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Spatio-temporal temperature and precipitation patterns in the southern Peruvian Andes - insights from the Climandes project

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In the southern Peruvian Andes, climatic threats such as water scarcity or frost pose major challenges for agriculture. Such events may result in severe yield losses threatening the livelihood of smallholder farmers due to missing adaptive and coping strategies. Knowledge on climate variability and change, on the current state of the climate, as well as short- to midrange predictions potentially improve the farmers' risk management. However, such knowledge is only partly available and often does not reach rural communities. Climandes, a pilot project of the Global Framework for Climate Services, tackled these shortcomings through the enhancement of climatological observations, the production of gridded datasets using satellite and station observations, the verification of seasonal forecasts to determine their usefulness for small-scale applications, and through the establishment of communication channels and user engagement. This contribution highlights some of the insights from the Climandes project: climatological analyses of spatio-temporal patterns in the southern Peruvian Andes, past trends, as well as the performance of seasonal forecasts in the region. The work focuses on temperature and precipitation using the newly developed gridded datasets, quality controlled observational data, and seasonal forecasts of ECMWF SEAS5.

The results of the climatological analysis let us draw the conclusion that precipitation and minimum temperature patterns are likely related through increased / reduced cloud cover and increased / reduced incoming longwave radiation. Both variables show similar spatial patterns for example in austral spring (SON), namely a pronounced northeast / southwest gradient. Trends, which were derived from the enhanced climatological observation data available since 1964, show a strong increase in maximum temperature of around 0.2°C / decade, while minimum temperatures show only very moderate trends. In addition to the slight decrease of total precipitation in austral spring, i.e., the time of sowing, the strong increase of maximum temperatures further decreases soil water availability and enhances drought risk. With regard to seasonal predictions, we found that especially the performance of precipitation forecasts is only

very limited in the southern Peruvian Andes, and mostly does not exceed information from climatology. We conclude that seasonal predictions are not applicable for small-scale applications in the region, whereas they may serve as a beneficial basis to assess climate variability and discuss decision-making based thereon.