More and more data (and their corresponding meta-data) have allowed the wide adoption of automatic machine learning approaches for Earth observation. These methods, often relying on supervised learning, are designed (and succeed!) to obtain high performances on numerous and ever larger carefully prepared benchmarks. But what happens when you go in the wild? When you cannot trust the labels, or worse, when no labels exist? Domain adaptation and generalisation issues appear, leading to unpredictable results.

In this talk I will present several approaches which learn beyond labels. First, I will present a weak supervision method which allows to train a neural network model when labels are inadequate or noisy. Second, I will talk about continual learning for adapting models with the help of a human-in-the-loop. Finally, I will address semi-supervised learning, or how to train models from both labelled and unlabelled data. All those approaches pave the way to today's great challenge of Earth observation: how to develop generic models able to handle the plethora of data now available?