Cloud classification task is a task where we classify images of clouds into groups of similar images. Images are similar in terms of texture, shape, colour, size and other visual aspects. The aim of this work is to create an algorithm that can cluster images of clouds based on their sky coverage so that a user can request a specific type of cloud coverage from database of images and use the images for downstream tasks such as procedural sky generation. We use various models for feature extraction based on contrastive learning and image reconstruction and for clustering we use self-supervised learning and distance-based methods. These methods were used for clustering a subset of our data and evaluated based on visual consistency of clusters and cluster separation metrics.