Clouds always cover approximately 60% of the globe [1] and are thus an important part of the climate system. Their detection and classification are vital for the analysis of remote sensing data and validation of climate models [2]. Their identification generally comes from visible and infrared satellite observations that are very sensitive to the presence of clouds and from geostationary satellites, offering continuous measurements.

Most retrieval and classification methods are physics-based [3,4], but recently Machine Learning (ML) methods have been developed to improve such physical methods [5,6]. Even more recently, Deep Learning (DL) techniques that seek to exploit spatial structures using image processing have emerged [7], proving that the content in information of neighboring pixels can be useful to detect specific cloud patterns [8].

We propose to use Infrared Atmospheric Sounding Interferometer (IASI) L1c observations [9] collocated with the cloud classification (specifying four classes: clear, water, ice, two-level ice) extracted from SEVIRI-based Optimal Cloud Analysis (OCA) Climate Data Record (CDR) [10]. For each IASI footprint, amongst all SEVIRI pixels inside, the most recurrent cloud class is selected. This database is used to train a Convolution Neural Network (CNN) on whole IASI orbits that can be seen as images [11,12]. Such a network is used to infer the OCA cloud classification at the IASI resolution but is in fact able to downscale to some extent, as the obtained class probabilities output by the network can in fact be compared to the fraction of each class inside each IASI Field Of View. Parts of the orbits that do not fall in the SEVIRI disk are masked during training, but this architecture allows the retrieval to be performed at a global scale.

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