CU research team awarded $2M to use modern methods to understand ancient Greenland ice.

The layers of ice cores from Greenland are often portrayed as pages in a book that record the history of the atmosphere. However, scientists have had difficulty interpreting exactly what details of the Arctic's climate history are actually written. Is it a history of once-a-year major storms or of gradual, gentle snowfall? Where did that snow come from, and how was it altered after it got there? A recent NSF award made to a CU research team aims to use modern instrumentation to make the most comprehensive measurements to date of the meteorological and glaciological processes which create the stable isotopic record in the ice cores and allow the history of the ice sheet to be retold with an increased level of detail.

"We know that the isotope record from ice cores is a very reliable indicator of the temperature of the Arctic in a general sense, but we don't know how this relates to the different types of clouds, the origin of the snow and chemistry occurring in the upper layers of the ice sheet, all which has made it difficult to make more specific analyses", said the research team lead David Noone, an Associate Professor in the Department of Atmospheric Science and a Fellow of the Cooperative Institute for Research in Environmental Sciences. "Our study will use the latest in laser spectroscopy and particle sensing combined with advanced meteorological and remote sensing data to finally resolve the links between the weather-of-the-day and what it is that the ice cores record."

The team will install instruments at Summit in Greenland, Reykjavik in Iceland and Eureka Station in far Northern Canada in a four-year study to collect data so show where the snow comes from, about the conditions in the clouds that produce snow, and what happens to the snow blowing on the ice sheet surface before it gets compacted into the ice sheet. This will allow them to better interpret how the ups and downs in the long ice core records can be linked to climate changes in the past. "With global warming the loss of sea ice from the Arctic Ocean would suggest that more of snow at Summit comes from the north. This would be a dramatic change the water cycle of the Arctic which we will be able to detect and relate to the history of the Arctic hydrology seen in the ice cores", said Noone. "Our work will show how different the changes related to global warming are from those that Greenland has seen in the past."