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Coronal rain as a marker for coronal heating mechanisms

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Abstract. Reported observations in Hα, Ca II H and K or other chromospheric lines of coronal rain trace back to the days of the Skylab mission. Offering a high contrast in intensity with respect to the background (either bright in emission if observed at the limb, or dark in absorption if observed on disk) these cool blobs are often observed falling down from high coronal heights above active regions. A physical explanation for this spectacular phenomenon has been put forward thanks to numerical simulations of loops with footpoint concentrated heating, a heating scenario in which cool condensations naturally form in the corona. This effect has been termed "catastrophic cooling" and is the predominant explanation for coronal rain. In this work we further investigate the link between this phenomenon and the heating mechanisms acting in the corona. We start by analyzing high resolution observations of coronal rain at the limb in the Ca II H and Hα lines performed by the SOT instrument of *Hinode* and by the Crisp instrument of the *SST*. We then compare the observations with 1.5-dimensional MHD simulations of loops being heated by small-scale discrete events concentrated towards the footpoints (that could come, for instance, from magnetic reconnection events), and by Alfvén waves generated at the photosphere. It is found that if a loop is heated predominantly from Alfvén waves coronal rain is inhibited due to the characteristic uniform heating they produce. Hence coronal rain may not only point to the spatial distribution of the heating in coronal loops but also to the agent of the heating itself. We thus propose coronal rain as a marker for coronal heating mechanisms.