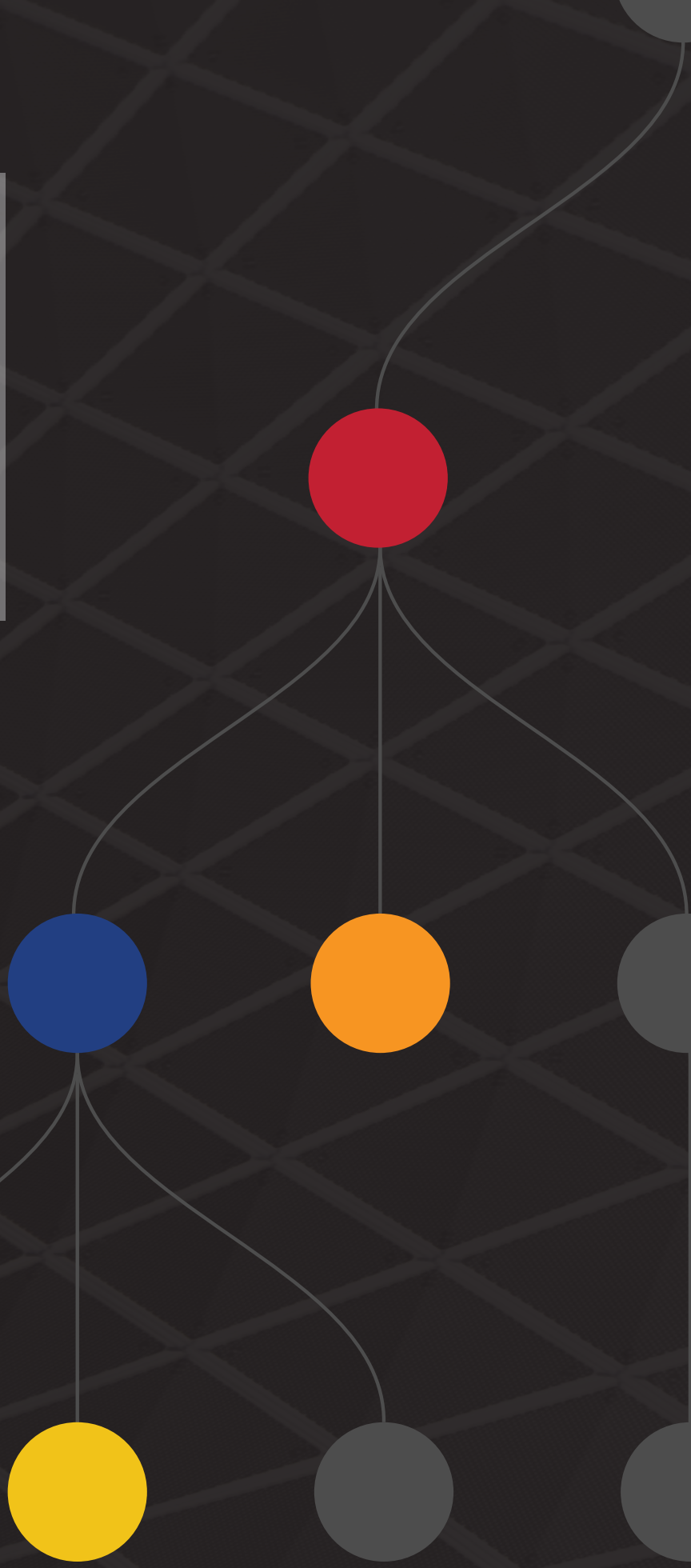
AI

Artificial Intelligence and Machine Learning at SSEC and CIMSS

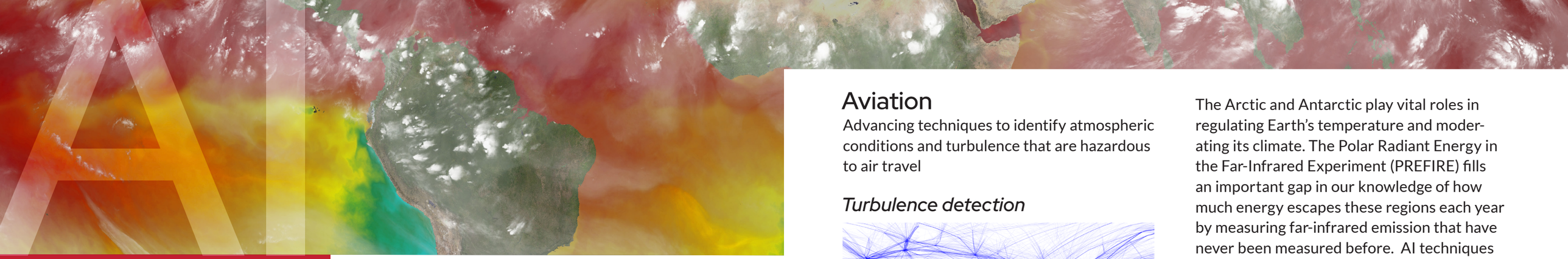


WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

SSEC

CIMSS

Space Science and Engineering Center
Cooperative Institute for Meteorological Satellite Studies



Artificial Intelligence and Machine Learning research

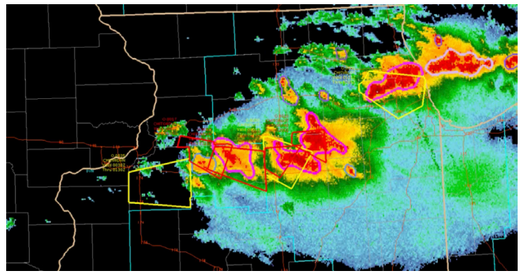
Advances in AI and ML are helping researchers to better use the wealth of data streaming from global weather and environmental satellites, including NOAA's next generation Geostationary Extended Observations (GeoXO) satellite system. At the University of Wisconsin–Madison Space Science and Engineering Center and the Cooperative Institute for Meteorological Satellite Studies, we are developing innovative AI methods to study and monitor severe weather, tropical cyclones, aviation safety, and satellite data and climate science while providing students with the opportunity to work side-by-side with our researchers to develop new AI and ML techniques.

These new methods are critical to forecasters, emergency managers, and other decision makers as they inform their communities of possible dangers and seek to protect property and save lives.

Severe weather forecasting

Developing new and improved methods to identify severe weather threats, such as lightning, hail, and tornadoes, to provide earlier warnings

ProbSevere

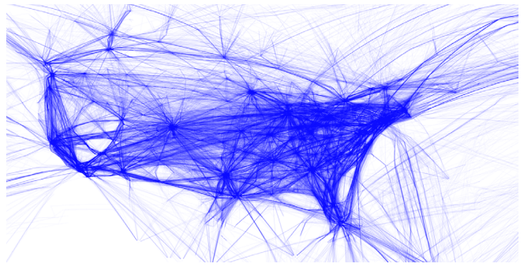


The Probability of Severe (ProbSevere) model automatically extracts information related to thunderstorm development to produce timely, short-term, statistical forecasts of thunderstorm intensity. The model uses numerical weather prediction guidance, geostationary satellite, ground-based radar, and lightning data to determine the probability of severe weather up to 90 minutes into the future. Since 2020 CIMSS and NOAA researchers have utilized AI methods to further improve ProbSevere's predictive abilities, resulting in timelier and more accurate forecasts of severe thunderstorms, precipitation, lightning, hail, and tornadoes.

Aviation

Advancing techniques to identify atmospheric conditions and turbulence that are hazardous to air travel

Turbulence detection

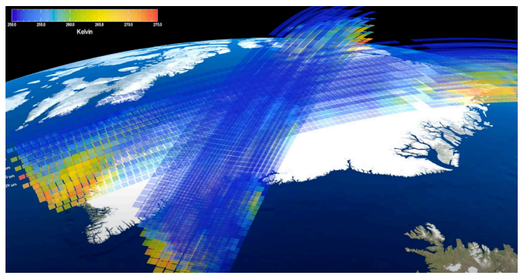


CIMSS researchers are developing a turbulence nowcasting product available to forecasters that leverages AI and data from geostationary satellites. The product estimates the probability of moderate-or-greater turbulence at commercial aircraft cruising altitudes, resulting in 10-minute predictions that can inform and warn pilots and air traffic officials of dangerous conditions.

Satellite data and climate

Synthesizing data from new geostationary and polar orbiting satellites, including the next generation CubeSats

PREFIRE

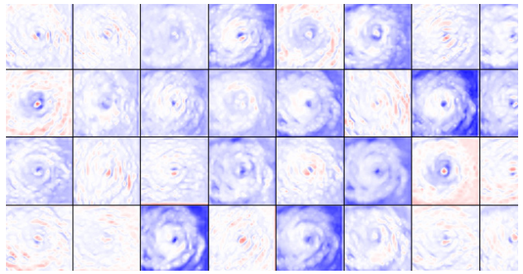


The Arctic and Antarctic play vital roles in regulating Earth's temperature and moderating its climate. The Polar Radiant Energy in the Far-Infrared Experiment (PREFIRE) fills an important gap in our knowledge of how much energy escapes these regions each year by measuring far-infrared emission that have never been measured before. AI techniques are being applied to these measurements to determine how clouds and water vapor influence Earth's energy budget and our future climate.

Tropical cyclones

Improving our understanding of tropical storms to better track and monitor their development and improve forecasts

Hurricane intensity



AI driven hurricane models are supporting forecasts with better estimates and predictions of hurricane wind speeds. CIMSS researchers are developing new AI methods that can augment current global hurricane predictions, improving long-range forecasts and our understanding of how hurricanes develop, strengthen, and impact vulnerable coastal regions. These AI driven products make efficient use of large sets of imagery captured by satellites from around the world.

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