Polar Science at DRI

Extreme Science at the Ends of the Earth

Chris Fritsen, Giles Marion

1. Wind Formed Landscapes of the McMurdo Dry Valleys

Amy MacKay

The McMurdo Dry Valleys represent an unusual landform of restricted spatial extent in the Dry Valleys were sculpted by winds over a long period of time, above sea level. Most sand is moved in the winter. In addition, wind formed gravel bedforms are also common. The large-scale bedforms that are sculpted by the wind are an excellent analog for the soils, sediments, wetlands, and lakes underlying the Antarctic ice sheet. This work expands our understanding of the types of life that can survive in isolated and extreme environments on Earth and on icy worlds such as Titan and Enceladus (moons of Saturn) and Europa (moon of Jupiter). This interdisciplinary project looks at the possibility and the ability for life to thrive here on Earth, we are looking at whether life can emerge and thrive in a cold, lightless, waterless, and airless environment and whether biological reactions can occur between the brine and sediments trapped in the lake ice. The brine ecosystem is anoxic, has no light, and is under ice. The research involves collecting sediment cores from the lake up to a meter deep, using a percussion corer. This procedure involves deploying a coring device at the surface of the lake, lowering it through the snow and ice, and collecting a sample of the sediments from under the ice. The core is then brought to the laboratory for analysis. The project also involves using stable isotopes to determine the age and history of the lake. The work is supported by the National Science Foundation for understanding drivers of rapid climate changes on icy worlds, including those that are currently experiencing high rates of warming.

2. Astrobiology of Icy Worlds: Habitability, Survivability and Extremophiles

Short-term arctic sea ice and potential climatic changes

Alison Murray

This work examines how the arctic sea ice can change in the future and what the implications are for the ecosystem and the people who depend on it. The project involves collecting samples from the sea ice and comparing them to past time periods. The results of this study will be used to develop models that can predict future changes in the sea ice.

3. Sedimentary Core Studies: Seasonal Succession in Antarctic Lakes

Joe McConnell

This project is developing and interpreting new generation records of short-lived black carbon, dust, volcanic, sea salt, and pollution aerosols and those generated by wildfires – are important environmental and global climate change. Those records are being used to improve predictions of those events in the past and to better understand the future. The project is supported by the National Science Foundation Arctic Natural Sciences and is ongoing.

4. Bromo Burning, Volcanics, and Pollution Aerosols in the Arctic

Rolph Tivy

National Science Foundation Arctic Natural Sciences

The project involves studying how air is brought from one area to another by the movement of the atmosphere. The research involves collecting samples from the air and analyzing them for traces of pollution. The results of this study will be used to improve predictions of future climate change.

5. Aquatic Ecosystems: Comparing the Arctic and Antarctic

Kendrick Taylor

National Science Foundation Arctic Natural Sciences

This project involves comparing the aquatic ecosystems of the Arctic and Antarctic. The research involves collecting samples from the water and analyzing them for traces of pollution. The results of this study will be used to improve predictions of future climate change.

6. Stratospheric Ozone and Mercury Chemical Processes, Transport, and Distribution

Daniel Obrist

National Science Foundation Arctic Natural Sciences

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7. Physiological Ecology of Seasonal Succession in Antarctic Lakes

Chris Fritsen, Giles Marion

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8. Investigating Antarctic Climate Change with Aerosol and Gas Measurements

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