

Earth and Environmental Sciences receives support for methane research



The [University of Rochester Department of Earth and Environmental Sciences](#) is a recent recipient of a gift from the [Virtual Earth System Research Institute](#) (VESRI), an initiative of [Schmidt Futures](#). This ambitious multi-year project, co-led by Rochester and the University of Washington, is aimed at improving an understanding of the fate of atmospheric methane (CH₄) and its influence on climate.

Leading the charge at Rochester are [Lee Murray](#) and [Vasilii Petrenko](#), both associate professors of Earth and environmental sciences, who specialize in climate and air quality. The “Fate, Emissions and Transport of CH₄” ([FETCH₄](#)) project brings together scientists from 19 institutions around

the world to shed light on the lesser-known aspects of the methane cycle.

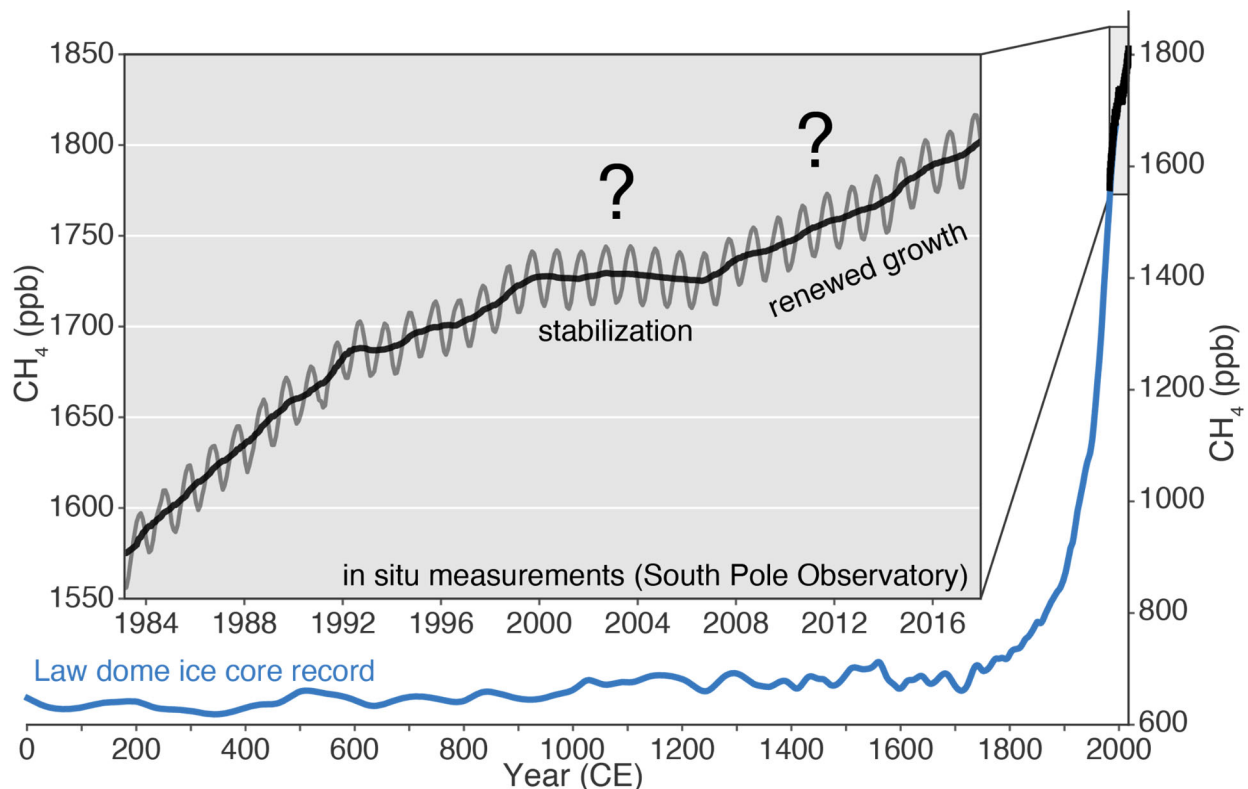
“Right now, our knowledge of how methane, the second most important anthropogenic greenhouse gas after carbon dioxide (CO₂), interacts with the global climate system depends on computer simulations,” Murray says. “These simulations must resolve both the physics of climate as well as the complex atmospheric chemistry of methane and are thus the most computationally expensive simulations in the world. We’re very excited to work to improve our understanding of this key component of the global climate system, while improving the efficiency of its representation within the models used for international climate assessment reports.”

Methane is a key component of the global carbon cycle, and understanding the processes controlling the abundance of atmospheric methane is profoundly important for understanding future climate and mitigation options. Major sources of methane include both natural- and human-driven pathways, including wetlands, fossil fuels, agriculture, landfills, and fires. Atmospheric methane concentrations have exhibited large variations over time, and have rapidly grown since 2020, yet the drivers of these variations remain scientifically elusive. Scientists know variations can be driven by other aspects of atmospheric chemistry as well, which are also currently poorly understood.

To fill these gaps, the FETCH₄ team will collect data from both Greenland ice cores and air samples from stations around the world and measure their unique chemical fingerprints. Their goal is to single out individual aspects of the methane cycle, such as those coming from fossil fuel emissions, and identify both their sources and sinks. Using what they learn, the team will develop and sharpen the capability of global climate models to account for methane. Scientists hope that by creating more efficient models, which will be accelerated by machine learning, they can better interpret these chemical fingerprints and more efficiently capture the methane feedback mechanism in global climate models.

Through VESRI, Schmidt Futures, a philanthropic initiative of Eric and Wendy Schmidt, seeks to help coordinate hundreds of climate and data scientists across the globe and at various institutions to identify solutions for pressing complex scientific and computational problems in climate science. By addressing current, foundational knowledge gaps in climate data, VESRI aims to establish baseline measurements of methane, investigate the carbon cycle, and build accessible emulators to help decision makers around the world access the most accurate climate system data.

“We are pleased to support these highly innovative scientists and interdisciplinary climate modeling initiatives as Schmidt Futures deepens its commitment to climate science,” says Stuart Feldman, Chief Science Officer at Schmidt Futures. “We aim to empower decision-makers, scientists, and stakeholders worldwide with invaluable insights to inform evidence-based decision-making, advance mitigation efforts, and strengthen our resilience to the impacts of climate change. VESRI is set to significantly enhance the accuracy and reliability of major climate models while fostering global cooperation and accessibility to vital climate data.”



Observations of atmospheric methane over the past 2,000 years. Ice core measurements from Law Dome are shown in blue and direct atmospheric observations from the South Pole in black. Figure adapted from Turner et al., PNAS (2019; <https://doi.org/10.1073/pnas.1814297116>).