

Interactive comment on “Trends in surface radiation and cloud radiative effect at four Swiss sites for the 1996–2015 period” by Stephan Nyeki et al.

Anonymous Referee #2

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This study used ground-based observations of shortwave and longwave fluxes associated with meteorological parameters under all-sky and cloud-free conditions, spanning over the period from 1996 to 2015 at four stations in Switzerland, to analyze the trends of downward shortwave and longwave radiation at the surface and consequent the trend of the cloud radiative effect.

It is important to investigate the trends of radiation and cloud radiative effect at the surface and put forward the possible explanations that account for the phenomenon. However, there are some weakness that requires more supporting material. The clouds identification methods are not accurate which may induce a contamination of radiation

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fluxes, since a slight change of cloud cover may significantly influence the radiation fluxes at the surface. Aerosol burden also has significant effects on shortwave radiation at the surface. Using climatological average of AOD to fill in the missing data of AOD during 2013 through 2015 may cause an artificial error in the trend analysis. Without any detailed description of how clouds change, it is quite arbitrary and blurry to infer the relationship between the variations of CRE and clouds.

Specific comments: 1. Page 5 and line 25: ‘In contrast, the specific humidity and IWV are higher during all-sky conditions which in turn results in higher DLR values.’, please mention the source of the specific humidity data? 2. Page 5 and line 30 : ‘IWV at JFJ was based on a widely-used parameterization using T 2m and relative humidity’, where is relative humidity data from and what is the accuracy of this parameterization? Please add description of these in the section of methods and data. 3. Page 5 and line 35: ‘which are probably associated with synoptic scale weather patterns’, what kind of weather patterns are they? 4. Page 6 and line 25: ‘the DSR trend at PAY is not monotonic but steeply’, as DSR has obvious changes, could you show its trend at four sites like Figure 1? 5. Page 7 and line 20: what are the ‘~<’ and ‘-<’? 6. Page 8 and line 15: ‘suggesting that a decrease in fractional cloud cover or a different cloud type has occurred during the 1996 – 2015 period’, there are many factors may affect cloud radiative effects such as cloud height and optical depth. A decrease of CRE magnitude doesn’t mean there can be the decrease of cloud fraction. What are the variations of different clouds during the 1996 – 2015 period?

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