Submitted Abstract

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Abstract

The range of plant species change in response to environmental conditions such as climate. Mountain socio-ecological systems are particularly vulnerable to climate change. Hence, it is important to have insights into species that could be 'winners' or 'losers' in a context of climate change. In this regard, the study sought to evaluate current and future habitat suitability of woody (Acacia dealbata, Leucosidea sericea, Venonanthura phospherica and grass (Poa annua) species in African mountains under present conditions, atmospheric CO2 representative concentration pathways (RCPs) 4.5 (intermediate) and 8.5 (maximum concentration) climate scenarios. We applied the machine learning Maximum Entropy (MaxEnt) ensemble modelling to understand present and future habitat suitability of the selected species. We found that temperature will decline in African mountains under climate change, although climate change models suggest an increasing trajectory in future temperatures. This suggests that climate change models may not be capturing dynamics in the climate of African mountains, possibly due to a paucity of observed climate data when calibrating climate change models and as such these models may not be able to track changes in high mountain ecosystems. Although, only climate variables were assessed, species distribution results were accurate as model evaluation metrics revealed and static factors believed to be modulating species distribution were either a function of climate or influenced climate at a point. Species investigated in this paper were more sensitive to temperature than precipitation related variables, an indication that understanding temperature dynamics under climate change could be critical if active management of these species was considered. Poa annua (48.2 – 49.7%) distribution was unlikely to be adversely affected by elevated CO2, contrary to the well-established notion that increased atmospheric CO2 concentration will undermine grass species by favouring woody vegetation. Habitat suitable for Leucosidea sericea will decline under climate, contrary to conventional belief in southern Africa that it was expanding its range under climate change. Elevated CO2 was likely to benefit V. phosphorica and A. dealbata given that their suitable habitat will increase under climate change. Most of the investigated species were largely specialists as their suitable hbitats were mainly restricted to specific mountains under current and future climate. An improved understanding of climate change in mountain systems through better representation of mountain climates in climate change models will enhance the accuracy of species distribution models.