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Cloud coverage estimation via deep learning applied to all-sky data in Romania : First Results

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Measuring the level of cloud coverage (CC) is important when analysing the absorption of solar radiation, the cloud formation process, and also to improve the forecast in general. This is becoming a more common task with the availability of digital sensors and their usage in monitoring the sky.

In this study we present a method of estimating the level of cloud coverage using Deep Learning (DL) applied to all-sky images of Meteorites Orbits Reconstruction by Optical Imaging (MOROI) network.

To label the data, a supervised validation was employed on the daytime images captured during the course of two years, recorded on Galati, Romania These were divided into three groups; CC <20%, CC between 20-80%, and CC >80%. Next, a set of DL models were trained, optimized and tested towards accurately classifying images according to each group.

We found that the classification accuracy can range between 89-95 % depending on how the cloud coverage is labeled and how the daytime is defined. This is mostly due to thin cirrus clouds, tricking the models, or poor sky illumination during sunrise or sunset. We discuss these methods and present a few strategies which circumvent classification problems, to further increase the accuracy of models.

The next step is to extend the study on the rest of the network, and also combining it with other sensors (e.g. satellite data) in order to understand the cloud-circulation coupling and its impact across climate models.