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From brightening to dimming in sunshine duration over the eastern and central Tibetan Plateau (1961-2005)

Qinglong You (1,2,6), Shichang Kang (1,3), Wolfgang-Albert Flügel (2), Arturo Sanchez-Lorenzo (4,7), Yuping Yan (5), and Javier Martin-Vide (7)

(1) Laboratory of Tibetan Environment Changes and Land Surface Processes, Institute of Tibetan Plateau Research, Chinese Academy of Sciences (CAS), Beijing 100085, China (yqingl@126.com, shichang.kang@itpcas.ac.cn), (2) Department of Geoinformatics, Friedrich-Schiller University Jena, Jena 07743, Germany, (3) State Key Laboratory of Cryospheric Science, CAS, Lanzhou 730000, China, (4) Climate Research Laboratory, Barcelona Science Park, Barcelona 08028, Spain, (5) National Climate Center, Beijing 100081, China, (6) Graduate University of Chinese Academy of Sciences, Beijing 100049, China, (7) Group of Climatology, University of Barcelona, Barcelona 08001, Spain

The Tibetan Plateau (TP) with an average elevation of over 4000 m a.s.l. is the highest and most extensive highland in the world. We used monthly mean sunshine duration from the Chinese Meteorological Administration to examine the spatial and temporal variability of sunshine duration at 71 stations in the eastern and central TP during the 1961-2005 period. The temporal evolution of the mean annual sunshine duration series shows a significant increase from 1961 to 1982 at a rate of 49.8 h/decade, followed by a decrease from 1983 to 2005 at a rate of -65.1h/decade, with an overall significant decrease at a rate of -20.6 h/decade during the whole 1961-2005 period. The surface solar radiation downwards from reanalysis data in the same region confirms the brightening/dimming phenomenon shown by the sunshine duration data. Otherwise, additional climatic variables, such as low cloud amount, total cloud amount, precipitation, relative humidity and water vapor pressure, in most cases exhibit significant negative correlations with sunshine duration in the TP on an annual and seasonal basis. The trends of these variables suggest that changes in some of them might be related to the brightening and dimming detected with the use of sunshine duration measurements over the TP. We also hypothesize that the impact of anthropogenic aerosols upon the climatic variables analyzed cannot be rejected, especially in the significant increase in low cloud cover since approximately 1980.