

## **Climate variability rather than overstocking causes recent large scale cover changes of Tibetan pastures**

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The Tibetan Plateau has been entitled “Third-Pole-Environment” because of its outstanding importance for the climate and the hydrology in East and South-east Asia. Its climatological and hydrological influences are strongly affected by the local grassland vegetation which is supposed to be subject to ongoing degradation. On a local scale, numerous studies focused on grassland degradation of the Tibetan pastures. However, because methods and scales substantially differed among previous studies, the overall pattern of the degradation in the Tibetan Plateau is unknown. Consequently, a satellite based approach was selected to cope with the spatial limitations. Therefore, a MODIS-based vegetation cover product was developed which is fully validated against 600 in situ measurements covering a wide extent of the Tibetan Plateau. The vegetation cover as a proxy for grassland degradation is modelled with low error rates using support vector machine regressions. To identify the changes in the vegetation cover, the trends seen in the new vegetation cover product since the beginning of the new millennium were analysed. The drivers of the vegetation changes were identified by the analysis of trends of climatic variables (precipitation and 2 m air temperature) and land-use (livestock numbers) over the same time. The results reveal that - in contrast to the prevailing opinion - pasture degradation on the Tibetan Plateau is not a generally proceeding process because areas of positive and negative changes are almost equal in extent. The positive and negative vegetation changes have regionally different triggers: While, from 2000 on, the vegetation cover has increased in the north-eastern part of the Tibetan Plateau due to increasing precipitation, it has declined in the central and western parts due to rising air temperature and declining precipitation. Increasing livestock numbers as a result of land use changes exacerbated the negative trends but, contrarily to the assumptions of former studies, were not their exclusive driver. Thus, it can be concluded that climate variability instead of overgrazing has been the primary cause for large scale vegetation cover changes on the Tibetan Plateau since the new millennium.