtain accurate cloud motions. Based on instant replay used for football viewers, McIDAS complemented Suomi's spin-scan camera in geosynchronous orbit, as a system for acquiring, storing, navigating and animating images from satellites. The combination of these two inventions enabled people to see, for the first time, animated cloud images, now a routine feature of television weather reports.

ATS-III launched on 5 November 1967. It sent the first color images from the Multicolor Spin Scan Cloud Camera (MSSCC), the second generation of Suomi's revolutionary technology. The ATS-III was the only geostationary satellite with a channel for observing phenomena in true blue color, which was, and remains, a unique feature for a weather satellite. The camera provided color pictures for approximately three months at which time the red and blue channels failed. The system continued to transmit black-and-white pictures until 11 December 1974.

1967

ATS-III image from 18 November 1967.
Credit: Space Science and Engineering Center, UW-Madison

GOES-1, the first geostationary orbiting environmental satellite.
Credit: NOAA

GOES-2 satellite before launch.
Credit: NOAA

1975
SMS led to GOES-1 launched on 16 October 1975, carrying Suomi's camera.

1977
GOES-2 launched on 16 June 1977 aboard a Delta rocket.

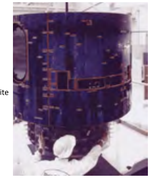
1978
First GARP Global Experiment (FGGE) planned for 1978-1979. SSEC was selected to archive satellite wind vectors from cloud heights. Suomi played a key organizing role. Europe and Japan adopted Suomi's basic concept to establish geostationary imaging over their parts of the world.

The success of Suomi's camera on the ATS series of satellites led to NASA's Synchronous Meteorological Satellite (SMS) with an infrared camera, allowing scientists to see clouds at night and to estimate their height in the atmosphere. SMS launched on 17 May 1974.

The Global Atmospheric Research Program (GARP) Atlantic Tropical Experiment (GATE), benefitted from the infrared camera that Suomi recommended. GARP was the first truly global effort to gather data on atmospheric circulation and other weather phenomena.

By applying the video-processing capability of McIDAS, the 'nowcasting' concept evolved emphasizing intermediate-sized atmospheric features and yielding better forecasts.

1974



The Synchronous Meteorological Satellite (SMS).
Credit: NASA

UW-Madison Space Science and Engineering Center, working with industry, NOAA and NASA, led the design of the High-resolution Interferometer Sounder (HIS), the first hyperspectral GOES sounder, an instrument used to vertically probe the atmosphere.

1979

SSEC scientists work on the High-resolution Interferometer Sounder (HIS).
Credit: Space Science and Engineering Center, UW-Madison

GOES-4 launch on 9 September 1980.
Credit: NOAA

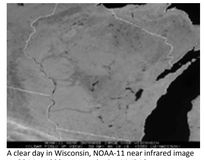
1980
Cooperative Institute for Meteorological Satellite Studies (CIMSS) founded by Dr. Suomi through a Memorandum of Understanding between UW-Madison, NOAA and NASA.

GOES-4, launched 9 September 1980, was the first geostationary satellite to provide continuous vertical profiles of atmospheric temperature and moisture. A new instrument, the Visible Infrared Spin Scan Radiometer (VISSR) Atmospheric Sounder (VAS), was a modification of the original spin-scan design. It was the first geostationary sounder. Wisconsin researchers led the world in developing infrared sounders which dramatically improved weather forecasts. Real-time applications from VAS were demonstrated by the UW/NOAA team.

McIDAS installations continued to expand with support and systems provided to the National Hurricane Center, NASA (in support of space shuttle launches), weather agencies worldwide, and commercial entities such as United Parcel Service.

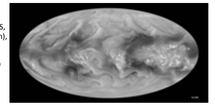
The International TOVS (TIROS Operational Vertical Sounder) Study Conferences have roots at UW-Madison. CIMSS Director Dr. William Smith was one of the early conveners working to optimize and standardize TOVS processing procedures so that accurate data sets could be available to the international scientific community. The first TOVS conference was held in Igls, Austria in 1983 and scientists around the globe have met every 18-24 months since.

1983



A clear day in Wisconsin, NOAA-11 near infrared image on 30 May 1990 processed using McIDAS.
Credit: Space Science and Engineering Center, UW-Madison

This global composite image, generated with McIDAS, combines GOES (United States), Meteosat (European), and MTSAT (Japanese) satellite data to show water vapor in the atmosphere.
Credit: Space Science and Engineering Center, UW-Madison



GOES-8 (artist's rendition).
Credit: NOAA

Fall color in Wisconsin, taken from the Aqua satellite on 6 October 2003.
Credit: Space Science and Engineering Center, UW-Madison

1988
SSEC participated in software and instrument development for next-generation geostationary satellites.

World-wide network of McIDAS sites continued to expand.

1991

1994
GOES-8 launched 13 April 1994 was the first GOES satellite deployed on a three-axis stable platform. The NOAA team at SSEC developed ingestors, simulations, and provided technical expertise.

The Terra satellite is an important part of NASA's Science Mission Directorate. The MODIS Science Team at UW-Madison utilizes imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite to study developing weather patterns.

1999

Wisconsin in winter, taken from the Terra satellite on 22 December 2004.
Credit: Space Science and Engineering Center, UW-Madison

2000

GOES-11 image, 17 May 2000.
Credit: Space Science and Engineering Center, UW-Madison

2001
GOES-11 launched 3 May 2000. First official visible channel image from GOES-11 posted on SSEC website on 17 May.

CIMSS and NOAA's Advanced Satellite Products Team (ASPT) participated in GOES pre-launch activities and performed the GOES science tests. Tests included checking data quality, producing products from data stream and comparing them to those from other satellites, investigating the impact of new spectral bands, and posting hourly displays of data from all 19 sounder channels.

McIDAS V allows combination and manipulation of data to overlay atmospheric phenomena onto surface contours of the Earth.
Credit: Space Science and Engineering Center, UW-Madison

2002
NASA's Aqua satellite mission will collect information about the Earth's water cycle. The Aqua Science Team at CIMSS processes the imagery to study the atmosphere, clouds, precipitation, sea and land ice, and snow cover.

GOES-14 launched at Cape Canaveral on 27 June 2009 with a mission to improve weather prediction in North America. GOES-15 followed in 2010.
Credit: NOAA

2009
GOES-14 launched 27 June 2009.

Images from Suomi NPP's Visible Infrared Imaging Radiometer Suite (VIIRS) instrument were stitched together to create this high-quality image of the Earth in January 2012.
Credit: NOAA/NASA

2011
The NPOESS Preparatory Project (NPP) spacecraft lifted off at Vandenberg Air Force Base on 28 October 2011. The NPP instrument payload builds on more than four decades of Earth observation to help us better understand our climate.

2012
On 24 January 2012 NASA announced that the NPP was renamed the Suomi National Polar-Orbiting Partnership (Suomi NPP) in honor of SSEC founder, Verner E. Suomi, the father of satellite meteorology.

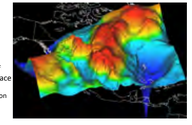
SSEC scientists and engineers build on their history, developing the next generation interferometer by using the phase transition as the reference temperature.

Anticipated launch of GOES-R. NOAA and CIMSS scientists are currently developing and testing instrument designs for improved and timely weather forecasts and detection of meteorological phenomena that affect public safety.

2015

McIDAS V, the fifth generation of SSEC's visualization software now displays weather satellite and other geophysical data in 2- and 3- dimensions for improved analysis of weather phenomena.

2010



For more information visit: http://library.ssec.wisc.edu/timeline

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