Submitted Abstract

ID IMC22-FSAbstr- 821

First Author First Name Last Name	 Marie (1,2) Stöckhardt
Submitting Author First Name Last Name	 Marie Charlotte Stöckhardt
Correspondence	s2mestoe@uni-bayreuth.de
Co-Authors >> E-Mails will be not listed	Hänchen, Lorenz (1); Thomas, Christoph (2); Maussion, Fabien (1); Wohlfahrt, Georg (1)
Organisations	1: University of Innsbruck, Austria 2: Universtiy of Bayreuth, Germany

Country	Austria
Region	Western Europe
Title	Elevation-Dependent Surface Temperature Changes In The Andes.
Keywords	Remote Sensing, Land Surface Warming, Mountains, South America
Type	List Of Focus Session
Focus Session ID	83

Abstract

On average, surface temperatures are rising globally, but the pace of warming varies with regional factors. Rates of warming are expected to increase with elevation, a phenomenon referred to as elevation-dependent warming (EDW). Drivers of EDW include albedo changes due to an upward migration of snow- and treelines, as well as a rise of the condensation level and water vapour changes.

Amplified warming in high altitudes can have a great impact on mountain ecosystems and agriculture, which are particularly sensitive to changes in climate. The cryosphere is also impacted by EDW, with consequences for downstream water availability. While various studies have reported the presence of EDW, it is still unclear whether the phenomenon occurs in all mountain ranges or at all elevations. Research on EDW is made more difficult by sparse station observations: satellite data can be used to overcome these limits and facilitate analysis on the scale of whole mountain ranges and for longer time periods.

In this study, we used 20 years of day- and nighttime products of land surface temperature (LST) observations from the Moderate Resolution Imaging Spectroradiometers (MODIS) on board of the TERRA satellite. The Andes were chosen as study area due to their latitudinal and altitudinal extent, which covers a wide range of climate and socio-economic zones.

We found warming to occur predominantly in the midlatitudes with an associated pattern of elevation-dependence. In contrast, the tropical Andes show both cooling and warming patterns with no clear elevation dependence. Additionally, seasonal variations of the magnitude and sign of the trends are more pronounced in the tropical latitudes than in the southern Andes. Trends were occurring more frequently during nighttime than during daytime. Our results depict the complex nature of EDW and call for further process-based studies supported by remote sensing data.