

# Long-term post-fire resilience of the Ericaceous belt, Bale Mountains, Ethiopia

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Fire is the most frequent disturbance in the Ericaceous belt, the dominant plant community of the Afromontane environment (3300-4000 m asl). By resprouting after fire, *Erica* establishes a fire-trap feedback in which a positive relationship exists between certain fire regimes and *Erica* spp. occurrence. However, present-day human activities in the Bale Mountain National Park (BMNP, Ethiopia) constitute a fire and grazing regime that may have a negative impact on the resilience of the Ericaceous ecosystem. Current knowledge of *Erica*-fire relationships is based on modern investigations, lacking a longer time perspective that can shed light on potential baseline conditions for the fire-trap. We hypothesize that fire has always existed in the BMNP, and has a long-lasting influence on the *Erica* vegetation. To test this, we aim to: 1) identify the fire history of the BMNP at millennial time-scales through a 14 kyr-long charcoal and pollen record from Garba Guracha, a lake at 3950 m above sea level (asl); and 2) describe the long-term bidirectional feedback between wildfire and *Erica*, which defines the ecosystem's resilience. Applying transfer functions to our charcoal record, we reconstruct the fire magnitudes in terms of burnt area, number of fires per year and fire radiative power. We fit a generalised least squares (GLS) model on lagged data to establish the effect of fire on *Erica* species and vice-versa. Our results indicate that fires have always occurred in the BMNP, with a particularly intense early Holocene burning phase equivalent in magnitude to the present-day fire regime. Our model proves that the bidirectional relationship between fire and *Erica* is positive; *Erica* presence is in part explained by fires that occurred in previous centuries and decades. Similarly, *Erica* fuel accumulation at decadal to centennial scales reinforces fire occurrence. We find that the Ericaceous belt is thus a long-term fire resilient ecosystem and that fire should be integrated in landscape management at the BMNP.

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