Climate changes has been a popular topic in scientific research. Particularly, the warming Arctic is one of the biggest stories in our times. Global climate models predict that the increasing atmospheric carbon dioxide levels is strongly related to the increasing surface air temperatures in the Arctic, where cloud plays an important role in producing more atmospheric carbon dioxide. In this paper, scientists use the Multiangle Imaging SpectroRadiometer (MISR) imagery to perform a cloud detection to ascertain whether cloud can potentially lead to further warming in the Arctic.

MISR collects a massive amount of data from its nine cameras viewing at a different angel in four spectral. It covers the daylight side of the Earth from the Arctic down to Antarctica in 45 minutes and completes all paths in 16 days of a cycle. Each path is subdivided into blocks, with the block numbers increasing from the North Pole to South Pole, and each complete trip of MISR around the Earth is counted as a unique orbit. However, due to the transmission channel constraints, only the red radiances and all channels from the nadir camera are transmitted at full 275m \* 275m resolution. The remaining blue, green and near-infrared radiances from the non-nadir cameras are aggregated to a lower resolution before transmission.

Scientists utilizes correlations in brightness among multiple MISR views of the same scene under cloud-free conditions to model the surface. This new algorithm, enhances linear correlation matching (ELCM), is based on thresholding three features: the correlation (CORR) of MISR images, the standard deviation (SD\_An) of the MISR nadir camera pixel values, and a normalized difference angular index (NDAI) to create labels for classification. Then, the resulting labels are used in the second algorithm, ELCM-QDA, to produce more informative probability prediction.

The results suggest that the ELCM algorithm based on the three features outperform those existing algorithms based only on the radiation measurement, where it provides better spatial coverage for cloud detection in the Arctic. Moreover, the ELCM algorithm combines classification and clustering framework to fit the MISR data processing, which help improve the computational speed online effectively.

This research not only creates a better algorithm to implement cloud detection but also encourages further study on the changing cloud properties to the warming Arctic. In addition, it demonstrates the significant impact of statistics in successfully solving a modern scientific problem. Statisticians are now directly involved in the data processing and use powerful statistical thinking to help tackle challenges.