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Correlating the surface mass balance on the Morteratsch glacier (Switzerland) with data from nearby meteorological stations

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Over the past decades strong negative surface mass balances have lead to a major retreat of glaciers in the European Alps. This trend in mass balance has been widely described in the literature. It has been modelled with simple approaches (such as positive degree day models) and more complex methods (for instance through 2-D surface energy balance models). A detailed approach is important to better understand the surface mass balance and its underlying processes, but is often not needed to understand its inter-annual variation. Here we show this based on an extensive dataset of annual surface mass balance measurements collected in the ablation zone of the Morteratsch glacier (Engadine, Switzerland) over the last 13 years. We correlate these measurements with data from nearby meteorological stations and point out that most of the variability in annual surface mass balance can be explained by only a few meteorological parameters. Subsequently we compare this to results from a simple 2-D surface energy balance model. Finally we use our simple correlation between meteorological measurements and the surface mass balance to explain the more positive 2012-2013 surface mass balance over the Morteratsch glacier.