

Evidence of recent treeline dynamics in the afro-alpine Ethiopian highlands from aerial photographs and satellite imagery

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The high altitude forest limit is one of the most apparent vegetation boundaries worldwide. The response of the tree-growth limit to present climate change is scarcely investigated in the tropics and in the southern hemisphere, comparison to treeline dynamics at higher northern latitudes. However treeline changes cannot be ascribed to climate change only, as tropical mountains are densely populated: 135 inhabitants per km² in areas above 2500m in Ethiopia. Humans directly impact the upper treeline through livestock herding, fire and wood harvesting. The *Erica arborea* L. treeline is studied in two tropical mountains in the north Ethiopian highlands: Leb Amba of the Abune Yosef Mt. range (12°04'N, 39°22'E, 3960 m a.s.l.) and the Ferrah Amba Mt. (12°52'N, 39°30'E, 3939 m a.s.l.). The present physiognomic treeline limit is recorded by high resolution Bing Map satellite imagery and field data (February, 2012). Historical treelines were studied from aerial photographs (1930-1965-1982) and Landsat imagery. Ground truthed Landsat images (1980s-present) are used to detect treeline dynamics as well as changes in forest density by calculating an NDVI ratio. Preliminary results indicate a severe decrease of the forest cover extent from the early 1990s up to 1965, caused by recent land occupation and agricultural expansion of mountain regions. Subsequently between 1965 and present the forest density increased in small isolated patches and strongly degraded outside of these managed forest patches. We found evidence that the elevation of the *Erica Arborea* L. treeline increased slightly, which has to be understood against the important land use changes on the mountains and potentially by regional temperature rise.

Keywords: Treeline dynamics, land cover change, NDVI ratio, land occupation, north Ethiopian highlands