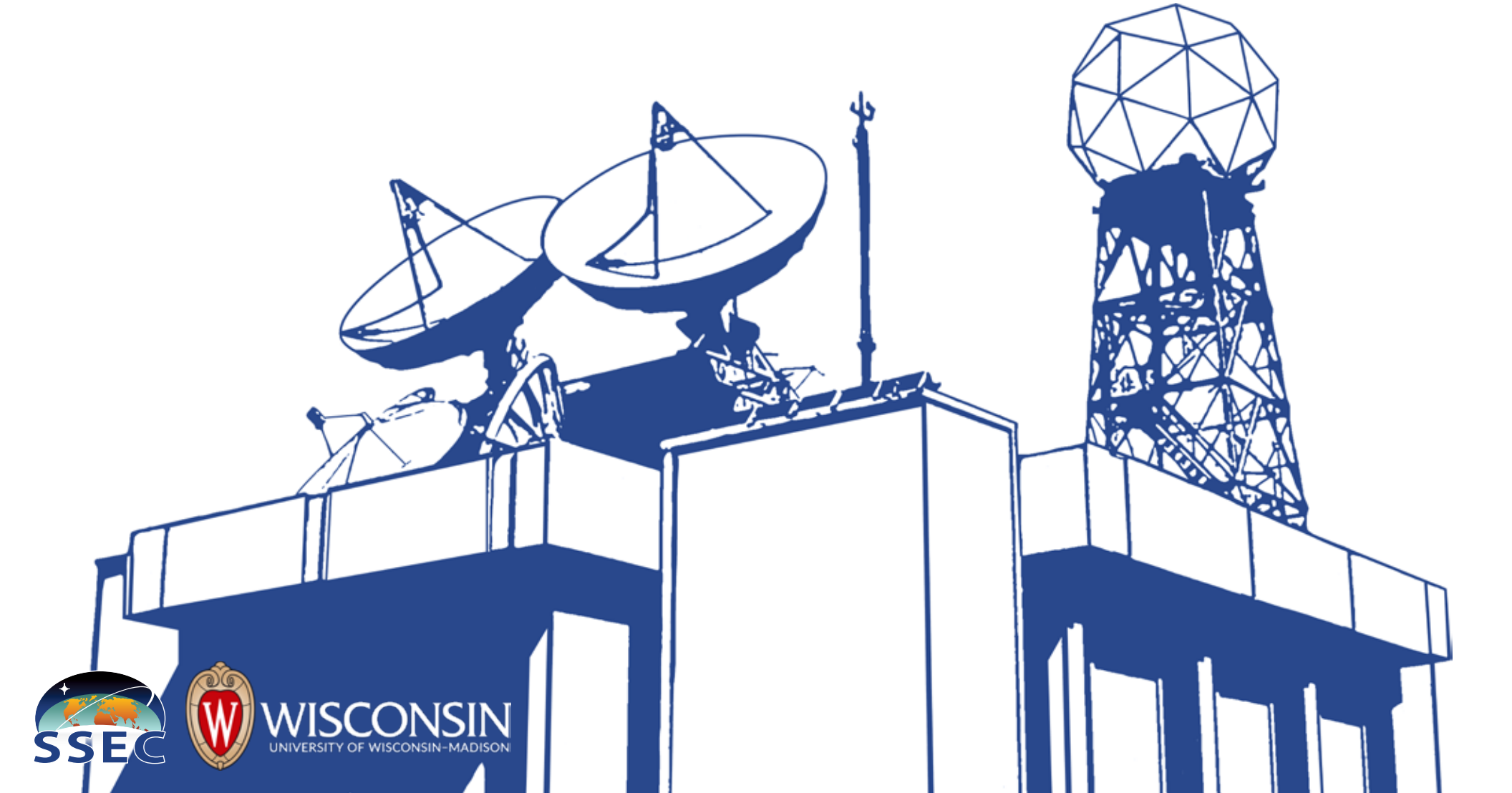
SPACE SCIENCE AND ENGINEERING CENTER

MISSION AND STRENGTHS



SSEC

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

MISSION

Located in the heart of Wisconsin's capital, the Space Science and Engineering Center (SSEC) is one of the largest research and development centers at the University of Wisconsin–Madison, receiving support and oversight through the university's Office of the Vice Chancellor for Research and Graduate Education. Housed within SSEC is the world-renowned Cooperative Institute for Meteorological Satellite Studies (CIMSS).

SSEC is internationally recognized for its research using space- and ground-based instrumentation to collect and analyze observations of the Earth's atmosphere, oceans, land surface and other planetary atmospheres to improve our understanding of weather, climate and atmospheric processes. On campus we support other research centers' initiatives with technical, administrative and management expertise. In addition we provide opportunities for undergraduate and graduate students to work side-by-side with scientists in support of the university's educational mission.

Throughout its 50-plus year history, SSEC has built key partnerships with government research and operational centers, research centers at other universities and industry. That cooperation has been instrumental in transferring our work to operational observing and forecast systems to serve and protect the citizens of Wisconsin and around the world.

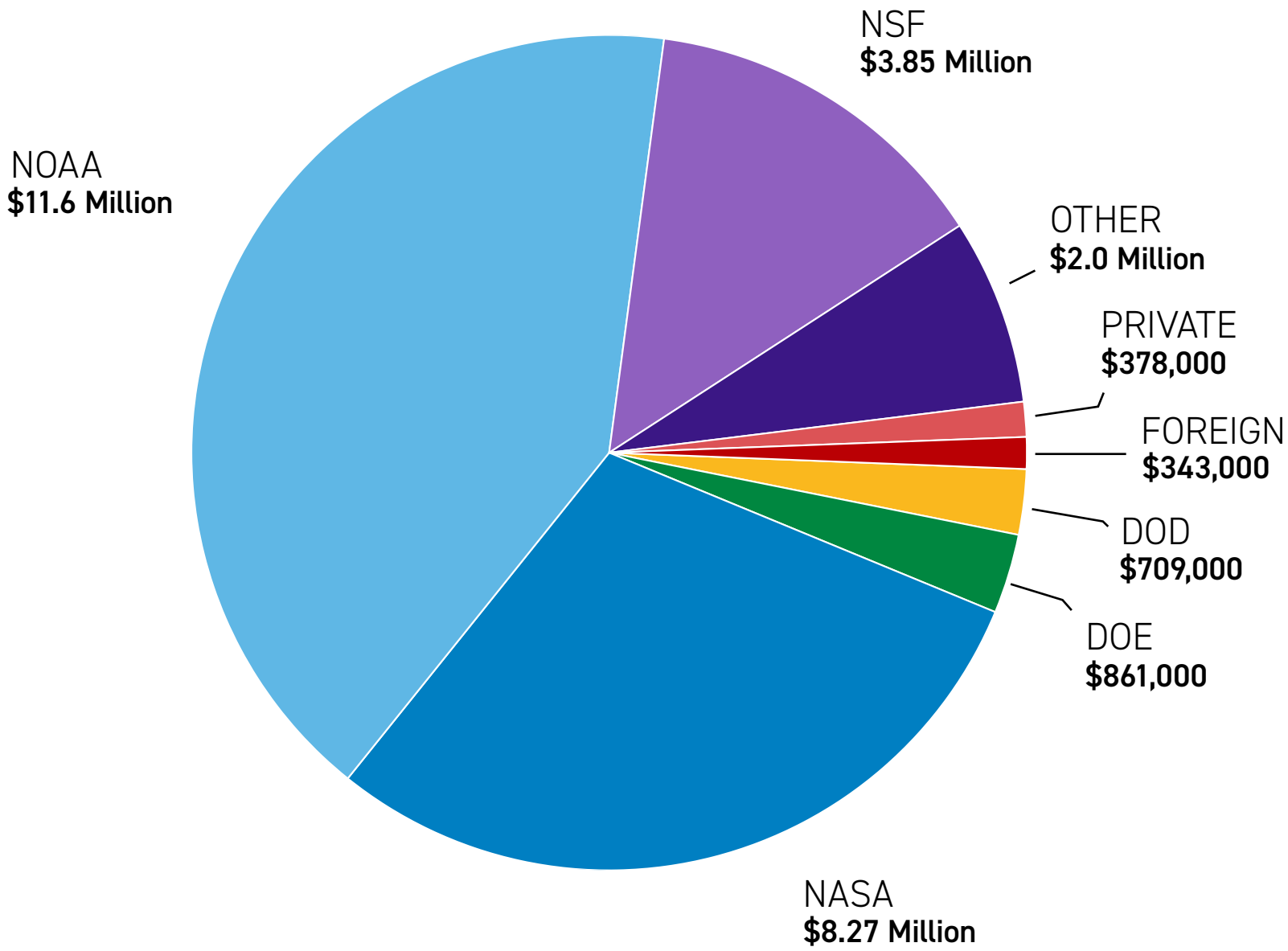
The following pages highlight the quality of our research and services through a variety of metrics.

CONTENTS

IMPACT AND SPENDING

The UW–Madison is consistently among the top universities in the nation for research spending. The 2018 Economic Impact Study of the University of Wisconsin System showed that more than $1 billion of sponsored research activity occurs on UW System campuses each year. Of that, approximately $890 million is competitively awarded to UW–Madison for research and support. These research dollars, in turn, generate Wisconsin jobs and state tax revenue that contributes to the state economy and beyond.

SSEC maintains a robust $28 million annual spending profile comprised primarily of federal sources. About two thirds of SSEC's funding is secured from NASA and the National Oceanic and Atmospheric Administration (NOAA). SSEC has partnered with NASA since the 1950s and with NOAA, since 1980, to conduct remote sensing research. The remaining third is a blend of National Science Foundation (NSF), Department of Defense (DOD), Department of Energy (DOE) and other funds. Partnerships between federal agencies and universities have consistently contributed to advances in science that benefit the nation's economy and public safety.

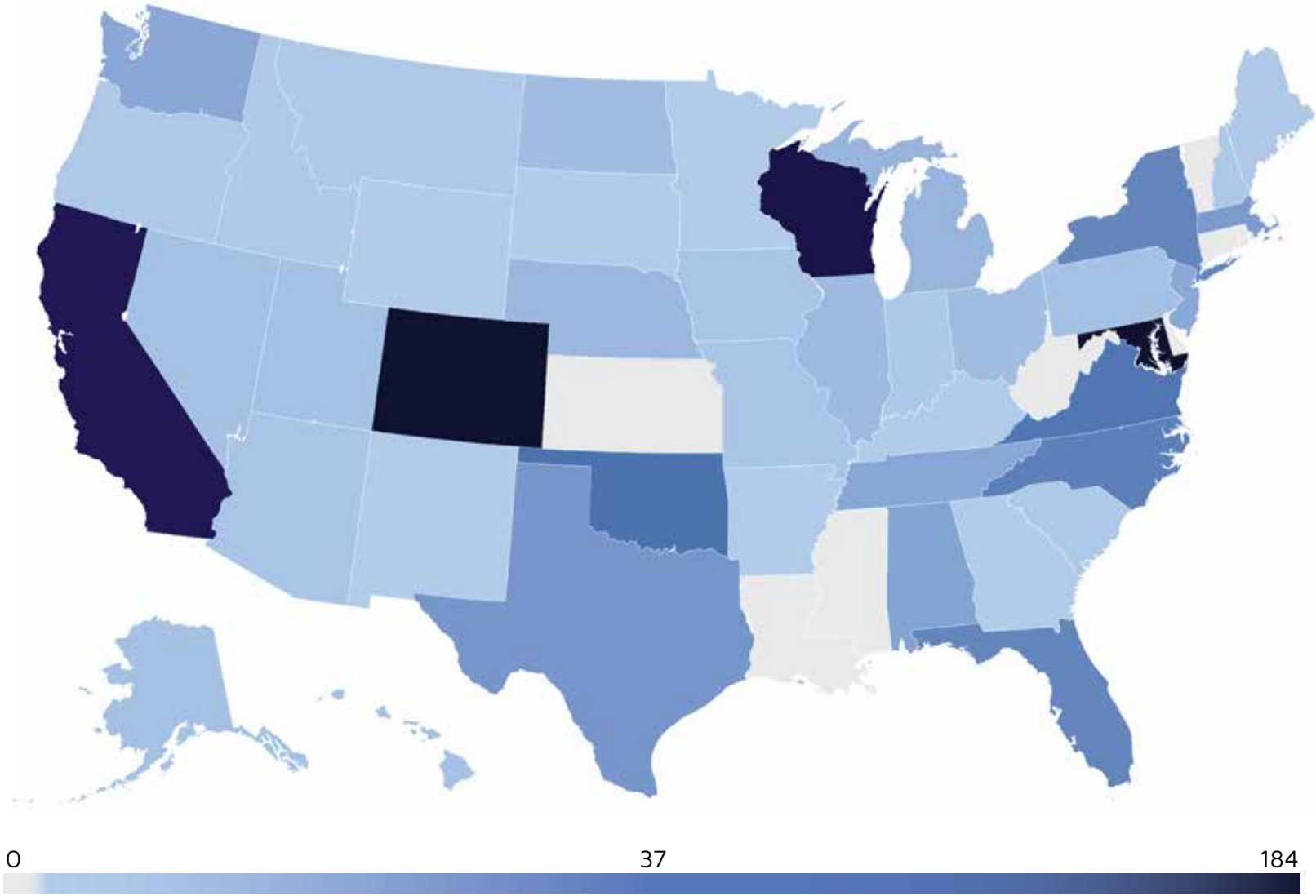

NSF
$3.85 Million
NOAA
$11.6 Million
OTHER
$2.0 Million
PRIVATE
$378,000
FOREIGN
$343,000
DOD
$709,000
DOE
$861,000
NASA
$8.27 Million

PUBLICATIONS AND COLLABORATIONS

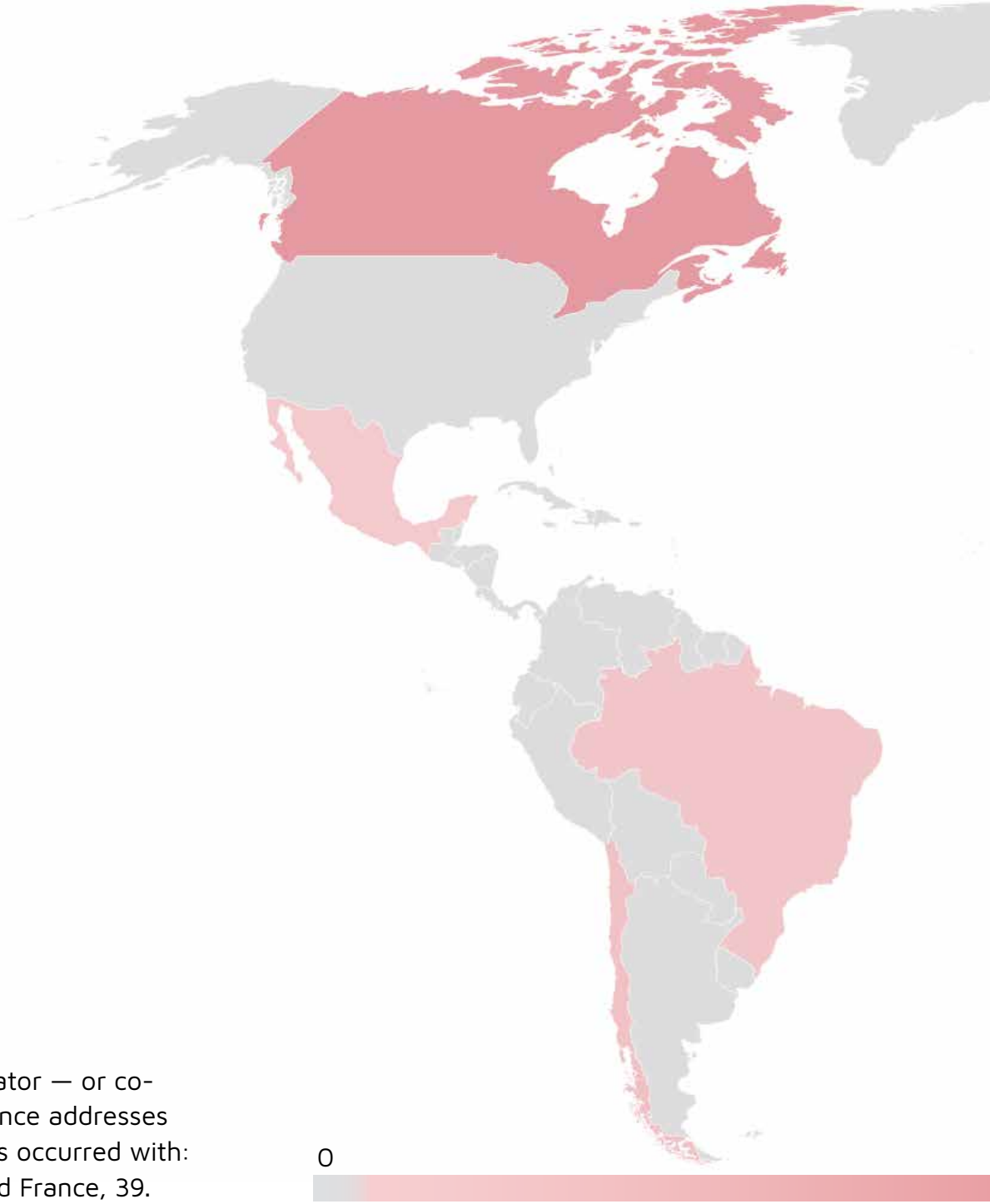
One established benchmark of mission success is the number of peer-reviewed publications. Since 2000, SSEC authors have published more than 1400 peer-reviewed articles in the top journals of their fields.

Beyond peer review, scientific developments are communicated at conferences — environments that foster collaboration and discovery. During the period 2000-2017, SSEC scientists and engineers contributed more than 6000 conference papers and presentations to the fields of atmospheric and environmental science, remote sensing and the geosciences.

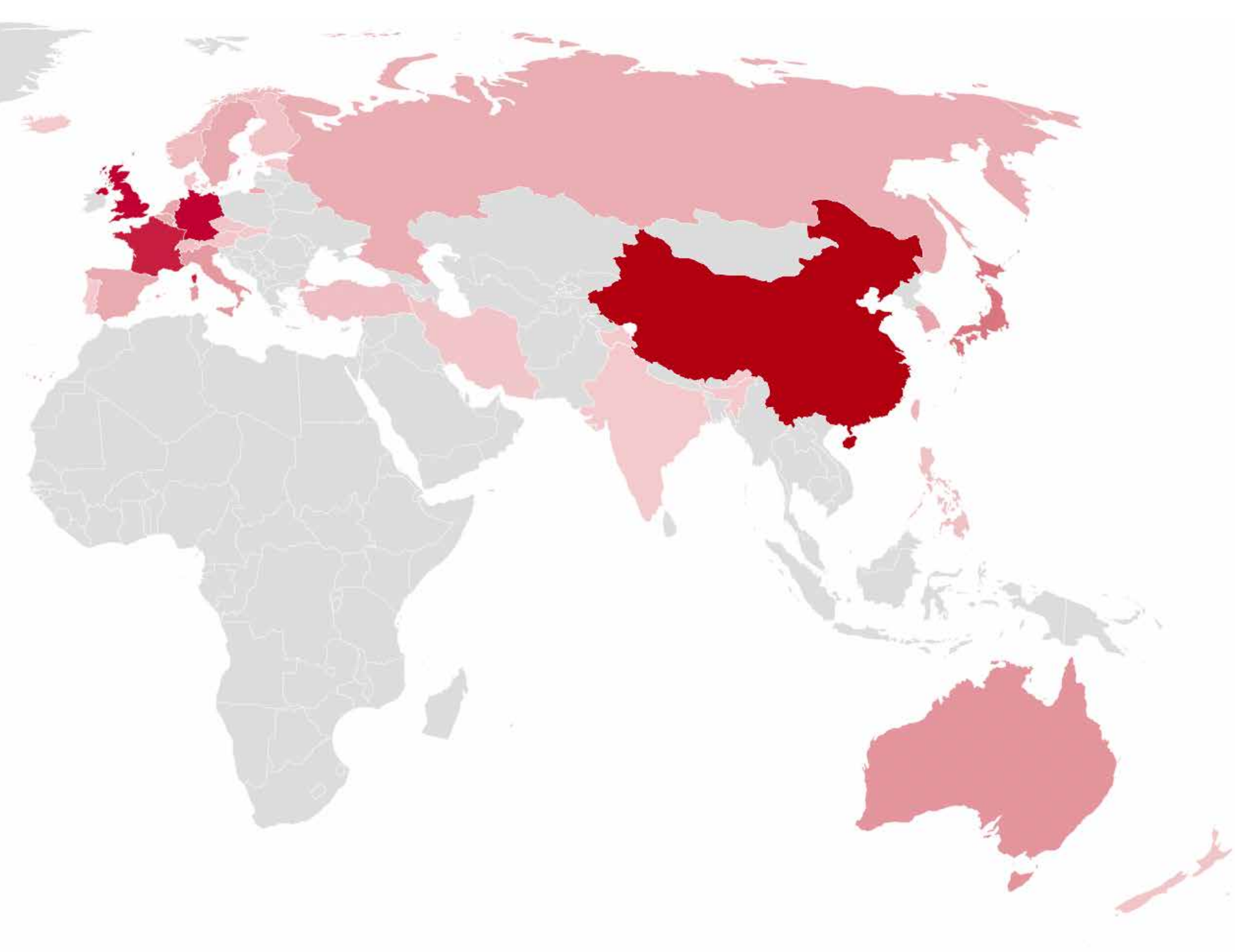
Our network continues to grow — SSEC scientists collaborate with investigators from United States and foreign government agencies and universities, national laboratories, international organizations, industry and departments and centers within the University of Wisconsin System.

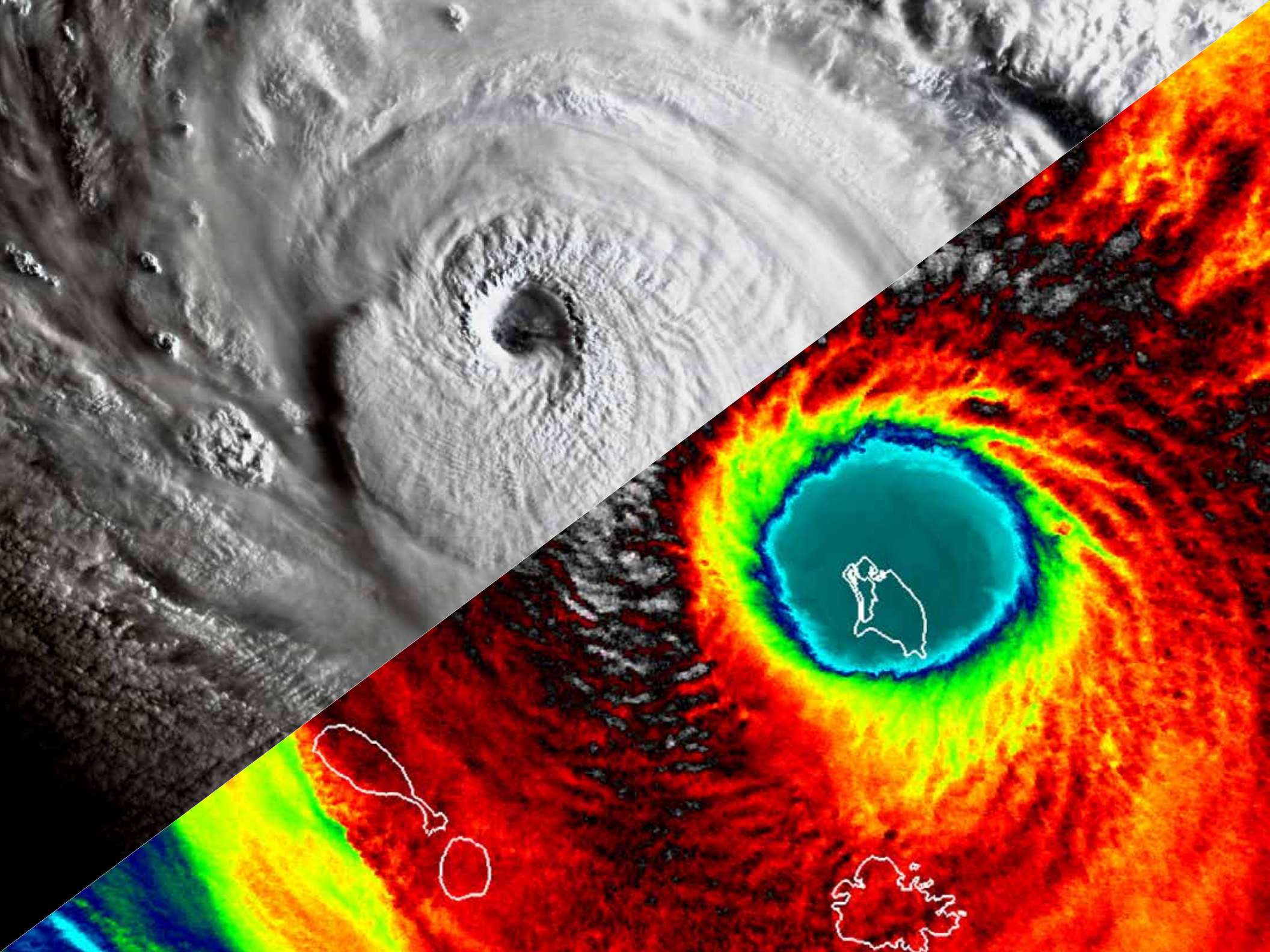


SSEC collaborators across the United States. Collaborator — or co-author — data were extracted from Web of Science addresses and grouped by state. The most collaborations occurred with: Maryland, 184; Colorado, 116; Wisconsin, 116; and California, 100.



SSEC collaborators around the world. Collaborator — or co-author — data were extracted from Web of Science addresses and grouped by country. The most collaborations occurred with: China, 59; Germany, 45; United Kingdom, 44, and France, 39.


20
59



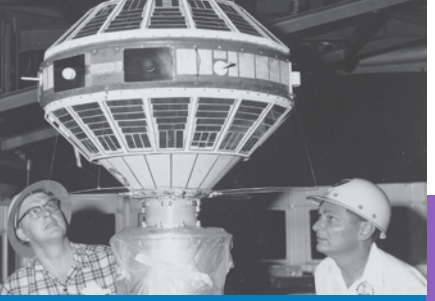
SATELLITE METEOROLOGY AND INSTRUMENT DEVELOPMENT

Instrument development and satellite meteorology (and its advances) are closely connected, and at the Space Science and Engineering Center that is no exception.

In 1959, Verner E. Suomi, SSEC founder and "father of satellite meteorology" along with UW–Madison engineering professor and co-founder, Robert Parent, designed and carried out the first successful space-based weather experiment, which studied the radiation budget of the Earth.

Since then, SSEC and CIMSS scientists have developed or made significant contributions to a range of meteorological and environmental satellite sensors to conduct atmospheric, oceanic, environmental and astronomical research leading to a better understanding of our planet. They have also developed or contributed to more than 50 scientific algorithms, and developed numerous products now operational within NOAA, yielding direct benefits to society.

Looking ahead, SSEC and CIMSS scientists are actively engaged in research and discussions that will shape the instruments and products for the next generation of geostationary and polar-orbiting satellites.

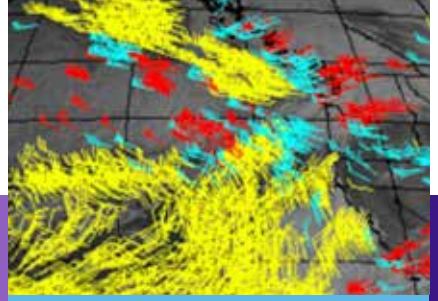


1959

SSEC co-founders Verner Suomi and Robert Parent conduct the first successful Earth radiation experiment from Explorer-7.

1967

First color images of Earth taken by Suomi's Multicolor Spin-Scan Cloud Camera from ATS-III geostationary satellite.



1973

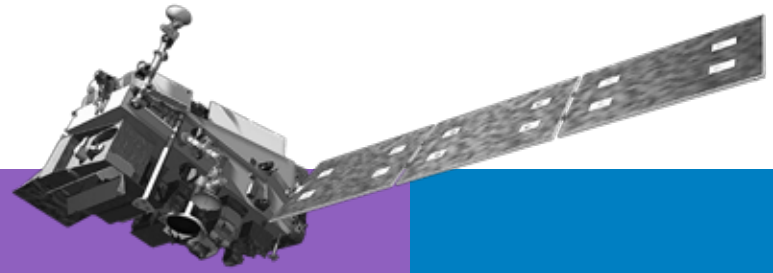
The first generation McIDAS creates animation, display and analysis of data from geostationary satellites. Developed at SSEC, it was the first tool to visualize satellite data.

1975

The first Geostationary Operational Environmental Satellite (GOES-1) carries Suomi's instrument, the Visible Infrared Spin-Scan Radiometer (VISSR).

1991

Atmospheric Emitted Radiance Interferometer (AERI), an advanced ground-based version of the High-spectral Resolution Interferometer Sounder, is deployed.



1994

Scanning High-resolution Interferometer Sounder (S-HIS), SSEC's airborne instrument, measures temperature and water vapor profiles from high altitude aircraft.

1999

MODIS direct broadcast begins at SSEC with tower installation.

2016

GOES-16 launches with onboard Advanced Baseline Imager. SSEC and CIMSS scientists proposed, tested and evaluated instruments and sensors on the satellite, as with previous generations.

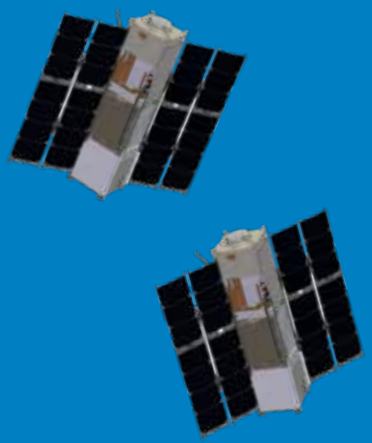
2017

SSEC and CIMSS staff calibrate and validate VIIRS and CrIS instruments aboard NOAA-20.

2019 (and beyond)

SSEC and CIMSS take science lead on NASA PREFIRE CubeSat mission to measure Arctic radiant energy and TROPICS CubeSat mission to provide rapid-refresh microwave measurements over the tropics.

S-HIS
Scanning High-resolution Interferometer Sounder



Credits: NASA

OUR STRENGTHS

RESEARCH

SSEC's research program focuses on remote sensing of the atmosphere — spanning planetary investigations, tracking tropical cyclones with CubeSats, drought monitoring, analyzing cloud properties and atmospheric aerosols and scientific computing, to name a few. Our scientists have applied this research to develop more than 50 algorithms that have become operational within US or international weather agencies. We are also exploring new and better methods of data assimilation to improve the accuracy of weather forecast models.

IMAGING & SOUNDING

Building on early successes with Explorer-7 and ATS, SSEC scientists have contributed to each new generation of geostationary and polar-orbiting satellite instruments. Today with the Advanced Baseline Imager on GOES-16 and -17, and CrIS and VIIRS on NOAA-20, our researchers continue to revolutionize the way we study the Earth and its atmosphere.

SOFTWARE

SSEC scientists and programmers have developed powerful software packages to process, analyze and visualize remote sensing data. Among them are McIDAS, RealEarth, and our open source, direct broadcast packages that allow users to process satellite data for local applications. In 2017-2018, SSEC and CIMSS scientists trained more than 400 professionals about new satellite data techniques, products and applications, from Guam to Kansas City and Vladivostok to Mexico City.

INSTRUMENT TECHNOLOGIES

Since the 1980s, our researchers and engineers have been at the forefront of ground-based, aircraft and satellite instrument design, refining and improving imagery and data accuracy.

On the ground: The Atmospheric Emitted Radiance Interferometer and a High Spectral Resolution Lidar are key components of SSEC's mobile laboratory, SPARC, as it travels to support field campaigns.

In the air: The Scanning High-resolution Interferometer Sounder provides data to calibrate and validate satellite instruments.

In orbit: We are defining future satellite instrument capabilities, developing new instrument technologies and helping to create prototype instruments.

RESEARCH TO OPERATIONS

SSEC and CIMSS scientists conduct end-to-end research, that includes designing instruments, calibrating radiances, developing algorithms, products, and data assimilation techniques that are transitioned from research to operational use by NOAA and international weather agencies. The Supercomputer for Satellite Simulations and Data Assimilation Studies (S4), funded by NOAA and administered by SSEC, allows SSEC and NOAA scientists to work together to develop and test data assimilation capabilities for new and future sensors using the current operational modeling and data assimilation systems.

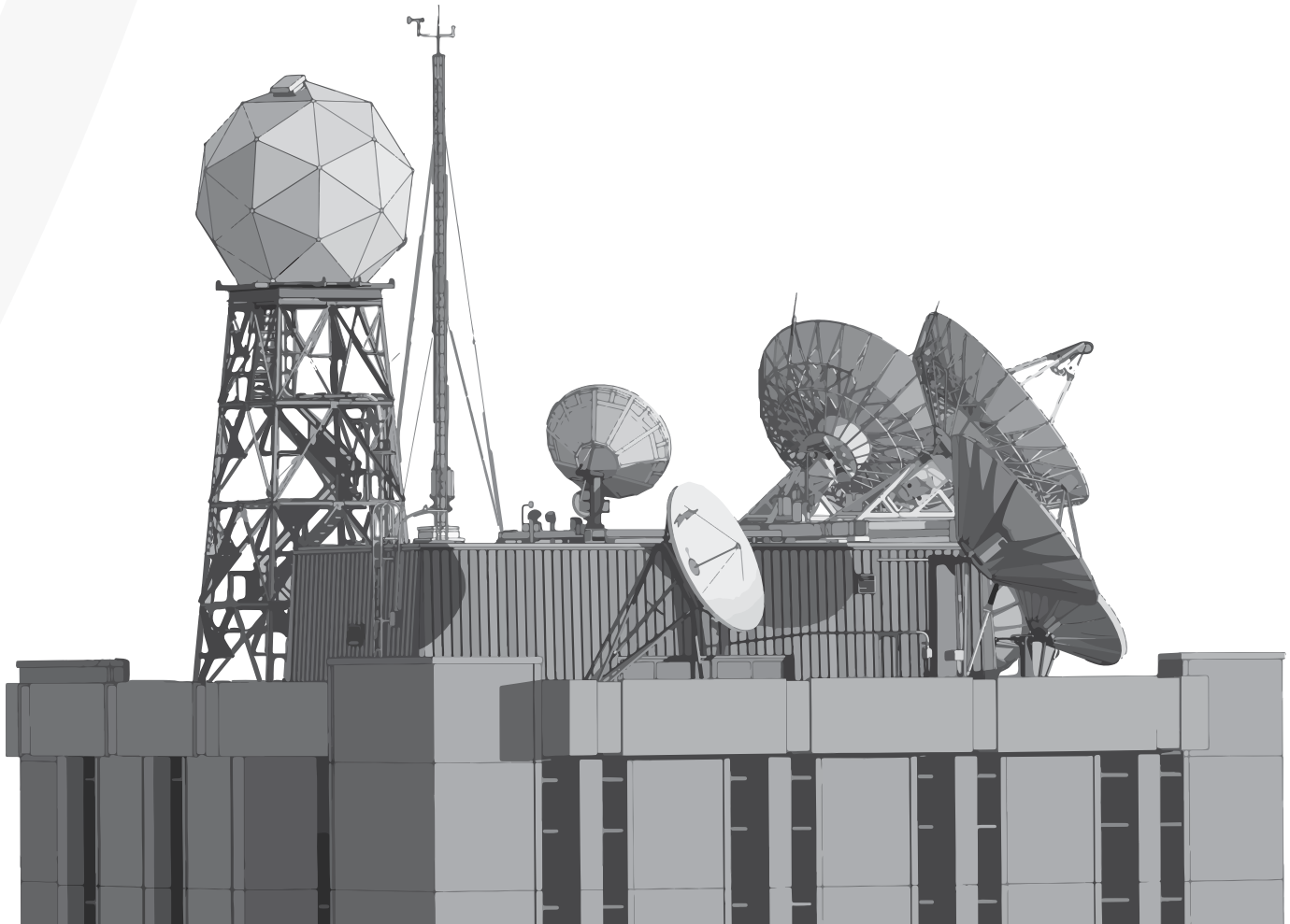
SATELLITE DATA

As part of our mission to research the Earth's atmosphere and climate, SSEC operates a state-of-the-art data center that routinely receives, processes and archives data from 13 polar-orbiting and 10 geostationary satellites.

SSEC houses the world's largest Geostationary Operational Environmental Satellite (GOES) data archive, dating back to 1976.

In addition, the Center is home to the largest and most powerful supercomputer on the UW–Madison campus, supporting the growing computing requirements of NOAA and SSEC scientists.

For data visualization and analysis, SSEC has developed and supported the Man Computer Interactive Data Access System (McIDAS) for more than four decades. Further, SSEC is meeting the needs of the growing global environmental satellite data user community with the Community Satellite Processing Package — packaging and distributing open source science software to users around the world.



10
GEO SATELLITES
TRACKED PER DAY

13
POLAR SATELLITES
TRACKED PER DAY

8
TERABYTES OF DATA
RECEIVED DAILY

5
TERABYTES OF DATA
SENT DAILY TO
COLLABORATORS

1.8
PETABYTES
OF WEATHER DATA
ARCHIVED

AWARDS

SSEC and CIMSS scientists — individuals and teams — continue to be recognized for their contributions to the atmospheric sciences with local, national and international awards for work that benefits the research community and improves public safety.

For example, 17 SSEC scientists received a NASA award in 2017 for their roles in the success of the GOES-R weather satellite that forms the backbone for the nation's weather monitoring and forecasting systems.

2017

SSEC/CIMSS
GOES-R Team Award
NASA 2017 Agency Honor Award
Group Achievement Award

Steven Ackerman
New Library World Highly Commended Award

Eva Borbas
ITSC-21 Gold for Best Poster Presentation

Burcu Kabatas
Best Dissertation Award, Istanbul Technical University

Jim Kossin
AMS Editor's Award
NESDIS Award for Outstanding Science and Data Management

Zhenglong Li
ITSC-21 Bronze for Third Best Poster Presentation

Margaret Mooney
New Library World Highly Commended Award

Hank Revercomb
Elected AMS Fellow
ITSC-21 Gold for Best Oral Presentation

Tim Schmit
NOAA Administrator's and Technology Transfer Award
NOAA Administrator's Award

William Straka
JPSS Program Office Extra Mile Award

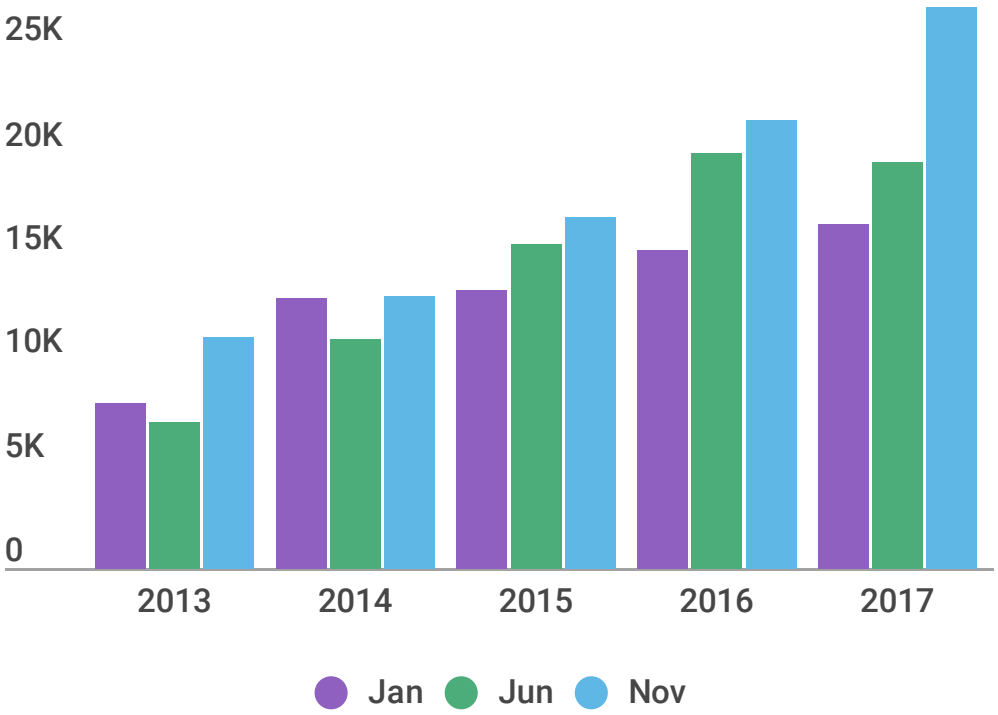
David Tobin
2017 Chancellor's Award for Excellence in Research

Pei Wang
Chinese-American Oceanic and Atmospheric Association Dissertation Award

COMMUNICATIONS

Our communications support the research and educational missions of SSEC and CIMSS by communicating across media to reach internal and external audiences. Our messaging aims to broaden awareness and visibility of our research as well as demonstrate its impact to Wisconsin and beyond.

SSEC NEWS WEBSITE VISITS



SOCIAL MEDIA

664K
AVERAGE MONTHLY TWITTER VIEWS

418K
AVERAGE MONTHLY FACEBOOK VIEWS

1.0
MILLION YOUTUBE VIEWS SINCE 2011

Social media statistics are combined totals for the Space Science and Engineering Center and the Cooperative Institute for Meteorological Satellite Studies accounts for 2017.

EDUCATION AND OUTREACH

Education and outreach are key elements of SSEC's mission. Our efforts are designed not only to encourage students to pursue careers in science, technology, engineering and mathematics (STEM) fields, but also to share the excitement of Earth remote sensing research and space exploration with the broader public.

We organize and participate in formal and informal education programs, ranging from classes and workshops at the UW–Madison for students and high school teachers to presentations at conferences, museums and schools to the Weather Guys monthly program on Wisconsin Public Radio. Education and public outreach programs reach more than 200,000 people each year, in-person, virtually and by radio.


November 2018

Space Science and Engineering Center
Cooperative Institute for Meteorological Satellite Studies
University of Wisconsin–Madison
1225 W. Dayton Street
Madison, WI 53706
ssec.wisc.edu