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Abstract Title	An Evaluation of a Convolutional Neural Network for Classifying Images from In-situ, High-resolution Cloud Probes	
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Abstract

A vast amount of ice crystal imagery exists from the high-resolution cloud probes such as the Cloud Particle Imager Particle Habit Imaging and Polar Scattering (PHIPS) probe, which have been deployed on aircraft during a variety of fie During a cirrus anvil experiment near Cape Canaveral, Florida in 2019 (CapeEx19), a vast amount of ice crystal image ained where a large percentage of particles were classified as chain aggregates.
C hain aggregate s are defined with at least one of the following characteristics:
three or more discernible particles oriented in a quasi-linear fashion, particles joined together by small joints, and links that are unusually elongated.
Our objective is to classify crystals by habit and identifying chain aggregates to provide information about their origin s nt habits form under different temperature and humidity conditions. Identifying ice crystals' properties leads to better unde microphysical processes, which play an important role in the Earth radiation budget and precipitation processes. Traditior ation methods where images are manually reviewed show reasonable performance; however, it requires a large amount c t's time.
Given
the sizable data set gathered during recent field projects such as CapeEx19 and NASA's Investigation of Microphysics pitation for Atlantic Coast-Threatening Snowstorms (IMPACTS) field projects
, there is a need for an automated classification approach. Convolutional N eural N etworks (CNN) have the potential to reduce the time required by using a training data set produced by manual classification to create a complex nonlinear model directly from the images . The performance of CNN models to classify particles by habit, including chain aggregates, is evaluated. The approach uses a data-driven model the CPI and PHIPS images gathered during the CapeEx19 and IMPACTS field projects with an attributed confidence To train the models, a manually labeled data set of images from the CapeEx19 and IMPACTS fields is used. An evaluation data set is used to test the developed network and evaluate its performance.
All evaluation metrics show the models' good performance for classifying single ice crystals followed by chain aggr gregates.