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Comparing methods for gap filling in historical snow depth time series

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Switzerland has a unique dataset of long-term manual daily snow depth time series ranging back more than 100 years for some stations. This makes the dataset predestined to be analyzed in a climatological sense. However, there are sometimes shorter (weeks, months) or longer (years) gaps in these manual snow depth series, which hinder a sound climatological analysis and reasonable conclusions. Therefore, we examine different methods for filling data gaps in daily snow depth series. We focus on longer gaps and use different methods of spatial interpolation, temperature index models and machine learning approaches to fill the data gaps. We assess the performance of the different methods by creating synthetic data gaps and set the applicability of the methods in relation to the density of the available neighboring stations, elevation and climatic setting of the target station.