Polarimetric radar characteristics of lightning initiation and propagating channels

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We present here an analysis of a large dataset of lightning and polarimetric weather radar data collected in the course of a lightning measurement campaign that took place in the summer of 2017 in the area surrounding the Säntis mountain, in the northeastern part of Switzerland. For this campaign and for the first time in the Alps, a lightning mapping array (LMA) was deployed. The main objective of the campaign was to study the atmospheric conditions leading to lightning production with a particular focus on the lightning discharges generated due to the presence of the 124 m tall Säntis telecommunications tower. In this study, we relate LMA very high frequency (VHF) sources data with collocated radar data in order to characterise the main features (location, timing, polarimetric signatures, etc.) of both the flash origin and its propagation path. We provide this type of analysis first for all of the data and then we separate the datasets into intra-cloud and cloud-to-ground flashes (and within this category positive and negative flashes) and also upward lightning. We show that polarimetric weather radar data can be helpful in determining regions where lightning is more likely to occur but that lightning climatology and/or knowledge of the orography and man-made structures is also relevant.

Keywords: Polarimetric radar, lightning, lightning mapping array